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# GO MOBILE, BANK ANYWHERE: EXAMINING THE WAYS MOBILE TECHNOLOGY CHANGED BANKING SECTOR

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## ABSTRACT
The future mobile banking is only big but it is considered to be very bright. With the growth of mobile commerce, electronic wallets and wireless purses are taking place of paper cash. Financial institutions like bank are facilitating their products, pricing and transactions for mobile channels. As a form of branchless banking, mobile banking holds the promise to cater lower transaction costs facilities any time at any place.

## INTRODUCTION
The possibilities for Mobile Commerce (MC) are just beginning to be realized as e-purses and wireless wallets are taking the place of physical cash and credit. Like an ATM, it can't spit out cash. But the mobile handset is rapidly becoming the next most viable platform for banking. Today, this pocket banking experience mirrors that of online banking in form and function: transferring money, checking accounts, and paying bills. The mobile bank of tomorrow has the potential to transform; however consumers purchase products, exchange money and manage finances on the go.

While Business-to-Business (B2B) applications have yet to emerge, business users are already heavily dependent on their smartphones. It is not difficult to imagine B2B marketers using NFC to enable instant payments on trade show floors or for "bumping" information between users in meetings.Future mobile wallet will let consumers deposit and withdraw cash through on-device clients, send money to friends or family via a short message service text, or purchase an item through near field communications (NFC), an RFID technology that enables data exchange with a swipe of the phone. NFC adoption would open the door for point-of- sale mobile transactions. As NFC technology develops, NFC-capable handsets are pushing mobile contactless payments into the mainstream. It's been rumored that the next generation of iPhones will be NFC-enabled. According to Forrester Research, four NFC business models are emerging.

There's a lot at stake with mobile payments. Juniper Research estimates the mobile payment market will reach about $630 billion worldwide by 2014. Wilcox predicts 20% of mobile phones will be NFC enabled in the next three years (Karpinski, 2011).

In all the models, a trusted service manager (TSM) serves as a partner – bridging the end user, application provider, and telecom provider. Another mobile payment option is Starbucks' Mobile Pay, using 2D bar codes, for the Blackberry and iPhone/iPod touch. This technology uses the device's camera and Starbucks Card Mobile App to display the barcode used to make a purchase. Starbucks is piloting the service in Seattle and the Silicon Valley. Through the pilot, Starbucks will learn about customers' habits around mobile payments and apply lessons learned while other technologies mature.

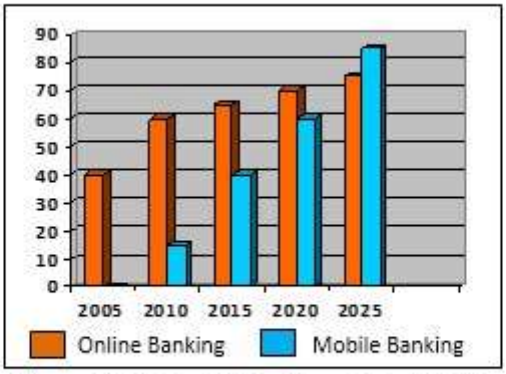
Mobile Device is "…anything that can be used on the move, ranging from laptops to mobile phones. As long as the location is not fixed, it is considered mobile. Areas that are not included in the definition of mobile include remote offices, home offices, or home appliances (Bose, Ping, Shan, Shing, Shing, Tin and Wai, 2006). Mobile has remodeled itself into a "media" with news clippings or video commercials on the device. The dramatic transformation of the mobile phone into a mobile computer is completed with Web surfing, music, sophisticated photography, and video functionality.Owing to the rapid development of mobile technology over past few decades, there have been many different kinds of mobile devices emerging in the market, and most of them work with databases seamlessly.…Mobile devices take various forms and configurations. The packaging, form factors,

hardware platforms, operating system support, and functional capabilities vary across these devices. There are, however, many common attributes shared by the devices, such as notebook computers, pen-based computers, handheld computers, and the like, all of which are used in mobile computing. These devices can be categorized into following categories according to their functionalities and features, as detailed in Dhawan (1997, as cited in Bose, Ping, Shan, Shing, Shing, Tin and Wai, 2006). Following are the example of mobile devices.

- notebook computers
- personal digital assistants
- tablet computers
- hybrid mobile devices
- mobile phones

Online banking, excluding mobile banking, is now the preferred method of conducting financial transactions, according to a survey by the American Bankers Association. Survey results showed that the popularity of online banking isn't exclusive to the youngest consumers: In 2009, for the first time, it surpassed all other options as the preferred banking method for all consumers younger than age 55. While it's likely mobile banking adoption will surpass traditional PC-based online banking in the next 10 to 15 years, next-generation home banking systems must continually evolve. (Top Tech Innovations, 2010).Mobile phones are the most popular and commonly used devices in the industry. It is rapidly being revolutionized to deliver much more than voice. Technologies using mobile phones, PDAs, and other handheld wireless became effective in financial service markets. In terms of usability, phones are challenging laptops and desktops, with iPhone a prime example of the trend. Network speeds have vastly improved as well.

**Exhibit1:** ***Mobile vs Online Banking (by millions of U.S. households)***




Source: BAI Online Banking Report, March 2010

Source-Top Tech Innovations (December, 2010). Credit Union Magazine, 76 (12):32.

