PAYMENTEYE

Future of Mobile Payments

The next wave of the mobile revolution

1 Executive Summary

Smartphone adoption is rapidly increasing in both developed and emerging markets across the globe. Many industry analysts have predicted that 5.4 billion smartphone handsets will be in circulation worldwide by 2015. This is expected to spur buoyant growth for various mobile-enabled services, especially mobile payments, or m-payments.

At present, the mobile payments industry's progress has been slow and fragmented primarily due to challenges related to infrastructure and adoption. However, experts are optimistic about this sector and the signs are that a significant take-off is imminent. The increased adoption of smartphones could result in $1 trillion of m-payments worldwide by 2015. M-payments subscribers will increase from 206 million worldwide users at the end of 2010 to 1,050 million users by the end of 2015.

This predicted growth can certainly be attributed to the drastic shift in the behaviour of consumers who are increasingly in search of convenience, such as that provided by portable technology. Nevertheless, uncertainty still looms over the prospects of this market due to the ever-evolving nature of consumer behaviour, technological glitches resulting in increased costs for merchants and various other related challenges.

Investors are therefore keen to answer questions like:

- **What is the growth of this market across the world?**
- **Which technologies are being adopted by the consumers as well as the merchants?**
- **Which m-payments business models are gaining prominence and why?**
- **Which geographies hold potential for growth and opportunities?**

The Future of Mobile Payments Report aims to answer these questions and shed light on the evolution and adoption of mobile technology and the growth of mobile payments across the globe.

It is important to remember that the space is still being moulded by various industry players, both from a technological and regulatory point of view. At present, most of the mobile payments industry remains fragmented and the local and global technology standards are yet to be universally defined.

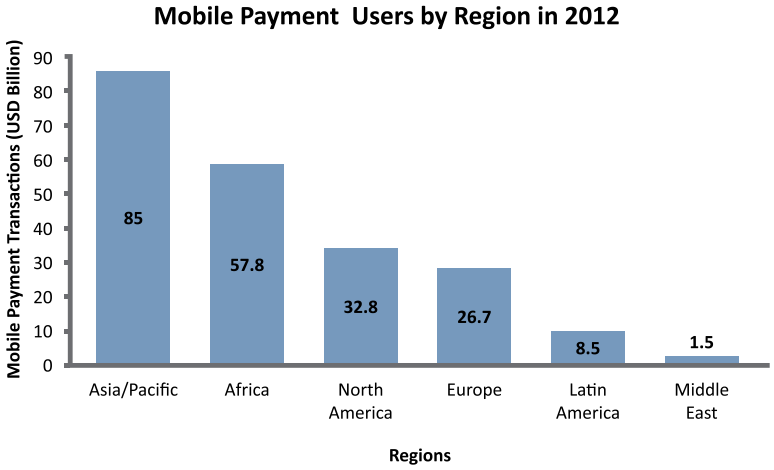
It follows that there is a need to develop and integrate end-to-end mobile payments processes, technologies and policies that could promote successful adoption. Until levels of consumer adoption in the m-payments space – be it wallets or NFC – surpass 50%, scepticism will remain.

Moreover, newer technologies such as cloud-based systems coupled with new market entrants and creative partnerships have changed the dynamics of the mobile payments ecosystem. This report throws light on the six main factors which directly influence the growth of the future of mobile payments, namely:

- **consumer willingness;**
- **cooperation amongst industry players;**
- **consumer financial services;**
- **technology infrastructure;**
- **mobile commerce clusters;**
- **regulations and policies.**

In what follows, this report explores how these factors influence the mobile payments industry as well as providing an in-depth view of the types of mobile payments technologies, services, business models, major players, drivers, gaps and future growth prospects of the mobile payments industry across the world.

2 Mobile Payments Industry – An Outlook



The mobile payments industry brings together diverse companies and sectors, both as competitors and collaborators and across traditional boundaries of industry and technology. This has created a unique market place that has expanded the possibilities for new products, services and types of companies in the business environment. Mobile devices have introduced portability of technology and various other features, such as multimedia services, GPS, internet access, mobile telephony, camera, and social media, which businesses believe can be leveraged to the advantage of the mobile payments industry. This underlying opportunity has resulted in the development of mobile payments systems, such as digital and mobile wallets, near field communication (NFC), cloud-based point-of-sale (POS) solutions, mobile apps, and quick response (QR) barcodes. When these technologies are merged with platforms including POS, online and other remote and user models, such as C2B[1] and P2P[2], new payment methods, such as virtual prepaid and direct carrier billing (DCB), are created.

Debates on the perceived success or failure of the mobile payments industry, as well as any mobile-payments-related topics such as technology and devices, have been of interest to many stakeholders. This rapidly evolving industry is still in the process of being moulded by players from a technological as well as regulatory perspective. At present, most of the industry is fragmented and still in its infacy, which means local and global technology standards are yet to be defined. Industry experts believe that the current relationships between the three major groups of stakeholders in the mobile payments value chain – banks, mobile operators and various technology partners – are likely to evolve over time due to growth of adoption, changes in technology and cost infrastructures.

Experts also believe that the convenience of banking, browsing and buying with mobile devices will be the main trigger for consumers adopting mobile payments. Although credit cards and cash are still clearly in use, paying via mobile devices is gaining impetus among consumers. The graph above depicts the regional distribution of the use of mobile devices for making different types of payments. However, to understand the industry better and evaluate its growth prospects, the following sections will take you through the ecosystem, services, business models and components that directly affect the growth of the mobile payments industry.

[1] *Consumer-to-Business*

[2] *Person-to-Person*

2.1 Acceptance & Readiness of Mobile Payments Worldwide

Mobile payments are currently experiencing the early days of adoption in many countries around the world. Consumers who are looking for convenience, security, and financial inclusion are most likely to accept mobile payments. According to the MasterCard Mobile Payments Readiness Index (MPRI) conducted in 2012, no market has progressed to what it calls the 'inflection point' score of 60 out of 100 on the mobile readiness scale, which is the stage at which mobile devices will account for an appreciable share of the payments mix. Indeed, the 34 countries included in the Index achieved an average mobile readiness score of 33.2, with no single market even reaching 50, indicating that there is still work to be done before mobile payments are used extensively.

Different geographies have shown particular traits of consumer acceptance and readiness. For example, although Singapore has a highly advanced infrastructure, financial systems and regulatory structures, it has relatively weak consumer willingness. Conversely, Kenya has a weaker infrastructure, financial services and regulatory systems so scores much lower on the MPRI, yet has high consumer willingness. Experts are of the opinion that it is consumer inclination to use technology and not the market's technological capability to develop mobile payments that will define the future of the m-payments industry. Furthermore, experts believe that since no two global markets are identical, mobile payments adoption/acceptance will be driven by local conditions of environment, infrastructure, regulation and financial services. However, ground conditions, such as stable telecommunication networks, established financial services and progressive regulation do not necessarily ensure consumer readiness. The two major stakeholder groups who will decide the growth of m-payments are consumers and merchants.

Consumers: As consumers become increasingly adept at using smartphones, growing ownership will influence stronger adoption of mobile banking and payments, which at present is more inclined towards m-commerce than for P2P or POS transactions. Activities such as downloading and using applications are likely to lead to an increase in consumer mobile payments activities either for access to electronic payments (mainly in developing economies) or the convenience of mobile phone payments (in the developed world). Frequent use of activities related to mobile financial services in turn build trust and awareness, and contribute to the willingness of consumers to try emerging mobile payment offerings. The primary barrier to adoption remains the limited availability of some technologies (e.g. NFC) and concerns with security and privacy. Further, the consumer's reluctance to indulge in activities involving sharing of their PINs, passwords, device-lock features or anti-virus software is also another factor for low adoption of m-payments.

Key industry observations: Users are often either confused or reluctant to pay huge sums of money as transaction fees. Therefore, these users are more receptive to mobile apps that facilitate credit card transactions for free. For example, LevelUp, a mobile payments provider, runs marketing campaigns specifically targeted to a business' loyal customers. Customers with the LevelUp app can check in to any business using their smartphones and can redeem rewards with their purchases. LevelUp receives payments whenever customers redeem these rewards. LevelUp, however, does not provide blanket solutions for all of the customer's payment needs.

Many mobile applications accept money transfers directly from customers' bank accounts at a flat processing rate. Further, payments under $10 are processed for free. For example, Dwolla an United States-only e-commerce and mobile payments company, securely connects to your bank account and allows you to move money for just $0.25 per transaction, or free for transactions $10 or less. Thus, many people and businesses are being more receptive to this service.

Merchants: As a major agent within the mobile payments ecosystem, merchants play a vital role in the adaptation of mobile payment services. Their investment strategies in mobile payments depend on multiple options related to hardware, software, choice of technology platform and how they implement external factors (e.g. EMV[3]). At present merchants incur incremental costs to enable NFC and tend to view implementation of EMV and use of NFC for mobile payments as two distinct investment decisions. For EMV, merchants want assurances that their investments are in sync with issuers and mobile operators.[4] Therefore, for mobile payments, merchants must conduct a cost-benefit analysis on whether to buy an NFC-enabled terminal, whether to enable NFC functionality and what payment brands to accept.

Key industry observations: Business owners are often confused by the system of fees that accompanies credit card payments. Interestingly, big dealers such as 7-Eleven, Bed Bath & Beyond, Target, Dunkin' Donuts and Walmart have come together to create an app called Merchant Customer Exchange (MCX). This app links customers' smartphones directly with their bank accounts, allowing MCX merchants to accept non-cash payments without paying credit card processing fees. It is expected that MCX could trigger mobile payments into the mainstream, as well as drive hesitant shoppers to use this app rather than a mobile wallet due to its ability to mobilize customer loyalty programmes for some of the biggest retailers in the US. Thus, merchants are more receptive to mobile apps since it reduces their liability for transaction fees.

Merchants who accept mobile payments from their customers worldwide have been seen using services that provide digital currencies, which can be purchased with real money. For example, Bitcoin Wallets (BW) is not linked to credit cards but only cash, working more like a prepaid wallet by allowing people to purchase digital money by spending real cash. This is an advantage to merchants as they can avoid high credit card processing fees. However, merchants do have to pay a nominal amount to accept Bitcoin in both physical and virtual stores. The popular Bitcoin Wallet 'BitPay' charges a transaction rate of 0.99 per cent of the total sale. By comparison, the popular mobile credit card-processing app 'Square' charges 2.75 per cent per transaction. Interestingly, LevelUp has partnered with companies that wish to have a mobile payments presence themselves to create custom-branded mobile payments apps that have been used by merchants to provide deals to their customers as well as process transactions. LevelUp claimss that it has sold many of these custom-branded mobile payments apps, but so far has announced only one by name, with a Washington DC-based eatery Sweetgreen.

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[1]Europay, MasterCard and Visa, a global standard for inter-operation of integrated circuit cards (IC cards or "chip cards") and IC card capable point of sale (POS) terminals and automated teller machines (ATMs), for authenticating credit and debit card transactions.

[2]Randy Vanderhoof, interview with Payments Source, September 2012. The EMV Migration Forum was created in September 2012, under the leadership of Randy Vanderhoof, president of the Smart Card Alliance.

2.2 Global Mobile Payment Transactions

US markets: A recent report by Berg Insight[5] stated that Smartphone owners in the US bought $500 million worth of goods and services using mobile wallet apps in 2012. Of these, the majority of in-store mobile wallet transactions occurred in Starbucks using the coffee giant's own smartphone card app. A recent report released by Gartner revealed that the US has seen low adoption of NFC payment services, with many merchants launching apps without a clear winning strategy. The total transaction value in North America is expected to reach $37 billion in 2013, up 53 per cent from $24 billion in 2012.

The US has a good, commercially available mobile payments transit programme that is a prime example of how transition from proprietary, transit-only systems to open-loop NFC contactless payments represents an opportunity for even greater efficiency, reduced operational costs and enhanced consumer convenience. Transit systems in the US have leveraged open-loop card networks for transit payments as they enable greater interoperability, lower operating costs through reduced card-issuance expenses and increase payments acceptance across the innumerable systems for transit authorities within the US. Merchants in the US are encouraged to upgrade their POS terminals to support EMV[6] in order to avoid the liability shift for fraudulent card transactions and ensure security of card and mobile payments.

[5] *A US-based business intelligence firm specializing in the telecom industry*

[6] *Dynamic data authentication (DDA) provides a secure method for protecting user data such as cardholder and other sensitive data for card-based mobile contactless payment transactions. From a security perspective, EMV is important because it uses DDA to secure Chip and PIN payments and can further secure mobile contactless payments. NFC is an extension of EMV chip technology that adds a radio interface. POS terminals that are upgraded to comply with EMV specifications are capable of supporting the payment card brands' contactless (NFC) payment applications and processing both contact (smartcard) transactions and contactless (mobile NFC) transactions, should merchants decide to enable that capability.*

Insights on consumer m-payments acceptance and merchants' m-payments use-encouragement initiatives:

- **Consumers:** Research conducted by Javelin Strategy & Research stated that, in 2012, the POS retail market towered above the online market, at 93 per cent of the total US retail dollar volume, and is expected to continue to do so in the future. During the same period, mobile payments were reported to be only 0.1 per cent of the total retail POS volume.

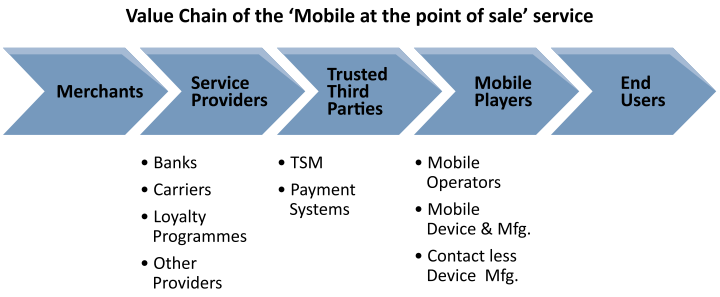
- **Merchants:** In the US, merchants have focussed on creating apps and modes of m-payments for the day-to-day activities of consumers, ranging from paying for coffees, reading newspapers (by creating closed-loop mobile payments), pay-by-text parking, mobile transport ticketing (by providing mobile barcode boarding passes), paying for taxis using QR code systems, NFC payments for vending machines, mobile food coupons using QR codes, m-payments for mass transit, m-donations, shopping using NFC payments and digital wallets for buying digital tickets for concerts. Research by TSYS and Mercator Advisory Group shows that consumers wish to consolidate their store loyalty and rewards cards in their mobile phones and want to pay for purchases with their preferred payment method in a mobile wallet.

- **European markets:** Berg Insight has reported that in Europe, mobile wallets are less prominent in the payment space. Berg calculated that 29 European countries generated only €100 million ($130 million) in wallet transactions in 2012. Further, Gartner projects the transaction value in Western Europe to reach $29 billion in 2013, as compared to $19 billion in 2012. The region is expected to witness a steady growth over the forecast period, but growth has been impacted by a dip in the average number of transactions per user in 2012, as several services struggled to generate sales and others launched only towards the end of the year.

- **Developing countries:** At present, Gartner predicts that mobile payments transactions in Asia-Pacific will grow by 38 per cent and reach $74 billion in 2013. The growth will be driven by both developed and developing markets such as Singapore, South Korea and India. In general, m-payments are not very popular due to the lack of contactless terminals and handsets in developing markets. Furthermore, as these markets have established bank infrastructure and payment methods by credit or debit card, there has been less urgency to develop an alternative m-payments infrastructure. Consumers have more trust in mobile payments solutions driven by Financial Institutions (FIs) and/or credit card companies than alternative providers. This is due to the credibility attached to them and the notion that they are considered instrumental in driving and shaping consumer acceptance. They also believe that any service backed by a bank financial instituion (FI) will be adept in due diligence, know-your-customer, authentication and authorization, corporate security, fraud monitoring and prevention tools, risk management policies and systems and anti-money laundering tools.

2.3 Mobile Payments Industry Overview

The mobile payments industry has many stakeholders including MNOs, smartphone/terminal manufacturers, mobile operating system providers, payment processors, alternative payment service providers, card and ACH networks, FIs, merchants, regulators and consumers, as well as banks, start-ups and regulators. Each stakeholder plays a unique role in the mobile payments ecosystem. Here are the five types of mobile payments enabled by devices currently on the market:

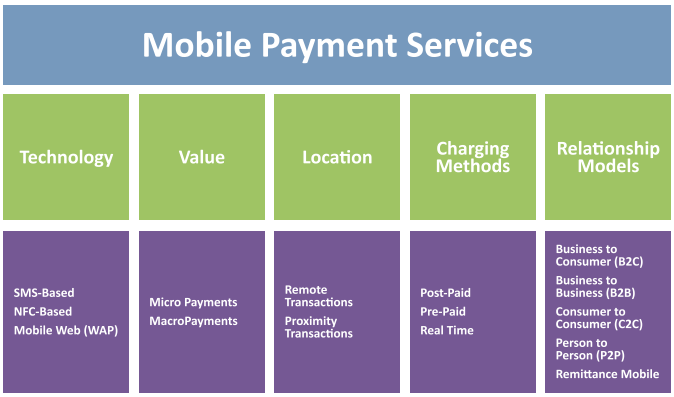


- **Mobile at the point-of-sale:** Paying for things at the store with the mobile device using the technologies mentioned below (some examples include Isis, Visa, MasterCard):
    - NFC (where radio-based technology is used to enable devices to exchange data)
    - QR codes (where 2D square bar codes placed on the terminal are scanned)
    - SMS (where premium SMS/USSD-based transactional payments enable users to send payment authorizations through text messages or USSD short codes. The payments made are either billed to the mobile account bill or debited from the respective prepaid account. These systems are typically used in mobile money programmes in developing countries, since many users have low-end phones. They have very little appeal in developed nations due to slow speed, high cost, and limited security)
- **Mobile as the point-of-sale:** A merchant uses a device to process a credit card payment. In this method, every smartphone becomes a cash register. Examples include VeriFone and Square.
- **Mobile payments platform:** Allows consumers to send money to merchants or even each other using mobile devices. Used at the point-of-sale, online or just by using text messages. Examples include PayPal and Serve.
- **Direct carrier billing:** Consumers buy digital content such as ringtones or games by adding the bill on their cell phone. After two-factor authentication involving a PIN and one-time-password (OTP), the consumer's mobile account is charged for the purchases. This type of mobile payment method is convenient and easy to use. Moreover, it is fast and has proven to be extremely popular in Asia – 70 per cent of all digital content purchased online in some parts of Asia uses the direct carrier billing method. It is often referred to as 'in app billing'. Zong (PayPal owned), Boku, Mopay and PaymentOne are some examples of this type of payment.
- **Closed-loop mobile payments:** The mobile version of the store credit card. This is a result of a company building its own mobile wallet and not waiting for a third party to do so. An example of this is Starbucks.