The wider adoption of smart phones and mobile phones is transforming online banking. Progressive banks have long since begun to urge their Internet customers to go mobile with their iPhone or iPod, to easily and securely check balances, pay bills, transfer funds, or locate an ATM or banking center in the neighborhood. Mobile banking is becoming more and more popular. Gartner has estimated that there will be 33 million mobile payment users worldwide in 2008, tripling to 103.9 million in 2011 (Vats and Mohan, 2008).The number of potential banking customers with mobile connectivity is more than double the number of users with Internet connectivity. Recent surveys by the Tower Group show that 16 percent of mobile phone subscribers already use mobile banking services -- with 60 percent using the services at least once a week. Many others, presently not banking and buying on-the-go, expressed interest in mobile banking, with 35 percent open to checking their bank account balances and transferring funds through their mobile devices. A third of those surveyed (33 percent) also said they would like to receive text message alerts from their financial institutions. About 25 percent of users with mobile access to the Internet now buy goods and services online with a credit card. One in five respondents (20 percent) said

they would like to someday use their phones like a "mobile wallet," where charges would be billed directly to their mobile accounts. In addition, 10 percent of the survey participants said they would consider wire transfers and stock trading through their mobile phones (Vats and Mohan, 2008). Exhibit 1 depicts how m-banking will gain popularity among consumers in contradiction to online banking in near future.The increase of storage capacity in mobile devices gives users the possibility to maintain large amounts of content to their phones. As a result, this amount of content is increasing at a high rate. Users are able to store a huge variety of content such as contacts, text, messages, ring tones, logos, calendar events, and textual notes. Furthermore, the development of novel applications has created new types of content, which include images, videos, MMS (multi-media) messaging , e-mail, music, play lists, audio clips, bookmarks, news and weather, chat, niche information services, travel and entertainment information, driving instructions, banking, and shopping (Koukia, Rigou, and Sirmakessis, 2009).

***Research by O2 tells us that we use mobiles to:***

| | |
|---|---|
| Request a brochure | 74 per cent |
| Access company information | 70 per cent |
| Check product availability | 70 per cent |
| Locate a retail store | 64 per cent |
| Make a booking | 50 per cent |
| Respond to an offline ad | 51 per cent (30 per cent of mobile users have used a short code to respond to an ad) |

Exhibit 2: Source- Thomas, B. and Housden, M. (2011). Direct and Digital Marketing in Practice: 267.

Within a decade of its commercialization, mobile communication is now often used more than landline telephony. In the early 1990s, only the privileged few used mobile communication, but by the mid-2000s, approximately one-third of the world's population had a mobile telephone. This period of seemingly effortless adoption has been accompanied by changes in our sense of safety and security, the way we coordinate everyday life, the way teenagers experience their coming of age, and the way we use and experience the public sphere (Ling, 2008). Exhibit 2 depicts multiple usages of mobile technologies by us.

The growth of mobile is one of the main digital marketing trends. In the last ten years, mobile phones have morphed into mobile computers, offering users a variety of text, music, and video functions. And consumers have responded.

Research firm Gartner estimates that spending worldwide on music received on mobile handsets will exceed US$30 billion by 2010, up from less than US$14 billion in 2007. In fact, it's estimated that by 2015, mobile content could be worth in excess of $1 trillion, with voice comprising only a 10% share of the market (Wertime and Fenwick, 2008).

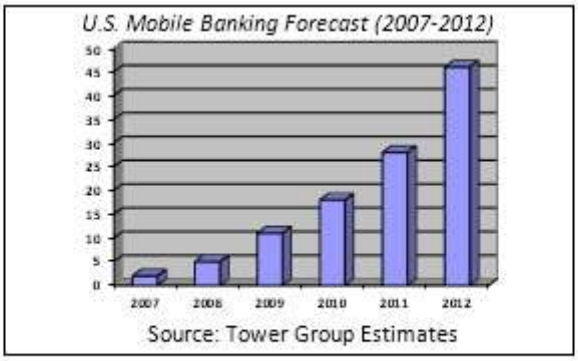
## MOBILE BANKING

The first wave of mobile banking hit world markets around 2001. Initially, customers were wary about transmitting account numbers and passwords over a text message. SMS-banking system usage steadily increased with time. Non-value transactions like account balance inquiries were the first to go mobile technologies. Customers then warmed up to the SMS channel for utility bill payments and financial transactions like fund transfers. However, browser-based banking, serving up a watered-down version of websites, failed to replicate the Internet banking experience on the mobile.Mobile Financial Services (MFS) that are offered as a part of Mobile Commerce can be divided into two categories: Mobile Payment and Mobile Banking. Buse and Tiwari defined Mobile Banking as "provision and an ailment of banking and financial services with the help of mobile

telecommunication devices. The scope of offered services may include facilities to conduct bank and stock market transactions, to administer accounts and to access customized information." (2006, as cited in Krishnan and Sowmiya, 2009).

According to Lee & Warkentin, Mobile Banking is a client-server system that enables banking customers to use handheld devices to access their accounts, pay bills, authorize funds transfers, or perform other activities (2006, as cited in Khosrow-Pour, 2007). Mobile banking is a logical extension of online banking and thus may be a comfortable next step for bankers. But extending the use of mobile devices beyond banking transactions to point-of-sale and person-to-person fund transfers may require innovations in merchant, telecommunication, and financial services infrastructure as well as consumer willingness to try new payment technologies (Bell, Hogarth, and Robbins, 2009).In simple language, Mobile Banking (also called M-Banking) or SMS Banking is referred to provision and accessibility of financial service such as banking with the help of movable telecommunication device like mobile phone. Through mobile banking, one can access account information, perform transactions; both account and stock market, make payments etc. in complete secure environment. A recent Forrester Research survey found adoption of mobile banking services has more than doubled since early 2009, and it's predicted to grow by about 20 percent a year over the next five years, reaching 50 million consumers by 2015(Sieroty, 2011). Exhibit 3 depicts forecast about sudden growth in Mobile Banking Services in United States.

Exhibit 3




Source: Reedy, S. (September 1, 2008). What's In Your [Mobile] Wallet? Telephony: 12-13.

Several recent studies indicate strong consumer interest in mobile banking. They also reveal that mobile banking is still in its infancy around the globe. A recent Sybase Inc. research indicates that mobile banking service is almost twice as prevalent in Asia-Pacific, with 15.4 percent of those surveyed in the region reporting to have used a mobile phone to check their bank balance in the past three months. This compares to just 8.7 percent in the Americas and 7 percent in Europe showing a disparity between the demand for mobile banking services and availability of these services. In both the United States and Europe, 40 percent of those surveyed claim to know exactly how much money lies in their bank account at all times and 41 percent check bank balances on a daily basis. Mobile banking services cater to this need, offering banking consumers the option to check account balances, transfer funds, and make payments or validate transactions, anytime anywhere (Vats and Mohan, 2008). Mobile banking is mostly performed by using SMS, Mobile Web, or GPRS. SMS (Short Message Service) was the first mainstream technology to enable that permit short text messages to be sent from one mobile device to another. The idea of SMS was first conceived in the late 1980s, and developed during the early 1990s.