Mobile at the point-of-sale and mobile as the point-of-sale are the most commonly used payment methods. NFC is just one of the many ways mobile devices (and even credit cards) can take advantage of these two mobile payment types.

2.4 Types of Mobile Payments Services

A mobile payment is when you use a mobile device to make a payment. It involves adding a payment/ transacting point to the existing payments network by enabling through proximity or remotely. These can be P2P, C2B or B2B. Mobile payments services are typically differentiated by technology, transaction size, location (remote or proximity), and charging methods and relationship models, as shown in the adjacent diagram:

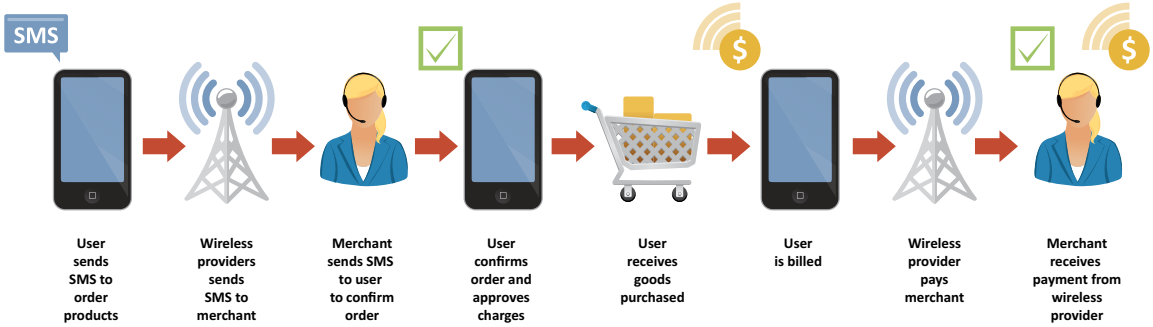


Mobile payments based on payment modes (technology): Mobile payments use different technologies to perform a transaction depending on whether the payments are made remotely (relying on SMS, a mobile browser, or a mobile app) or in proximity (relying on either bar codes or a contactless interface to chip-enabled payment technology, such as NFC-enabled mobile phones, contactless stickers, tags, or fobs).

The purchase relationships in this type of payment are C2B and B2B (typically small and medium enterprises). All the payments in these transactions are charged to the debit/credit card or a pre-paid account. The SMS and NFC payments are described below:

- **SMS-based payments:** Also termed 'premium SMS/USSD-based payments', these enable users to send payment authorizations via text messages or USSD short codes. The payments made are either billed to the mobile account bill or debited from the respective prepaid account. Examples include M-Pesa, Obopay, Roshan, US-based mBlox and France-based Netsize. The figure below depicts how the SMS payments work. In this type of payment method, the customer asks for a payment request by means of a text message. Once the transaction is completed, the customer is charged against his/her phone bill then the merchant is notified and allows the goods to be released.

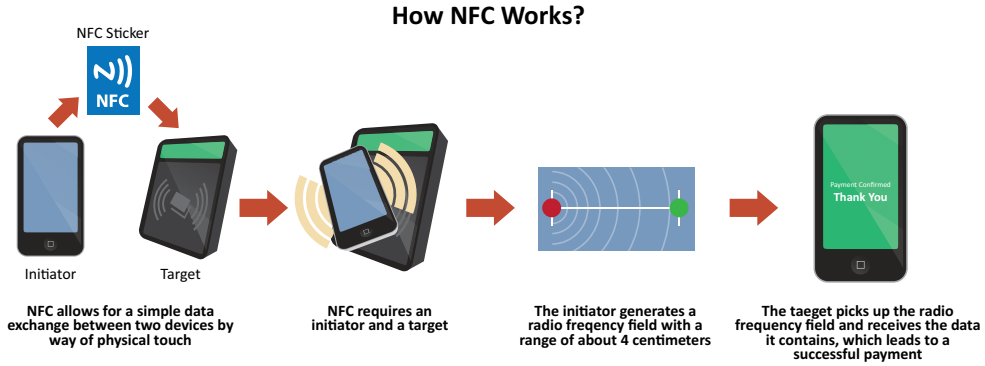
How SMS Payments Work?



Pros	Cons
The security is greater than other options such as NFC payments.	Text messages can get lost if the connection/ network is poor, hence lowering the reliability of the system.
The inconvenience caused by keeping cash or plastic cards can be avoided.	The speed may not be good; delay in a merchant receiving a receipt may lead to long waiting times for the customer.

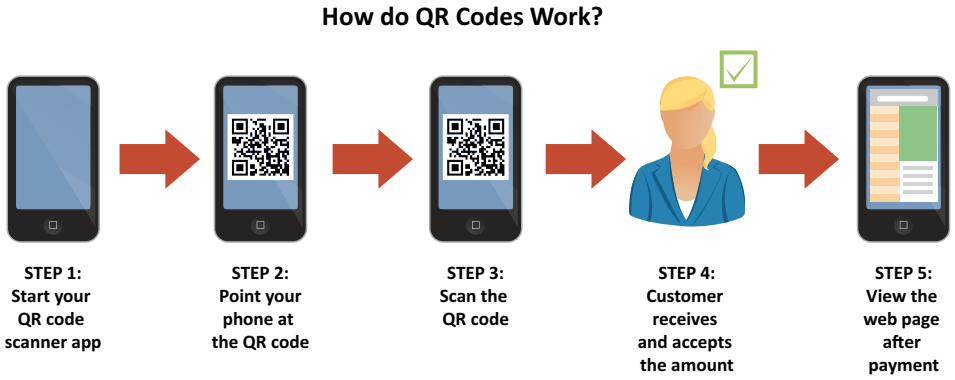
Near field communication (NFC)-based payments: A type of contactless m-payment used mostly in paying for purchases made in physical stores. This type of payment has purchase relationships such as C2B, B2B (typically small and medium enterprises) where the payment is charged to the debit/credit cards or pre-paid accounts. Mobile Felica, Paypass, and "Touch and Go" (Zantel) are examples of this type of mobile payments. The figure below depicts the working of the NFC system. By using a NFC-equipped mobile phone, customers can simply wave a phone at a retailer's NFC reader module to make a payment. Most transactions do not require authentication while some do in the form of a PIN, before the transaction is completed. The payment could be deducted from a pre-paid account or charged to a mobile or bank account directly.

It is a radio-based technology, whereby a mobile is embedded with a chip, enabling devices to exchange data over a distance of a few centimetres thereby acting as a mode of payment. NFC data is difficult to intercept. The other members of the group are RFID (radio-frequency identification), Bluetooth and IrDA-based (infrared wireless communication) payment models. The methodology remains the same across all these types but there are slight changes in the implementation technology. The industry is just beginning to adopt the technology, with most major smartphone manufacturers expected to support it in the near future. Interestingly, payment majors like Visa have formed various alliances with handset manufacturers to catapult NFC adoption. In 2013, Samsung has agreed to pre-load Visa's NFC payment applet on its future NFC-enabled handsets.



Pros	Cons
Speedy: the process is similar to swiping of credit and debit cards, but without any contact with the machine.	Most transactions do not require authentication which could lead to security issues in case mobiles/identities are stolen. Therefore NFC- based payment is generally considered less secure than the SMS-based model.
Since there is no need to type a message, this method is more convenient than the SMS based payment method.	

QR (quick response) code payments: QR code payments are made by scanning a two-dimensional barcode that can be read using smartphones and dedicated QR reading devices, either on the QR reading terminal or at the electronic cash register, depending on the retailer. These terminals are linked directly to text, emails, websites and phone numbers. The customer then gets a request to accept the amount entered by the merchant. After accepting the payment, the money is transferred from the customer's account to the retailer's account.



Pros	Cons
QR code technology only needs a compatible phone with an in-built camera, as opposed to NFC-enabled technologies for NFC	Users must be equipped with a camera phone and the correct reader software that can scan the image of the QR Code. Currently only smart phones are technically equipped to do this. Many users that have mobile phones that have cameras are unable to get QR reading software for their phones.
QR Codes can be used to store addresses and URLs that can appear in magazines, on signs, buses, business cards or just about any product that users might need information about.	

Mobile web payments (WAP) - The wireless application protocol (WAP) is commonly used to access e-commerce websites and make payments. WAP allows mobile phones to display specially formatted sites on a small screen. To make payments, a consumer accesses a webpage and charges transactions to a credit card, mobile wallet, or wireless account. The system then sends the payment information to the merchant. All communications are handled through WAP.

Pros	Cons
Reliability: The transaction is reliable, which adds to customer satisfaction.	Compared to technologies such as NFC, WAP is slow and unreliable, is not highly secure, and offers limited graphical user interface.
After-sales proceedings: Consumers can bookmark pages that they wish to access at a later stage and wish to share with friends.	

Cloud-based mobile payments: Cloud-based payments services may offer merchants cost-effective and rapidly deployable capabilities. Often cloud-based technology leverages barcode technology and card tokenization to further reduce the likelihood and costs of dealing with fraud. 'Tokenization' is a technology that enables the payment service provider to exchange a one-time payment token at the merchant's e-commerce or POS system to redeem for payment. In some ways, barcode technology is a more feasible solution to other mobile payment technologies from a customer integration perspective. Several mature and start-up companies offer cloud-based payment solutions, which initially serviced small merchants, but are expanding to larger retailers. Some of these companies are opting for mobile payments with lower fees and loyalty programmes. A cloud-based m-payment solution involves the use of a mobile app, such as PayPal, that requires an individual's authentication prior to connecting with the account details stored in a cloud to process the transaction. The biggest advantage of using this payment solution over NFC is that the transaction can be carried out using any device with network connectivity. Further, in a cloud-based solution, data is stored virtually and is not easy to access or track. However, despite constant monitoring and authentication checks that make the cloud itself secure, transmitting data over the air carries an element of risk. The recently introduced payment options using mobile phones integrate NFC technology with a cloud-based system. With this approach, cardholders' account details will no longer be stored on a secure element within a mobile phone, but will instead be maintained in the cloud. However, successful combinations of NFC and cloud will require solutions to help mitigate the security risks involved in data transmission.

- **Mobile Payments based on value (transaction size):** A transaction size affects the choice of mobile payment technology and approach. Mobile payments typically fit into one of two transaction size categories. Micro-payments are less than $10-$25 and macro-payments are over $25.

Type of	Description
Micro-payments	A transaction that is less than $10-$25 made usually for the purchase of mobile content such as logos, ringtones, tunes, games, paying for parking, buying coffee or buying commodities from a vending machine and convenience stores. This payment system plays a vital role in situations where the transaction involves a very small money transfer, which is difficult through the usual payment systems, or is very expensive. They can also be payments that are easily/affordably processed through the electronic transaction processing mechanism. Examples include Vodafone's m-pay bill.
Macro-payments	Payments above $25 are typical for all other transactions, such as P2P domestic and international remittances, charitable donations, website purchases, bill payment and retail POS.

- **Mobile payments based on location:** Remote mobile payments and proximity mobile payments are distinguished by the location of the mobile handset in relation to the merchant's POS, as well as by payment account information and the payment acceptance device or service.

Type of	Description
Remote transactions	A remote mobile payment is one in which the payer does not interact directly with the merchant's physical POS system (for example, transferring funds through a mobile phone app to a merchant's PayPal account). Remote payment is used for applications such as pre-paid top-up, online payment, electronic bill payment, digital cash and international fund transfer. Transactions of goods/services between customers and the merchant done via phone (voice call), SMS, or online payment techniques from a remote place fall in this category. Examples include prepaid top-up, electronic bill, mCheck, Peer-to-Peer (P2P), electronic cash/ fund transfer and mPOS.
Proximity/local transactions	A proximity payment is one in which the mobile phone interacts in some way with a physical POS device to transfer the consumer's payment information and perform the transaction. The transactions require a mobile device to be in the local vicinity in order to make payments. They are used for applications such as making payment at unattended/ traditional POS and payment through mobile parking. The technology platform for this type of payment includes Bluetooth, RFID and NFC. Examples include mParking, ATM transaction, RFID-based payments, IrDA-based payments, NFC-based payments and Bluetooth-based payments.

- **Mobile payments based on charging methods:** The three such types of payments, post-paid, prepaid and real-time payment, are discussed below:

Post-paid	Pre-paid	Real-time
In this method, the user pays after the bill is generated. This is the most common method used for paying through m-commerce and e-commerce. This user can opt for one of the following payment methods: • Phone bill-based: internal phone bill charged by the operator • Account-based: payment done through banks/credit cards	In this method, the services and goods are paid for in advance. It is the most common method for evaluating a customer's potential. Customer's potential is determined on the basis of frequency of re-charge and amount re-charged and this sometimes forms the basis for migrating the customer to the post-paid method. The user also has the flexibility to monitor usage in advance.	In this method, the user pays the amount in real time or almost real time. Example: electronic wallet

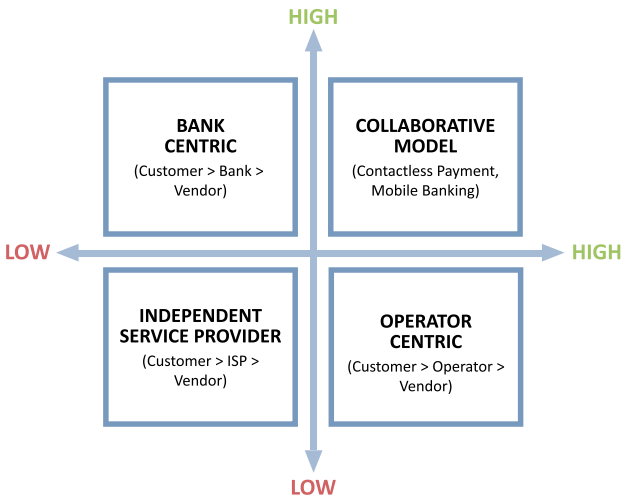
- **Mobile payments based on relationship models**

Payment relationship	Dependence	Usage	Examples
B2C	Handset and its user interface	Day-to-day items, monthly bills, insurance premiums and taxes	Yeepay and Octopus card
B2B	Handset and its user interface	Purchase of specific industry solutions between industries	Safetrader
C2C	Handsets and third party business platforms to facilitate sales and payments	Purchase of virtual goods such as gaming features	
P2P	Handset and its user interface	For top-up credits, m-banking and digital goods exchanged between two individuals	PayPal
Remittance mobile payments	Handset and its user interface	Transfer of money by a working member to family in another country, or payment by a parent of their child's cab fare	

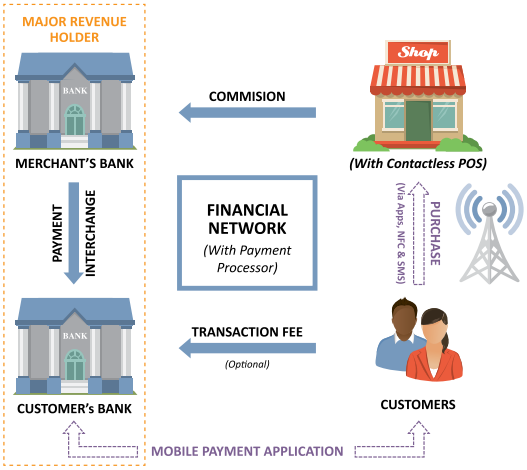
- **Hybrid payment methods:** In such type of payments, hardware-based mobile payment devices can be 'clipped on to a device' or 'built in' to the device, thereby converting a mobile phone into a card reader. Usually this is seen in C2B, B2B and P2P purchase relationships. The payments are charged to the credit/debit cards. Examples include Square, VeriFone PayWare and Intuit GoPayment.

2.5 Business Models

The figure adjacent ranges these four models according the level of implication of the two main partners: the mobile network operator(s) (MNOs) and the bank/ FI(s).



2.5.1Bank/FI-Led Model

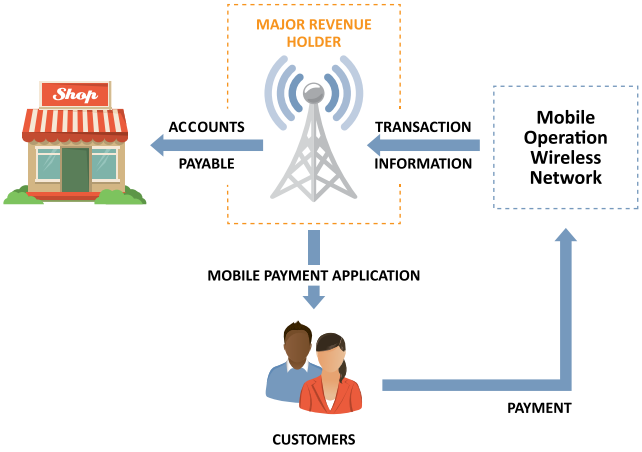


Also referred to as the evolution of the credit card model, a bank-driven model is when one or more banks/FIs establisha mobile payments service based on already existing payment processes, deploying a mobile payments solution or devices to customers and ensuring merchants have the required POS acceptance capability. Payments are processed over the existing financial networks, with credits and debits to the appropriate accounts. Similar to credit card services, customers continue with the same bank-client relationship by replacing the credit card with a mobile phone. Payments will be processed over mobile networks (remote payments, for example) through SMS for electronic goods or directly at the POS (e.g. through NFC). Through this service, banks and FIs can offer a wide variety of mobile payment solutions, due to their competence in financial transactions with regard to security, efficiency and speed. This competency gives them an upper hand on other value-chain players and it would take other players a long time and a significant amount of effort to compete with this positioning. The basic structure of the bank-dominated model is shown in the figure above.