IMS Research forecasts that the number of active users of mobile banking and payment services will increase 66.2% over the next four years, while overall mobile users will grow at just 32% in the same period. Therefore mentioned functionality could be a leading driver of the explosion in mobile commerce, but today consumers and vendors are still realizing the possibilities. Firethorn, acquired by Qualcomm last year, is one prominent provider of mobile banking services. The goal of the company is to keep increasing functionality, with mobile payments being the ultimate goal, according to Kelly Buday, director of marketing for Firethorn. It isn't out to recreate Internet banking on the phone, but rather to turn the handset into a usable device for banking, payments and

transactions (Reedy, 2008).

Buday further added "Payments are definitely a big part of the importance and value a phone can provide. There could be relevant info provided to the consumer, be it an offer or something that provides them value as they are about to make a purchase." One of the best examples Buday used was of a consumer going to a store to buy something. Rather than search for coupons and best offers, the shopper could use a mobile wallet to display each credit card's information and balance. If using a certain card garners a 10% discount, consumers will have that information at their disposal. This is more relevant and compelling for the consumer to use their mobile channel and their accounts within their mobile wallet versus going back to their computer, printing off a coupon, and going to the store, etc.

Both AT&T and Veri2on run Firethorn-powered mobile banking offerings. AT&T has been offering its service: focused on balance inquiry, transaction history, bill presentment, payment and transfer functionality. Through Firethorn, the carrier partners with several banks to offer a downloadable Java-based client for its handsets. AT&T plans to pre-load the application into at least 34 handsets by the end of the 2008.

According to Spencer White, director of mobile financial services for AT&T, they has chosen client model because they thought it was superior to a wireless application protocol-based mobile Internet session or messaging session in that it allows for offline operation. The information can be refreshed mobile screen. So if a client is on a train traveling, he can still open up the application and see the most recent info loaded into the phone and queue up transactions.

Recently, AT&T moves from mobile banking to mobile payments, the carrier also is looking at doing more advanced banking functions and applications. AT&T has yet to deploy near field communications (NFC), it has done two large consumer trials with the technology. Most NFC experiments have been in Asia to date. It was believed NFC should prove to be a "see it to believe it" type of service. It is based on RFID technology and consumers have given rave reviews at every point.

It was found that after introducing that technology and letting consumers to touch it, feel it, play with it and use it, they get very excited about such functionality.

On September 2007 at a CTIA event, Spencer White stated that one of the stumbling blocks in mobile banking sector is the diversity of service types. Though mobile banking falls under the umbrella of m-commerce, it has its own set of requirements and technology enhancements. Despite the several successful trials and launches thus far, the m-commerce market is still far from being ubiquitous. Consumer doubts surrounding ease of use and security, uncertainty around business models, and investment in infra-structure retain major hurdles. He pointed out that contactless payments pose one of the biggest challenges because finding a suitable business model for all parties in e-commerce ecosystem is difficult. Banks currently make money on transaction fees and don't want to change that model. Service providers carry the transactions and prefer a larger share of the revenue. As the financial sector continues to see movement toward contactless payments, it seems to move slowly towards operators and their partners sort out the infrastructure investment required in chipsets, backend systems and PoS terminals. Operators and other players in the m-commerce space understand the need for an adoption curve.

AT&T appears to be pushing hard on the mobile banking side because the service doesn't require infrastructure investments and it represents a good way to begin educating consumers about m-commerce. AT&T has conducted a number of trials in both mobile banking and contactless payments. White further added that "…before the trials, customers had a mild to moderate interest in the services, but once they experienced the capabilities their enthusiasm went through the roof."

Mobile Money Ventures (a joint venture between Citi and SK Telecom) was formed to provide mobile financial services across the globe. Its first customer implementation is with Citibank Hong Kong, announced at the end of July, 2008. Going forward, Steve Keitz, CEO of MMV and executive vice president for Citi, envisions consumers picking up the service and their mobile phones as a complete alternative to the online experience.

Keitz stated that "We think we need the core functionality wherever we operate in terms of basic banking and brokerage, and then we have a product road map with many services that are ahead of the curve….A lot of them are based on what we've seen in South Korea, where they also have some of the sharing and receipt capture." The service basically focused on basic banking and brokerage during launching period. In the next period, the service may include information on budgeting, receipt capturing and sharing merchant comments with contact lists, as well as NFC through a partnership with ViVOtech and peer-to-peer mobile payments through partner Obopay. Peer-to-peer payments provider Obopay has already linked deals with Helio and Verizon Wireless to integrate the service into the carriers' decks, although the service can be used via any operator or phone.

When NFC is added to the equation, the forecast for mobile payments goes up to $75 billion globally by 2013, according to Jumper Research, which believes the market will reach its tipping point between 2011 and 2013. Japan, for one, already is leading the way with NFC-enabled handsets now on the market. Outside of awareness, the biggest hindrance to the technology is still simply the fact that only a handful of handsets currently are capable of making these transactions (Reedy, 2008).

The mobile commerce industry is now seeing some real traction around announcements, services and deployments. In 2007, a plethora of banks in the United States and abroad began marketing mobile banking services to their customers, and various deals involving some high profile players in the financial and retail world have come to fruition. Following are some examples:

- In September 2007, Sprint Nextel introduced Mobile Shopper, which enables customers to buy products via their mobile phones through an e-commerce tool powered by mShopper. The service allows consumers to search among 7 million products from 30 online retailers such as eBags, eLuxury, JC Penney, Target and Wal-Mart. Verizon Wireless also teamed with mShopper in October 2007.
- Citibank's free program, Citi Mobile, lets cardholders pay bills, check account balances and transfer funds by using their mobile phones, regardless of which mobile operator they use.
- First Data, which provides electronic commerce and payments services globally to 1,900 card issuers and more than 5 million merchants, partnered with mFoundry, a mobile application platform provider, to help financial companies offer mobile banking services.
- LogicaCMG recently partnered with Dutch supermarket chain ClOOO to enable customers to use NFC-enabled mobile devices to purchase groceries (Luna, 2007).