Stakeholder	Pros	Cons
Banks	• Revenue stream capture for micro-payments • Reduced cash/cheque handling • Potential to include value-added advertising to retailers for a fee • Potential for new customer acquisition (including unbanked), value for customer relationships and retention and enhanced security features	• Limited experience in application distribution or phone accessories • Added cost of installation and maintenance of mobile applications for multiple operators and cannibalizing their card-based products • Potential for paying “rental” fees to operators
MNO	• Possible increase in data transaction volumes and revenues and potential incentive fees for introducing new customers	• Operators bypassed in mobile payments value chain
Merchant	• Reduced cash-handling costs, including theft, shrinkage, counterfeit exposure and cash deposit charges • Increased cashier efficiency and throughput, impulse spending and shorter queues • Faster payment directly into merchant’s account	• Commissions/transaction fees for low-value transactions • Merchant resistance to increasing card-based transactions due to interchange
Customer	• Speed and convenience • Provides access to transaction history for low-value purchases	• Limited to specific bank offering a service – may not be permitted to add other applications/transactions due to interchange

2.5.2 Mobile Network Operator (MNO)-Led Model

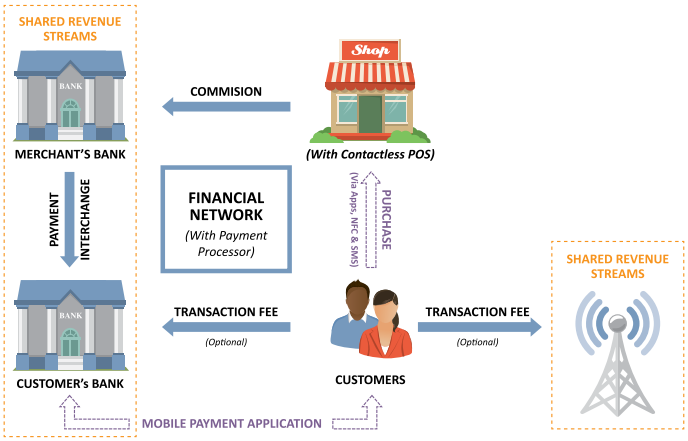
The MNO-led model indicates the launch of a payment solution in association with a bank/FI as required for the development of issuance of the payment by one or more mobile network operator(s) (MNO). In this model, the MNO offers the technology, operates the transactions and compensates the system. Strong partnerships with merchants are essential for this model. The operator-centric model has played an important role in bringing m-payments to its current stage. For example, three of the top US mobile carriers (AT&T, Verizon and T-Mobile) invested in the Isis joint venture. They receive a share of revenue from card issuers for wallet payment transactions, together with rent paid by the issuers to add their customers' cards to the secure element. The revenue potential and cost implications associated with the rent model are unforeseen, particularly given that participation in the Isis wallet is currently limited to three financial institutions (Barclaycard, Capital One, and Chase). NTT DoCoMo (Japan), Mobipay (Spain) and Mobikom (Austria) are some of the international examples of operator-centric models.



Stakeholder	Pros	Cons
Banks	• None	• Can be excluded from m-payments value chain
MNO	• Advantage from the existing infrastructure and expertise in billing customers and paying merchants • Control over majority of the revenue stream • Flexibility in fixing the transaction fees • Can build a new reliable image and hence high customer loyalty and reduced customer turnover	• Low adoption from the merchants due to investment into new POS system and management of integration and managing multiple issuers • Unable to focus on their core-competencies • Risk of additional credit from customers
Merchant	• Reduced cash-handling costs, including theft, shrinkage and cash deposit charges • Increased efficiency, through-put, and convenience • Potential for additional sales due to consumers' impulse spending • Since there are no multiple acquirers, networks and issuers, the transaction fee is reduced considerably	• Has to pay for transaction fee for low value payments • Reimbursement dependent on operator's payment cycle (delay in payment) • Exposure to mobile operator with limited payments processing experience • Investment required for new payment system
Customer	• Improved convenience	• Billing complexity • Security risk

2.5.3 Collaboration Model

The collaborative model involves the collaboration between banks, mobile operators and other stakeholders in the mobile payments value chain, including a potential new stakeholder – a trusted third party to manage the deployment of mobile applications. The collaborative model is the most feasible mobile payments business model, as the stakeholders are able to focus on their core competencies and it also opens the door for new revenue streams from incremental services, improves customer retention and loyalty and responds to the fundamental demand of customers for new payment models.

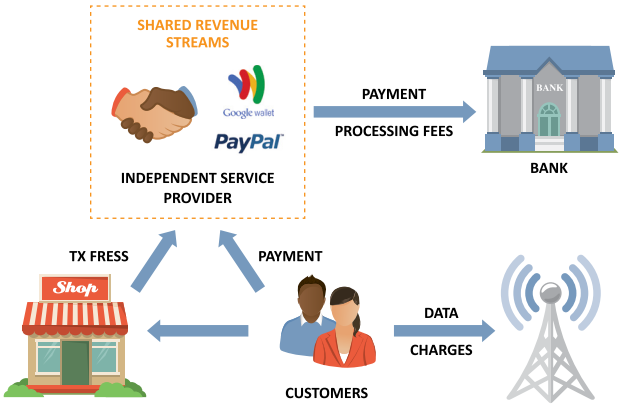


All partners derive their revenue from fees charged to merchants and end users: these different sources of revenue are still the subject of disagreements between partners. Investment costs are generally split between banks, operators and sometimes the third party providing an escrow service.

Stakeholder	Pros	Cons
Banks	• Alternative channel • Additional revenue from transactions • Potential for new customer acquisition if partnering with MNO	• Can be excluded from m-payments value chain
MNO	• Advantage from the existing infrastructure and expertise in billing customers and paying merchants • Control over majority of the revenue stream • Flexibility in fixing the transaction fees • Can build a new reliable image and hence high customer loyalty and reduced customer turnover	• Low adoption from the merchants due to investment into new POS system and management of integration and managing multiple issuers • Unable to focus on their core-competencies • Risk of additional credit from customers
Merchant	• Reduced cash-handling costs, including theft, shrinkage and cash deposit charges • Increased efficiency, through-put, and convenience • Potential for additional sales due to consumers' impulse spending • Since there are no multiple acquirers, networks and issuers, the transaction fee is reduced considerably	• Has to pay for transaction fee for low value payments • Reimbursement dependent on operator's payment cycle (delay in payment) • Exposure to mobile operator with limited payments processing experience • Investment required for new payment system
Customer	• Improved convenience	• Billing complexity • Security risk

2.5.4 Independent Service Provider Model

This is also referred to as the P2P Model and the 'disintermediation model'. In this model, a third party, distinct from a bank/FI or a MNO, plays the role of intermediary between banks, operators, merchants and customers. This independent service provider (ISP) concentrates on all the organizational prerogatives held by banks or operators in the previously presented models. Here, the payments are processed without using existing wire transfer and bank card processing networks while the other models are designed to bring contactless payments and mobile loyalty to the marketplace. Currently, banks are not completely dis-intermediated from the value chain; however, this model does reduce their potential revenue streams from m-payments. The model uses the mobile phone to eliminate the existing payments ecosystem, which consists of POS terminals and acquirers deploying them, as well as, the processors and payment networks that route and settle the transactions. It is attractive to merchants who are looking to decrease their costs of processing credit and debit payments. It is also attracting the unbanked customers who cannot obtain a traditional bank card, and the customers who make cross-border transactions and remittances. PayPal, Wizzit, Obopay and Paymate are examples of such models.



Stakeholder	Pros	Cons
Banks	• None	• Potential disintermediation if another bank is used as the payment processor • Reduced revenue from service
MNO	• Increase in data transaction volumes • Potential to partner with independent service provider	• Increased expenditure for customer service issues
Intermediaries	• Added revenues from transaction fees, potential commissions & marketing • Cross-sell opportunities for other offerings or products	• High entry costs for acceptance by merchants and customers • Assumption of risk of theft/ fraud • Need competency for marketing/loyalty
Merchant	• Potential for less expensive remittance/payment option • In-expensive or free service	• Potential fees charged by the service provider • Not Reliable Service Providers
Customer	• Potential for less expensive remittance/payment option • In-expensive or free service	• Potential fees charged by the service provider • Not Reliable Service Providers

2.5.5 Close-knit Partnership

Close-knit partnership is when selective FIs/banks and mobile network operators enter into a partnership to offer a mobile solution to their collective client base where non-members cannot participate.