Text messaging is one of the fastest growing communication technologies in human history. It has been recognized for providing a broad range of advantages to both service providers and receivers. Following are the benefits one can get acquire through mobile messages:

(1) Cost-effective medium-In many countries, text messaging has overtaken e-mails and voice calls because it is a cheaper alternative. One of the unexpected social consequences of cheap mobile communication has been its impact on the teenager emancipation process. During the emancipation process, teens move freely and securely without being dependent on their parents.

(2) Open Communication medium- The use of voice communication and the growth of texting have revised the way people use to think about interpersonal communication.

(3) Confidentiality – Conversation through text or multimedia messages remain private, even it is carried out in a public place (such as rail station, roadside). In case of verbal communication through mobile, one may feel being inhibited while speaking over mobile, but the same does not apply to written conversation via mobile.

(4) Convenience- Mobile messages can be sent anywhere at any time, and can be composed within a couple of minutes. SMS/MMS conversation can be carried on in public spaces, irrespective of noise levels.

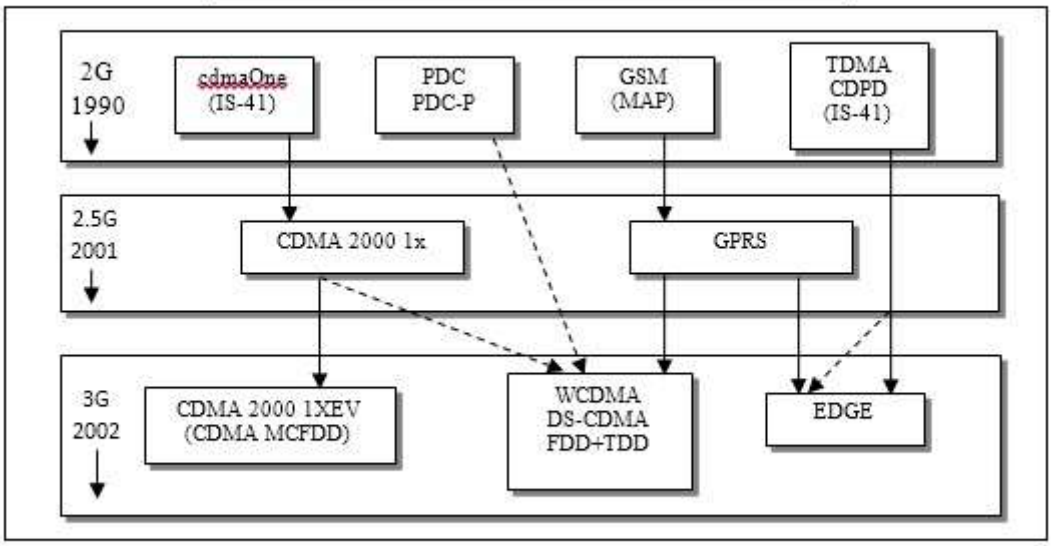
(5) Immediacy- SMS/MMS messages are not only quick to compose, but they also reach the distant contacts within a moment of time. Feedbacks are often equally fast as composition of messages. This is one of the facts, which attract the financial service providers to assess the success of a campaign or program in a very short timeframe. Mobile messages are ideal for storing appointments and addresses.

(6) Ubiquity- One of the most important impacts of mobile communication is the ability to call individuals regardless of where they are. Rather than being called at a specific geographical place, an individual can

be called anywhere at any time.

Initially, mobile network was introduced for transmitting signals during the Great War period. Now, as advanced networking technologies are being developed, new networks and standards are evolving in such way they can be layered on previous network systems for the sake of easy upgrades. Exhibit 4 illustrates the evolution and migration of mobile networks in communication system.

*Exhibit 4: Mobile network evolution and migration*




Source- Raina, and Harsh (2002). Figure-5.2:132.

In mobile communication technology, 3G is a specification for the third generation of mobile communication. It promises increased bandwidth, ranging from 128 Kbps in an automobile to 2 Mbps in fixed applications. It was primarily designed as a voice technology, and as a platform for high-speed Internet access. This technology might replace traditional wireline phone service and could be substitute for primary-line voice service. The third generation mobile system brought about many changes in comparison to first and second generations. Now, users not only involve in voice communication but they can also look at the phone screens for information and can inquire for transactions. The mobile phones are not only becoming an integral part of people's life but they can be also used as mobile control devices. 3G wireless standards brought more bandwidth and video-centric devices compared to GPRS terminals.

From a network architecture point of view, the layering of 3G over older systems such as GPRS was not a big jump. Such modification was not so huge in comparison to the movement when circuit switched networks switched to GPRS. Because GPRS was a first-time addition of packet capability to a circuit switched network, whereas 3G is the addition of more packets.However, from a consumer point of view, the move from 2Gdata services to GPRS, because GPRS brings mobile network data bandwidths to the same level as fixed telecommunications networks, whereas 3G enhances bandwidth to a level where new applications will need to be developed to use it (Raina and Harsh, 2002). GPRS was the precursor to the third generation (3G) cellular networks such as Universal Mobile Telecommunications System (UMTS) and Enhanced Data Rate for GSM Evolution (EDGE). Even though 3G systems are installed in various parts of the world, GPRS is still being deployed in many countries. GPRS provides a low cost migration from the 2G GSM networks to 3G networks such as UMTS. The integration of GPRS into an existing GSM network requires the addition of only two GPRS supporting nodes (GSNs) and modifications to several existing nodes. The two GSNs form the core network of GPRS. These two GSNs are utilized with minor modifications in 3G systems such as UMTS (Narayanan, 2006).

The enhanced bandwidth provided by 3G raised a plethora of new applications. Mobile multimedia applications such as audio downloads, making calls over the internet, static and dynamic image transmissions, virtual home environment, and download of software have driven the development of new applications and services. Thus 3G is increasing the data traffic. 3G also offers mobile agents. Mobile agents are programs that carry out searches and tasks on the Internet according to the instructions provided to them and then report back to their senders. It is anticipated that in coming years 3G will provide users much more control over their lives with new tools like mobile assistants, mobile advisors, mobile secretaries, and mobile administrators.

With mobile technology, banks can offer a wide range of convenient and comprehensive services to their customers such as doing funds transfer while traveling, receiving online updates of stock price or even performing stock trading while being stuck in traffic. Banking customers can inquire about account balances and transfer funds by their own. These self service capabilities empower customers to manage their banking activities better. Along with regular banking customers, retail and corporate customers can access to this banking solution through SMS, GPRS/ 3G and USSD-enabled mobile handsets. Banks offer text alerts, which are messages sent to customer's cell phone to alert him about his account's activity such as deposits, withdrawals, and usage of ATM, debit card or credit card.

M-banking is quite a popular method of banking that fits in well with a busy and technologically oriented lifestyle. It allows the user to log into his or her account from a mobile phone, and then also use the same device to make payments, check balances, stop payment on a check, transfer money between accounts, notify the bank of about a lost or stolen ATM card, receive a new PIN, view a monthly statement, or make deposits through text messages or by using the phone's camera to take photos of a check and send an email to make a deposit. It is more convenient for the consumer than going to bank physically as he can log on to account from his home desktop, or just make a phone call. For banks, mobile banking is just as another effort to recruit new customers, as they are keeping their existing customers along with all products and services they desire.

The usage of Apple iPhones are spreading among the consumers. As the popularity of tablet computing is rising, banks of all sizes have had to adjust quickly to meet consumer demands for mobile banking services. Banks that have led the charge into the mobile world include Bank of America Corp. and JP Morgan Chase & Co. But a growing number of smaller financial institutions in Las Vegas have braved this new world. Nevada State Bank, the largest state-chartered bank in Nevada, launched its service on August 2011. Mobile banking is available for iPhone, Android, BlackBerry and other mobile Web-enabled devices though a down loadable application. Nevada State Bank online banking manager Cathy Sheehy said just more than 4,800 clients has downloaded an application. Sheehy further claims that number will grow in future as the bank continues to roll out more features through the first quarter of 2012. The Bank will provide its Phase II m-banking service by the end of 2011.Phase II includes a branch and ATM locator feature. Online and mobile bill pay will be available early 2012.

Bank of America launched mobile banking services in 2007 and had 1 million active users by the following year (Sieroty, 2011).

According to Vats and Mohan (2008) "Mobile banking is by far the best option for financial service providers to reach the unbanked, for three key reasons".

- Penetration: In most economies, mobile usage is growing at a much faster rate than banking services, since far more people have mobile phones than bank accounts.
- Cost: When banking the unbanked, financial service providers need to keep their fixed costs low. Mobile banking's branchless advantage can help banks provide cost-effective services and accelerate access to their products.
- Infrastructure: Mobile banking uses the existing mobile communications infrastructure, which already reaches the unbanked. Thus, a bank does not have to invest time, money and effort in setting up new infrastructure.

The following example clearly illustrates the point. The Inter-American Development Bank (IDB) recently reported that unbanked Latin American immigrants working in the United States send an estimated $45 billion to

their home countries each year, rising to more than $100 billion annually by 2010. Globally, the remittance market is valued at $239 billion. At $20, $50 or $100 a remittance, these consumers are spending an enormous amount on the transactions alone. For instance, a conventional money transfer of $200 to Mexico costs $14.99. Mobile service providers believe they can reduce the cost of completing most financial transactions to 0.4 cents. This would eliminate the cost of cashing payroll checks; reduce a $200 money transfer charge from $14.99 to $5 and cut the cost of paying utility bills through conventional means from $12 per bill to $2 (Vats and Mohan, 2008).
M-banking consists of three inter-related application:

1. Mobile Financial Information Services.
2. Mobile Accounting Availability.
3. Mobile Brokerage.

## TECHNOLOGY BEHIND MOBILE BANKING SERVICES

Mobile banking and transactions depend on several technologies such as:

- Short Message Service (SMS)
- WAP (Wireless Application Protocol)
- Near-Field Communication (NFC) Chip
- Downloadable application

The earliest mobile banking service was offered through Short Message Services. In 1999, mobile banking was initiated with the primitive smart phones. Phones with WAP support enabled the use of mobile web, and the same platform was adopted by the European Banks to cater mobile banking to their customers.

WAP is a technical standard for text-based mobile Internet services. It is heralded as the first major global technology to make the mobile Web a reality. In the early 2000, the first WAP phones were launched in Europe providing basic news and other information over such mobile device. But WAP failed to live up its expectations in the initial period as users were not able to move freely around the web and had to dial up every time they wanted to access the service.

## TECHNICAL HISTORY OF MOBILE

Though mobile phones and the Internet seem to be new technologies, their history traced back to the era when the development of wired forms of telegraph and telegraph and wireless radio took place. Entire generations become defined by the technologies they use. People are often circumspect when a new technology is introduced, especially when younger generations become the experts on its use. For the radio generation (anyone born before 1940), now referred to as the "Matures" by Riggs (2004) and others, their children, called the Baby Boomer TV generation, seemed to process information faster and more visually. For the TV generation, whose children grew up in homes with multiple cable channels, VCRs, home computers, the Internet, and video games, the pace of change has been even faster. The Boomer's kids, who became known as the "X" and "Y" generations, seemed much better at understanding digital technologies, working with computers, and figuring out digital logic. Now, the children of the "X" and "Y" generations seem to be able to program technology, manipulate content, and communicate digitally far more efficiently and capably than their parents (Hanson, 2007).

### Telegraph

Both cell phones and the Internet have a history of 120 years that grew from an environment which allowed wired communication especially through telegraph and telephone. This was the first major phase of wired communication in the United States. The second major phase of development occurred in the mid-twentieth century with cable television and the Internet.