Stakeholder	Pros	Cons
Banks	• Attractive since it offers an exclusive offering that results in new customer acquisition and increased retention.	• Competitors may form their own coalition and offer their own technology, spurring a standards war. This will present many operational and financial risks that make this model unattractive in the long term.
MNO	• Attractive since it offers an exclusive offering that results in new customer acquisition and increased retention. • Depending on the technology selected, MNOs may either earn a percentage of interchange revenue, or a 'real-estate' fee for enabling mobile applications on the phone.	• The overlay between MNO and FI may be small and thus make the partnership unfeasible due to the inability to reach a critical mass.
Merchant	• This service will allow speed to the market and have shorter turnaround time for payments.	• Cannot reach to a wider audience since the service is limited only to limited/registered members.
Customer	• This service will allow speed to the market and have shorter turn-around time for payments.	• Only registered members can use the service. Non-members cannot participate.

2.6 Major Players

It is perhaps expected that the major players in the mobile payments industry are all multi-billion-dollar companies, publicly traded behemoths including big names such as Visa, MasterCard and American Express, technology companies such as Apple, Google and PayPal, mobile carriers such as Verizon, AT&T, Sprint and T-Mobile, or many major banks. Interestingly however, our research reveals that the real leaders in the US and globally are small start-ups such as Square, ShopKeep, Dwolla and LevelUp. Details of these companies are mentioned below:

Company	Brief	Product / Service Description
Square Inc.	Description: Square Inc. is a merchant services aggregator and mobile payments company based in San Francisco, California. Growth: Established in 2010, the company's growth has been exponential. It processes more than $4 million daily in mobile payments between customers and the merchant done through phone (voice call), SMS, or online payment techniques from a remote place. For instance: Prepaid top-up, electronic bill, mCheck, Peer-to-Peer (P2P), electronic cash/ fund transfer and mPOS.	The company has two services: Square Register and Square Wallet. Square Register allows individuals and merchants in the US and Canada to accept debit and credit cards on their iOS or Android smartphone or tablet computer. The app supports manually entering the card details or swiping the card through the Square Reader, a small plastic device which plugs into the audio jack of a supported smartphone or tablet and reads the magnetic stripe. Square Wallet allows customers to set up a tab and pay for their order simply with their name (or a barcode) using a stored credit, debit, or gift card.

Company	Brief	Product / Service Description
ShopKeep	ShopKeep is a cloud-based iPad (POS) or checkout system founded by a former retailer. It replaces traditional expensive POS terminals with easy to use, high-end technology that stores all data in the cloud. The company has partnered with PayPal and other mobile payment providers such as LevelUp and Dwolla to facilitate mobile payments.	ShopKeep comprises of two parts: (1) front-end cash register interface for iPad or Mac; and (2) a 'BackOffice' website where all transaction data is located and available for store owners and managers to view from any web browser. The register front-end is synced with the BackOffice, which provides full reports and QuickBooks integration for real-time accurate reports with the click of a button.
Dwolla	Dwolla is a US-based e-commerce company that provides an online payment system and mobile payments network that allows any business or person to send, request and accept money. The company has raised $22.8m through VC funding to date. In June 2011, the company hit a major milestone – completing $1 million in daily transactions, putting it on a faster initial pace than Square. While, Square took 10 months to hit $1 million in daily transactions, Dwolla was able to reach the $1 million mark in about seven months.	Users can send, request and accept money via the web or with the Dwolla mobile app. The system is securely connected to the individual's bank account and enables them to transfer at a flat rate of $0.25 per transaction, or free for transactions $10 or less.
LevelUp	LevelUp is a mobile payments platform created by Cambridge-based start-up SCVNGR. The LevelUp mobile application uses QR code technology to allow for mobile transactions to be made at local businesses via iPhone and Android phone. LevelUp follows an advertising and data business model. It creates custom-branded mobile payments apps like Sweetgreen that are used by merchants to provide deals to their customers as well as process the transactions themselves. Currently, the company is in talks with First Trade Union Bank to create a mobile payments app for its customers.	The LevelUp mobile application for iPhone and Android allows registered users to securely link their debit or credit card to a unique QR code displayed within the app. To pay with LevelUp, users scan the QR code on their phone at LevelUp terminals located at local businesses who accept LevelUp as a form of payment. Additionally, users without smart phones can order a physical LevelUp card on which their unique QR code is printed. Currently LevelUp is available at businesses in the Boston, Chicago, Philadelphia, St. Louis, New York City, Atlanta and San Francisco areas.
Google Wallet	Google Wallet is a collaboration between US-based Sprint, Google and Citi. It is a mobile payments system developed by Google that allows its users to store debit cards, credit cards, loyalty cards and gift cards among other things, as well as redeeming sales promotions on their mobile phone.	Google Wallet uses near field communication (NFC) to make secure payments fast and convenient by simply tapping the phone on any PayPass-enabled terminal at checkout. The service works with the 300,000 plus MasterCard PayPass merchant locations and Visa licensing their Visa payWave system.
BOKU Inc.	A group of VCs comprising Andreessen Horowitz, Benchmark Capital, DAG Ventures, Index Ventures, and Khosla Ventures acquired two global mobile payments providers - Paymo and Mobillcash, infused $13 million and created the new entity Boku Inc. The company provides a mobile payments platform and carrier network, enabling consumers to pay using their mobile phone.	The company has partnered with mobile operators around the world to enable their subscribers to purchase virtual goods simply using their mobile number. BOKU carrier-billing (charge to mobile phone bill) provides a secure and easy-to-use payment method. It also enables unbanked consumers who may have a mobile phone, but no credit card or traditional bank account, to make purchases online.

Company	Brief	Product / Service Description
Paypal Here	PayPal Here is a mobile payment solution that includes a free app and a thumb-sized card reader for the smartphone. It enables merchants to securely accept multiple forms of payment. Currently, PayPal Here is in exclusive release with pre-selected merchants in the United States, Canada, Hong Kong and Australia.	The PayPalHere mobile payment solution enables small businesses to accept credit and debit card payments using its supplied card reader and app – PaypalHere. It offers an additional feature that allows the smartphone's camera to scan and process checks.
Isis	Incorporated in 2010, Isis is a JV between AT&T, T-Mobile and Verizon Wireless along with an FI and a card network in the mobile payment space. The system is reported to be based on NFC. Their partners include Barclaycard US, Visa, MasterCard, Discover and American Express.	The Isis mobile app stores credit card information on an NFC enabled Smartphone; Isis-enabled POS system, and on Isis price tags. Instead of scanning credit card and producing signature or entering PIN to approve the payment, customers can simply tap their mobile device on Isis-enabled point of sales system. When you tap your mobile device at POS, that payment will be credited from your credit card that you choose.
Serve (American Express)	American Express is a late entrant in this space. It has teamed up with some of the larger carriers like Sprint and Verizon as partners for Serve and has also announced a deal with Payfone to handle cell phone payments. American Express is also looking at linking up NFC to Serve.	Users fund their Serve account from their bank account or credit card and access that account to send money directly to another user, pay through the Serve mobile app or use a physical card to draw from the account.
Starbucks (mFoundry)	Starbucks Corporation is an American global coffee company and coffeehouse chain based in Seattle, Washington. Although, Starbucks is a coffee house chain, the company is claims to run one of the largest mobile payments programmes in the US. Nearly 20 per cent of transactions on Starbucks cards now come through mobile payments. Over 7 million customers use Starbucks' mobile payment app translating into 2.1 million mobile payment transactions each week, according to CEO Howard Schultz. The company also has strategic partnership with mobile payments firm Square. The coffee chain accepting payments from users of Square apps and selling Square's card reader in Starbucks outlets.	The system works through a Starbucks Card Mobile App, available for iPhone and BlackBerry handsets. The app, which is loaded up with a user's funds via PayPal or a credit card, displays a barcode which the register processes. After a user waves their phone at a Starbucks register for payment, the funds are subtracted from their Starbucks account. The Starbucks Card Mobile app for BlackBerry and iPhone was developed by mFoundry. While mFoundry is a mobile app developer, in recent years the company has emerge as a leading white-label mobile payment services player. The company has managed to snag customers like Bank of America, Citi and Starbucks.

2.7 Drivers

The growing ubiquity of mobile commerce, coupled with the expanded functionality and greater convenience of smartphones, provide the framework for driving consumer mobile payments behaviour.

- **Need for convenience and accessibility** – Mobile payments are more convenient than traditional payment methods in terms of portability, flexibility, speed and ease of use. They can be used for small-dollar transactions, eliminating the inconvenience to consumers for carrying coins. Mobile payments are increasingly being adopted by consumers as the concept of adding payment functionality to mobile phones offers customers' greater convenience to carry out transactions such as bill payments, purchase of bus, train and movie tickets, payments for grocery shopping or even money transfers to family, without the need to visit the bank or use physical cash. Consumers are beginning to see the advantage of channelling these offline payments through their mobile devices. Further, consumers are prepared to go wallet-free and begin paying for goods and services through their mobile devices resulting in increased adoption of mobile payments services. It is also imperative to understand that different markets have different needs which directly impact the adoption and use of any service. Consumers may, however, have to invest time and money to ensure that their handsets are compatible with the mobile payments systems as well as make the effort to use the application.