Samuel F.B. Morse is often credited as the "inventor" of the telegraph. What he did contribute to the effective use of telegraphy was an efficient language for sending messages over wires through a system of electronically generated dots and dashes. When Morse developed Morse code in 1884, the United States was still a country in formation. The population was scattered throughout the country, but the human migration westward was the most noticeable feature of the population drift….When the final golden spike was driven into the earth uniting rails

from the east and west, the United States had as many as 200 time zones. By 1883, a system of coordinated time zones was established, making commerce and travel by rail a far more orderly process and giving the telegraph operator (a job often held by a man, even though women, too, were telegraph operators) a certain social status as an expert (Earle, 1983). The appearance of the electrical wires beside the train tracks was not immediately welcomed by those settlers who reveled in the open scenery of the West, in part because they were an unsightly mess, but also because they brought new ideas from the east to the west. News could be transmitted over the telegraph wires and published in local newspapers, and catalogs and new products from the east could be more easily transported by rail (Hanson, 2007).

**Wired Telephone**

In the early 19th century, several inventors made numerous attempts to transmit sound by electric means. Charles Bourseul of France was first to suggest that sound could be transmitted electrically. He enumerated that a diaphragm making and breaking contact with an electrode could be used for sound transmission. A German named Johann Philipp Reis had designed several instruments for this purpose by 1861. The first device for transmission of speech was invented by two Americans named Elisha Gray and Alexander Graham Bell, both independently designed electrical sound transmission devices. In the spring of 1874 Gray realized that a receiver consisting of a single steel diaphragm in front of an electromagnet could reproduce any of the transmitted tones. Gray, however, was initially unable to conceive of a transmitter that would transmit complex speech vibrations and instead chose to demonstrate the transmission of tones via his telegraphic device in the summer of 1874. Bell, meanwhile, also had considered the transmission of speech using the harmonic telegraph concept, and in the summer of 1874 he conceived of a membrane receiver similar to Gray's (The New Encyclopædia Britannica: Macropædia-Knowledge in Depth, 2007).

It was recounted by Ithiel de Sola Poole (1977) that telephone seemed to eliminate regional dialects and have the effect of eliminating written records for historians. Bell himself thought that the technology would be used to record voices so that family members would be able to remember their loved ones after their death. At first, telephones seemed strange and unnecessary; reinforcing the idea that innovation alone is not enough to create social change. Until individuals found a need for telephones, they remained as interesting novelty (Hanson, 2007). Fischer (1992) in his book discussed how telephone company salesmen attempted to cultivate different users. The first targeted groups were businessmen, who were persuaded to use the telephone to be efficient, to save time, and to impress customers. Later, residential market was targeted. Many phone company targeted women as their clients as they considered women's conversation frivolous. But Men viewed women's social communication as "gossip" and considered it a waste of time. The most important part was that a number of new jobs brought women from the privacy of the home into the public and to the office. As the population shifted across the United States and cities became centers for business, women entered the workforce, often as telephone operators, secretaries, and clerks….Women became the equivalent of a paid office-wife, taking care of the man, who was too busy to be bothered by the mundane routine of keeping the office going. Once women began to earn their own livings, their social status began to change. The acceptance of women as workers outside the home changed dynamics in the home, and the rocky road toward gender equality had begun (Hanson, 2007).

Mobile, radio-based communication, including what is known as mobile telephony, has its origin in the work of Marconi and radio telegraphy. The ability to modulate voice signals allowed for the development of services such as police radio, which first appeared in the 1920s in Detroit. The use of radio to "dispatch" various services expanded to include police and fire departments, taxis, and even rural veterinary services. Radio-based communication in the switched telephony era had to wait until after World War II. Some of the first experiments with radio-based telephony-the so-called wireless local loop- were carried out in the eastern Colorado town of Cheyenne Wells in the United States. Local farmers, living as far as 30 kilometers outside town, were tied into the traditional telephony system via a radio link to their homes. The calls were manually routed via an operated in town, but the essentials were there, i.e., a radio link that was "switched" into the traditional system. At this time, the so-called radio cell was many kilometers in diameter. The next advance was the development of cellular technology whereby a conversation was "handed" from one relatively small radio cell to another; hence the name cellular telephony. The ability to support this type of routing of signals led to the current form of mobile communication. The first true cellular telephone system that used multiple radio cells and a handoff was the

Amtrak Metroliner between New York and Philadelphia in 1969. Miniaturization of handsets and the digitalization of communication resulted in today's mobile telephony systems (Ling, 2008).

Presently, wireless telephones fall into three categories: cordless telephones, cellular radio system, and personal communication systems. Cordless telephones are devices that work within a house or office and it permit very little mobility. Cellular telephones are personal or vehicle portable devices, which permit higher degree of mobility within a defined serving region i.e. about hundreds of square kilometers in area. Cellular radio systems provide such service at the expense of providing voice-only service at significant monthly prices. To cope with such limitation, many countries introduced a new radiotelephone service, which is known as Personal Communication System (PCS). PCS consists of all forms of radiotelephone communication interconnected with public switched telephone network (PSTN) including cellular radio and aeronautical public correspondence. With global satellite-based telephony, these wireless telephone systems are expanding rapidly.

The first personal communication system (PCS) implemented for wireless communication was the second-generation cordless telephony (CT-2) system, which entered service in United Kingdom in 1991. The CT-2 system was designed at the outset to serve as a telepoint system. In telepoint systems, a user of a portable unit may originate telephone calls (but not receive them) by dialing a base station located within several hundred metres. The base unit is connected to the PSTN and operates as a public (pay) telephone, charging calls to the subscriber. The CT-2 system transmits a digital signal at low power (10 megawatts) in the 864-868-megahertz band: Modifications that permit two-way call placement have been incorporated into the system (The New Encyclopædia Britannica: Macropædia-Knowledge in Depth, 2007).

## DEVELOPMENT OF CELLULAR SYSTEMS

Mobile telephone service (MTS) was introduced by AT&T. the MTS system employed frequencies in either the 35-megahertz band or the 150-megahertz band. The first mobile and portable subscribe units for cellular system was heavy and large.

Mobile technology has evolved through three main stages:

- The first generation of mobile phones was based on analogue technology. Signal was patchy and least clear. These phones were large in size, heavy and difficult to use.
- The second generation used digital technology, which helped improved signal reception. These phones enabled wide range of sophisticated services.
- The third generation or 3G mobile phones are the intelligent ones, which allows users to download music files or visual clips, play games, and communicate via a corporate intranet.

In United States, with the introduction of MTS in 1946, mobile radio transmitter and receivers were interconnected with the public switched telephone network (PSTN). In 1964 AT&T introduced a second generation of mobile telephony, known as improved mobile telephone service (IMTS). This provided full-duplex operation, automatic dialing, and automatic channel searching. Initially 11 channels were provided in the 152-158-megahertz band, but in 1969 an additional 12 channels were added in the 454-459-megahertz band. Since only 11 (or 12) channels were available for all users of the system within a given geographical area (such as metropolitan area around a large city) and since each frequency was used only once in that geographical area, IMTS system faced a high demand for a very limited channel resource. For example, in New York City during 1976, the IMTS system served 545 customers with another 3,700 customers placed on a wait list for service (The New Encyclopædia Britannica: Macropædia-Knowledge in Depth, 2007).

During this period the American cellular radio system known as Advanced Mobile Phone System (AMPS) was developed by AT&T and Motorola, Inc. The first cellular phone call (mobile) took place in 1973 in the United States of America by Motorola's Martin Cooper. Initially mobile phones were very popular among automobile-crazy population and were primarily used as car phones. Although AMPS was the first cellular system to be developed, but actually the first cellular system was developed by Japanese. In Japan, the first commercial cellular network was launched in 1979 by NTT, three years before the first cellular network went commercially live in the USA. In 1981, the first internationally roaming cellular network standard was NMT (Nordic Mobile Telecoms) was introduced throughout Scandinavia. In 1983, the Total Access Communication System (TACS) was installed

in the United Kingdom. In the following years many other nations developed cellular systems for communication purpose.

In 1988 a group of government-owned public telephone bodies within the European Community announced the digital global system for digital global system for mobile (GSM) communications, the first such system that would permit a cellular user in one European country to operate in another European country with the same equipment (The New Encyclopædia Britannica: Macropædia-Knowledge in Depth, 2007). In 1991, the first digital commercial cellular network, GSM (Global System for Mobile communications) was started in Finland by Radiolinja, which ushered the competitive age in mobile telecom industries.

GSM is a digital mobile telephone system that is the de facto standard in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) multiplexing. It digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band in Europe and 1900 MHz in North America (Graf and Kneeshaw, 2006).The first digital services in mobile industries were digital versions of voice services i.e. voice calls was instigated. In 1994 a new digital services, SMS (short message service) text messaging services were introduced in Finland and the UK.

The mobile telecom industries were adding new and innovative services. In 1994, Nokia installed pre-installed (music) ringing tones to selected models, and soon many new features like interchangeable colors and pre-installed games were launched in mobiles. The first prepaid services were launched by Telecom Italia Mobile (TIM) in Italy in 1996. The prepaid service was the key attractive element that encouraged the 'whole population' of any Western nations to adopt mobile networks. In 1998, the mobile telecom industry faced another innovation, and the mobile data value-added service industries were launched.

3G, standing for third generation, has long been heralded as the nirvana of mobile technology. While the first generation of mobile devices were limited to voice calls, second generation (2G) devices offered more. Indeed, 2G made possible SMS, WAP and mobile shopping. 3G, however, goes a whole lot further. What 3G offers is far more powerful data transmission across mobile networks. Whereas the intermediary 2.5G devices offer transmission rates of up to 384 kilobits per second, 3G's transmission speed is five times faster, averaging about two megabits per second (Haig, 2002). 3G mobile technology does not allow enough bandwidth for multichannel video, but it is able to provide high-speed Internet access comparable to cable modem or DSL for its users.

Ahonen, Kasper, and Melkko, (2004) asserted that "…the mobile Internet or the wireless services market, and where the current ultimate pinnacle is 3G, was invented by a fixed Internet service provider (ISP). In 1998, Saunalahden Serveri (now called Jappii Group or just Saunalahti), one of the biggest ISPs in Finland, launched a gimmicky service to manipulate the software on selected high-end Nokia mobile phones. The service ran on top of SMS, and Saunalahden Serveri had negotiated an interconnect deal with the incumbent mobile operators in Finland to get part of the SMS revenue for these messages. The messages allowed users to send new codes for installing custom ringing tones on mobile phones. The first versions of the solution had a small selection of pre-programmed songs, and also allowed users to compose their own songs and use them as ringing tones. The *downloadable* ringing-tone business was invented."

The cellular innovation strategies shifted to Asia from Europe and America, when Japan's NTT DoCoMo launched its revolutionary I-Mode service in 1999. I-Mode and its two other rivals named KDDI and J-Phone (renamed Vodafone KK) in Japan launched smaller phones, polyphonic sounds, color screens, in-built cameras, MIDI interfaces, and numerous of other valuable services like games, information services, mobile commerce, and countless entertainment services.

In October 2001, DoCoMo launched FOMA (Freedom of Mobile Multimedia Access), the world's first fully commercialized 3G mobile service based upon IMT-2000-compliant Wideband Code Division Multiple Access (W-CDMA). By March 2004, coverage had extended to 99 percent of the populated areas of Japan (Natsuno, 2005). Completely unlike 1G and 2G networks, DoCoMo's 3G networks utilizes ATM technology that manages

packet switching and circuit switching on the same network node, enabling various traffic types. Asymmetric communications with differing characteristics for uplink and downlink are also supported. Terminals have evolved to handle the increasing versatility of 3G technologies (Natsuno, 2005).

European Telecommunications Standards Institute (ETSI) introduced a packet switched bearer service based on Global System for Mobile Communications (GSM) to provide affordable and fast Internet connections to service users. GPRS offers efficient bandwidth utilization by allocating channels only when needed and by releasing them immediately after their use. Data service was offered by the GPRS at very low price as the billing was made based on the quantity of data transmitted rather than the connection time and the negotiated quality of service (QoS). GPRS may offer data rates up to 171.2 kbps (Narayanan, 2006).It is an enhancement to the mobile communication system that supports data packets. It enables the continuous flow of Internet data packets over mobile communication system for applications like file transfer and web browsing. GPRS phones have the capacity to transmit data at a speed of 144 kilobits per second. The first wave of GPRS-enabled phones was initiated by models like Ericsson T39 and Siemens ME45. Vizzavi was the first UK mobile content provider to launch content required for GPRS handsets. One of the advantages of GPRS is that it permits 24-hour Internet access, but people only pay for hours they use.