- **Adoption of smartphones by consumers:** Growing smartphone ownership and penetration will influence stronger adoption of mobile banking and payments as smartphones enable users to perform a variety of day-to-day tasks, ranging from buying food and beverages, paying for transit, buying digital content and paying for goods and services. Using smartphones for mobile payments has been discussed as a natural evolution for all users. Smartphone users are increasing adapting to various mobile-related activities, such as downloading and using of apps. This is expected to catapult the increase in the consumer mobile commerce activities, such as using them for product reviews, comparing prices, purchasing goods and mobile banking. Regular use of mobile banking services is expected to be a major driver in building trust and awareness, which in turn will encourage the consumers' willingness to try emerging mobile payment offerings.

- **Merchants adoption of mobile payments:** Worldwide, small retailers and merchants are increasingly adopting payment solutions that help to transform tablets and even smartphones into payment registers. This is in addition to payment services accepting physical cards. Although, the adaptation is at a slow rate, this positive attitude towards accepting the new mode of payment services and making provisions to facilitate them could encourage consumers to adopt and use mobile payments.

- **Availability of user-friendly apps:** The growing acknowledgement of mobile commerce, coupled with the user-friendly functionality and greater convenience of smartphones, provide the framework for driving consumer mobile payment behaviour. Prior to the introduction of smartphone platforms and app stores by Apple and Google, mobile subscribers were bound by their MNOs with respect to the applications that could be downloaded to their mobile phones and the terms of app purchases. However, following the introduction of app stores managed by these two giants, the leverage of MNOs was reduced and consumers' control of the software on handsets increased immensely. This gave the consumers the options and capabilities that were unavailable earlier, thereby changing the mobile app dynamic. As the mobile payments industry is still evolving, many small mobile app developers are launching mobile payments apps compatible on smartphones, such as the PayPal Here and CIBC mobile payment apps. The emergence of applications stores, such as Google's Play Store and Apple's App Store, allows users to download such apps into their phones, which gives them a convenient and hassle-free mobile payments environment. This in turn has positively affected customers' attitudes towards mobile payments that will encourage them to adopt mobile payments services.

- **Increase in smartphone penetration:** The number of smartphones in use worldwide is expected to double, surpassing 1 billion in 2015. Further, an increase in global smartphone shipments is expected to drive the growth in the mobile payments markets to approximately $398 billion by 2015.

- **Government support:** Various governments across the world are also recognising the relevance of mobile payments and in many markets, mobile payments are fast receiving substantial support from government. In 2005, the Reserve Bank of India (India's biggest bank) had recommended that banks increase access to banking services for the unbanked population using mobile payments systems. In 2011, the Education Minister of Afghanistan had emphasized the need to develop mobile payments technology for tasks such as paying salaries to teachers and paying electricity bills. This resulted in the US Agency for International Development (USAID) issuing a grant of over $2 million to support the development of mobile payments in Afghanistan.

2.8 Current Gaps - Threats to Industry Growth

The mobile payments market is still niche and undergoing periodic evolution and innovation. These rapidly developing innovations in the mobile payments space have led researchers to believe that the mobile landscape remains characterized by fragmentation. Key issues that stakeholders are working on include convergence of channels, the role of non-banks, the formation of new relationships, unresolved security and privacy issues and the increasing role of data monetization. Listed below are some attributes of the mobile payments industry and their respective strengths, weaknesses and implications. Consumers' primary concern in using mobile payments is security, be it through processing services or through NFC. Thus, mobile payment providers need to implement and educate consumers on the safety benefits of such mobile features as dynamic authentication, multi-layered password protection and authentication by facial recognition. If so, security could eventually become an attribute that encourages rather than discourages consumer adoption of mobile payments.

- **Industry regulations:** As the industry is niche, it faces a unique situation when it comes to dealing with regulations. Mobile payments solutions clearly fall under the scope of existing regulations, while other alternatives using new technologies (e.g., NFC, QR code) may not have an obvious fit and require a better understanding before regulations can be prescribed. Mobile payments stakeholders perceive that regulators have not kept pace with mobile payments innovation and that the industry would benefit from more specific guidance and a legal framework for mobile payments providers. The mobile payments industry faces an issue with uncertainty around regulations governing coverage and liability responsibilities and a need for enhanced coordination among regulatory bodies. FIs and related organizations also express concern for participation by non-banks, including MNOs and alternative payment providers, which may be less familiar with payment banking laws (e.g., BSA/AML, KYC, state money transmission licensing, risk compliance and consumer protection). The key issues sighted are around consumer protection, privacy and data security. The industry faces a challenge of inadequate education and communication between the industry and the agencies.

    a. Mobile Remittance market: The World Bank indicated that that while the use of mobile phones has grown worldwide from $0.7 billion in 2000 to $6.0 billion in 2011 - of which $4.6 billion is being used in developing countries - as of early 2012, only 20 per cent of 130 mobile banking operators worldwide offered international remittance services. The low numbers are attributed to regulatory and operational challenges. Mobile remittances also fall in the regulatory void between financial and telecom laws, creating ‘regulatory uncertainty for potential market entrants’. The World Bank stated that mobile remittances will not take off until central banks and telecom authorities come together to craft rules that facilitate branchless banking. International remittances through mobile phones will also not take off until there is an ecosystem of domestic services built around mobile payments

- **Lack of industry standards:** Mobile apps lack industry standards that could lead to the exposure of payment platforms and networks to fraud and other security risks, resulting in the misuse or theft of payment credentials. Mobile applications downloaded to the handset can expose payment platforms and networks to fraud and other security risks. At present only the major players such as Google and Apple have the oversight to develop apps which could result in the creation of some industry standards. However, small app stores operating independently in the mobile ecosystem have little or no oversight. Since the industry is niche, there is a need to identify potential threats and vulnerabilities in the mobile payments ecosystem and share accessible data and security gaps in the mobile process in order to help stakeholders develop inter-operable standards, guidelines and rules for newer technologies.

- **Security and privacy risks:** The mobile payments industry's success is based on how stakeholders manage the trust and transparency of consumers and their information, as mobile can expose payments data to new parties and create the opportunity for data to be compromised. Further, many consumers engage in risky behaviours such as opening spam emails and jailbreaking phones. Stakeholders will have to convince users to change such behaviour if a wallet containing payment credentials is added to the mobile phone. In addition, many users worry that sensitive data could leak to the wrong hands and that such leakage could bring forth an increase in unwanted junk mail, promotions and spam from companies that access user lists. Additionally, the use of location-based services (LBS) by merchants and payment service providers to drive active and passive mobile marketing efforts has also heightened concerns around privacy. Even if consumers adopt an 'opt-in' option for sharing information, they may unknowingly allow companies to compile detailed profiles of their lives, since many LBS tools lack clear and concise disclosures about personal information collection, how that data is used and the process for consumer consent. Others see even graver consequences, such as unauthorized credit max-outs or identity theft. This could likely dissuade consumers from adopting mobile payments initially due to concerns about the safety of a relatively new and unproven payment method. Uncertainty about consumer liability for losses from fraudulent mobile payments may reinforce these concerns. In a nutshell, there is a need to identify evolving threats and vulnerabilities that exist for mobile, address the need for stronger authentication and advance security awareness among consumers and industry stakeholders in the mobile payments ecosystem. At present, both NFC mobile and cloud-based digital create customized promotions and rewards which could present risk to the customer's transaction information if not managed properly. There is a need to agree on how to protect, share and present customers' personal data, buying habits and preferences and subject it to customer preference.

- **Complexity of the market:** At present, the mobile payment market is highly fragmented. The variety of players involved in delivering mobile payments solutions, including payment processors, online payment service providers, mobile software solution vendors and application and hardware developers, has created a highly complex ecosystem. This could easily result in multiple software/apps having different compatibility, in turn resulting in delays in consumer adoption and merchant acceptance. Further, implementation of all possible mobile payments technologies is highly uneconomical for small merchants/retailers. Therefore, the major industry players need to agree on technology standards for mobile payments. All major industry participants have different business models and thus positions in relation to customer interaction. In addition, they all want to control access to the 'secure element' required for the payment application. In essence, this means that the handset providers want to embed the secure element in the handset, the mobile network operators want to incorporate the secure element into their SIM module (card) and the banks would prefer to introduce a new micro SD card format that contains both the secure chip and an NFC communication chip, issued and managed by the bank issuers.

- **Customer infrastructure:** The cost of investing in equipment needed for mobile payments is likely to vary significantly across consumers, depending on the type of mobile phone and the technology the consumer owns. To make a mobile payment with NFC technology, even consumers who already have smartphones would have to purchase a new phone, since few smartphones are now equipped with the technology. The effect of cost on consumers' willingness to use mobile payments is ambiguous. Practical evidence indicates that consumers respond strongly to differences in costs across payment methods. While some customers may refrain from adopting the latest technologies, some consumers will be ready to pay to upgrade their mobile phones to use mobile payments, especially if NFC is the primary technology

- **Merchant infrastructure:** Merchants worldwide have expressed concerns related to the overall business case for mobile payments. Their concerns stem from the related costs in comparison to the benefits of rolling out mobile contactless payments. These costs include, but are not limited to, processing, investment in terminal upgrades, chargebacks from card payments, security (including PCI compliance) and EMV implementation. In addition to cost considerations, merchants are concerned about rules and liability shifts that vary depending on how a payment is handled, for example whether a transaction will be processed as card-present (CP) or card-not-present (CNP). As such, merchants of all sizes (e.g. big box retailer, quick-service restaurants (QSRs), small and micro-businesses) and across various segments are experimenting with different mobile payment technologies to build cost-efficient POS solutions that enhance customer experience and lower costs.