While most mobile phones that are bought by the poor enable short-message services (SMS) through a 14-kbps data communication, third-and fourth-generation mobile phones provide wealthy members of the information society with mobile videoconferencing capabilities of several hundred kilobits per second (Hilbert, López, and Vásquez, 2010).

Banks are seeking to make a strategic shift from competing on price to managing cost structures, by leveraging disruptive service concepts that span multiple channels of delivery. They are also aggressively exploring alternative channels of customer acquisition, and means to enhance the service experience. As a result, financial institutions are now facilitating their products, pricing and transactions for multiple channels. As a form of branchless banking, mobile banking holds the promise of significantly lower per-transaction costs.

## MOBILE BANKING IN INDIA

At first, mobile commerce is all about content providing. Then it is about bill pay and purchase. And finally it deals with banking via mobile gadgets. In India, content providing is there, bill pay and other processes such as purchases are also coming up. But the banking is at its nascent stage, so there is wide opportunity to explode this free space in the next few years. India is largely a mobile phone nation, where various model of business applications had evolved to aid both banking and marketing sectors.

In September 2007, Corporation Bank launched a mobile commerce technology. It was the first Indian bank that facilitated financial transactions through a cell phone or through a Short Messaging System. Though, previously many other banks such as Citibank and others initiated trial runs for such services. Several software companies including Sam Pitroda's C-sam are developing software for full payment systems via mobile phones. But all such efforts are in various stages of trials.

The mobile user base in India has launched 170 million and is expected to reach 300 million by the end of 2008. The plastic cards base is around 60 million (expected to reach 100 million in 2008). This user base is larger than the Internet, fixed line, cable and satellite all put together (Rodrigues, 2007). As the number of mobile phones is increasing, it is becoming a critical part of day-to-day working. The bankers are betting on mobile technology because unlike Internet, mobiles are widely accepted by the masses. Today, the younger generation who use SMSs and MMSs can be student but in next three or five years they can be customers. So marketers are aligned towards behaviors and habits of today's mobile phone users. In the past, the Indian consumers had not readily accepted Internet banking as a convenient mode of transaction. Though, the service was launched a couple of years ago, it still accounts for a fraction of the turnover of Indian banks. PayMate is offering an end-to-end SMS based shopping solution for flight tickets, movie tickets, car hires, hotel bookings and mobile gift vouchers.

Ajay Adiseshann, founder and managing director, PayMate, which is the only player so far to offer these services to the banks, says, "Countries like the Far East, Japan, and Korea have advance mobile commerce application in place with chips set in the mobile phone itself. If you look at India, even from a value-added service perspective, we lean heavily towards SMS. We are trying to keep the technology as simple as possible, while building in relevant security requirements." (Rodrigues, 2007).

Fewer than 360 million of India's 1.2 billion populations have bank accounts. In contrast, there are 800 million mobile connections in the country (Kaushik, 2011). This configuration encouraged Abhishek Sinha and Abhinav Singha, in the early 2007, to try an extended banking service on mobile phones. EKO India Financial Services founded by two brothers, mark a new beginning in India's banking sector. The service enabled its 150,000 clients to save and transfer money via their mobiles. The clients required to visit one of EKO's 1,500–odd retailers to access the service. The banking firm then uses back–end servers, which are integrated with the core banking system of State Bank of India (SBI). The mobile phones of the clients and retailers acts as debit cards and points of sale of sale devices respectively, on the basis of demand. EKO's mobile banking helps unbanked migrant workers to transfer their money through mobile devices.

With a wafer-thin margin of 0.025 per cent – 25 paise on Rs 1,000 – EKO needs to keep scaling up. In 2010/11, it had transactions around Rs 1,200 crore (Kaushik, 2011). Though mobile banking and mobile payment industries had a great potential in future, still cash is the predominant mode of payment in India. Today, the value of physical bank notes and coins as a percentage of total money in the country stands at 60 per cent, compared to 20 per cent in China and 18 per cent in South Africa. According to Shashank Joshi, CEO of My Mobile Payments, "Payment systems in India are still in the Stone Age, although we supposedly live in the Jet Age". Another reason for moving to mobile-based payment is that the growth of Internet banking is constrained by low Internet penetration levels, the high cost, and the fact that nearly half the country's population does not yet have a bank account. India's mobile phone subscriber base of 700 million means that mobile payment is accessible to more people. The start-up service of My Mobile Payments offers a mobile payment solution for paying bills for utilities, direct-to-home TV and movie tickets across a nationwide network by 'loading' mobiles with cash prepayments. This technology obviates the need for an Internet connection or a bank account. The service has a long way to go. Retail electronic clearing and payment through cards currently accounts for 40 per cent of the number of transactions, and less than two per cent of their total value. In May 2012, the Reserve Bank of India raised the limit for mobile-to-mobile money transfers from 5,000 rupees to 50,000 rupees a day. Both the limit and the use of mobile payment are expected to increase in coming years (Adhikari, 2012).

## CONCLUSION

With developing technologies, the communication world is changing. The growth of self-service channels is expected to increase the usage of mobile devices for financial activities. Mobile services are expanding enormously due to high penetration of mobile handsets. The use of a mobile phone enables us to make contactless payment at the physical retail places. Customers use mobile devices to make online purchases and banking transactions. The scope of mobile commercial activities is expanding with vast array of innovative applications on smart phones. Financial institutions like banks possessing real time opportunity to make mutually rewarding relationship with their clients. They are forming long-lasting customers' relationship by catering those personalized mobile services. Different banks are providing various android applications. Apart from wireless communication, customers now can use mobile devices for various reasons. One can use mobile to transact finances, to store transaction records, to compare online retail prices with local retail prices, download software, and to watch product demonstration videos. With new modes and methods on mobile devices, various banks cater total independence to their clients. Last few decades witnessed various efforts to make "anytime" banking possible. But the beginning of 21st century, witnessed wide emphasis on "anywhere" banking.

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