- **Interoperability of stakeholders:** There is a need for interoperability and industry guidance, and a standard is imperative for a secure and cost-efficient ecosystem. Since this sector is still niche, competitive and rapidly innovating, the new solutions launched do not have a uniform open model. Further, installing new hardware to enable NFC on every POS terminal, changing POS software and upgrading POS terminals to support NFC is not only costly, but also an operational challenge resulting in reluctance or delay by merchants to implement NFC payment ssystems in their outlets.

- **Cost savings:** A mobile payments system eases and automates linking of payments to points or other loyalty programmes. Using a mobile payments service enables merchants/retailers to integrate loyalty and incentive programmes into the mobile payments applications. Instead of having to keep up with punch cards or key ring tags, customers can store all their information in the application itself. This will result in customers returning, which in return increases revenue. Mobile payments services help merchants/retailers to track customer behaviour and accordingly manage their inventory. Using this information, merchants can understand their customer demand to increase product sales and improve customer service.

- **Customer and merchant expenditure:** Mobile payments companies charge less per transaction than credit card companies, which equates to direct savings for the merchant/retailer. Thus, merchants will save transaction costs.

- **Absence of standard technology:** Although in many countries the EMV chip technology is considered to be important to the security of NFC card-based mobile payments, stakeholders are reluctant to adopt this technology and are debating on the cardholder verification method, generating a debate about the level of risk of chip-and-PIN vs. chip-and-signature.

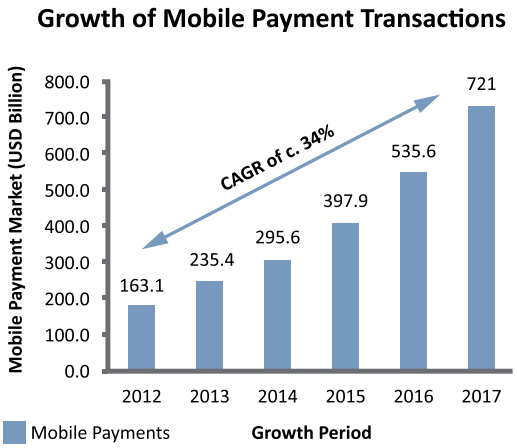
3 Future of Mobile Payments

Industry experts believe that m-payments subscribers will increase from 206 million users worldwide at the end of 2010 to 1,050 million users by the end of 2015. Researchers have predicted that worldwide, 5.4 billion smartphone handsets will be in circulation by 2015 which could result in approximately $1 trillion m-payments worldwide by 2015. With a growing number of handset owners not having bank accounts, it is predicted that the mobile phone will become the influencing force to capitalise on the potential for m-banking and the wider potential of m-payment services enabled by the mobile phone.

The future of the mobile payment market will depend on six critical factors:

- **Consumer readiness:** This will include the consumer's familiarity with using a mobile device to send money to family and friends, frequency of usage of a mobile device to purchase a commodity from a store and willingness of a consumer to use a mobile device to search using the internet and purchase merchandise.
- **Environment:** This includes economic, technological, and demographic elements, such as a market's per capita income, consumer access to the internet and how well businesses adapt to new technologies
- **Financial services:** This includes the level of development of consumer financial services, such as how well consumers are treated by the industry, the accessibility and affordability of financial services and the penetration rate of payment cards
- **Infrastructure:** This includes the breadth and sophistication of the mobile phone industry by calibrating variables, such as mobile phone penetration, network coverage, levels of NFC terminalisation and investments in telecom services. Revenue from mobile services as a percentage of revenue from all telecomm services. NFC-enabled merchant locations as a percentage of the population
- **Mobile commerce clusters:** Scale of partnerships between financial service companies, Telcos, governments and other members of the mobile payments ecosystem to promote mobile commerce. Scale of involvement by government groups. This is crucial since the industry set-up can be defined by one entity that can develop and promote mobile payments by itself; collaborations generally ensure smoother and more successful product introductions.
- **Regulation:** This includes the structure and efficiency of a market's legal and governmental bodies in terms of how they interact with business, particularly the communication and technology businesses. This should include intellectual property protection, procurement of advanced technology by government bodies, efficiency of legal framework in settling disputes and in challenging regulations.

It is noticeable that large banks are focussing on creating joint ventures, partnerships, consortiums, and bilateral relationships with MNOs, card networks, retailers, mobile solution providers, and well-funded innovative start-ups to implement numerous mobile payments solutions in a bid to capitalise the mobile payments market. In some instances, stakeholders are experimenting with multiple approaches to see what consumers will use, and what merchants will accept. Merchants are positive about the business case for mobile. They see mobile as an opportunity to introduce competition and innovation in the payments market.



3.1 Future Growth worldwide

As consumers become increasingly adept at using smartphones, the growing ownership will influence stronger adoption of mobile banking and payments, which at present is more inclined towards m-commerce than for person-to-person or point-of-sale transactions. Activities such as downloading and using applications are likely to lead to an increase in consumer mobile payment activities either for access to electronic payments (mainly in developing economies) or the convenience of mobile phone payments (in the developed world). Frequent use of activities related to mobile financial services in turn build trust and awareness, and contribute to the willingness of consumers to try emerging mobile payment offerings.

Gartner has predicted that worldwide mobile payment transaction values will reach $235.4 billion in 2013, a 44% increase in comparison to 2012's $163.1billion. They are expecting global mobile transaction volume and value to average 35% annual growth between 2012 and 2017 and are forecasting a market worth $721 billion with more than 450 million users by 2017. Worldwide, people are not purchasing as much because the buying experience on mobile devices has yet to be optimized. People are spending less through mobile devices than through online e-commerce services and at retail outlets. Money transfer value continues to increase because users are transacting much more frequently (although at lower values) due to the wider availability of services and to transaction costs that are lower than those of traditional bank services. Money transfers are expected to be a leading cause for mobile payments, accounting for 69 per cent of the total value in 2017.

A report released by Portio Research in 2013 states that worldwide, the mobile payments segment is expected to grow to $410 billion in 2013. Mobile payments volumes are also expected to grow at a CAGR of 59 per cent until 2017, breaching the $1 trillion mark by the end of 2015, and $2 trillion by the end of December 2017. The report also states that at the end of 2012, the number of mobile payments users worldwide is expected to reach 480 million; this number is expected to cross the 1 billion users mark by the end of 2015. Thereafter, the figure is expected to continue increasing, reaching nearly 1.5 billion users by the end of 2017.

There is a need to develop and integrate an end-to-end mobile payments process that could promote successful adoption. NFC payments have not evolved as quickly as originally predicted. Cloud-based and other innovative technologies, coupled with new market entrants and creative partnerships, have changed the dynamics of the mobile payments ecosystem, calling for a re-evaluation and modification of the MPIW's original strategic principles.

3.2 Emergence of New Technologies

- **Mobile/digital wallet:** When the mobile wallet was being developed it focussed on NFC contactless technology, which would store payment credentials, coupons, rewards, and other value-added features in the secure element in the physical mobile phone. In due course of time, the mobile wallet has evolved into a digital wallet (cloud wallet) which leverages cloud computing (i.e. remote servers) and wireless networks to enable proximity and remote mobile purchases and bill payments, without requiring secure financial data to be embedded in the mobile device. In a digital wallet, a payment may also be transacted without the physical presence of the mobile device by using a mobile phone number and a PIN/password at the POS. Although, the NFC/secure element solution remains a viable option, cloud-based mobile services also provide secure storage and access to payment credentials, without the limitations inherent in a hardware model. The idea is that users register for the service (or receive the service from their Telco), and then use the service for one-click checkouts in e-commerce. This may in some cases include a stored value or prepaid account to draw funds from your bank and use as cash in the cloud wallet. These wallets are evolving from existing services from the likes of PayPal and Telefonica. These solutions have helped consumers get more value from their existing relationship with the Telcos.

  In a nutshell, this service is expected to evolve depending on the consumer's preferences in terms of the type of payment and payment-related apps that have been pre-loaded onto the mobile device, or has been downloaded through various app stores. Interestingly, although the cloud wallet requires cardholders to enter a PIN into their wallet app from the receipt to complete the transaction in POS retail solutions, which is more demanding than NFC, it has seen much higher transaction volume initially because merchants do not have to change their POS infrastructure. Experts believe that future wallet business models may leverage emerging standards such as the FIDO[7] Alliance that combine the strong device-level security (a characteristic of NFC) with cloud-based technologies, driving improved efficiencies and innovation for user experiences, while standardizing the back-end protocols for interoperability, ubiquity, and optimum security.

- **New Investments in Mobile Technology:** The future sees the convergence of multiple technology platforms for mobile payments where NFC mobile payments will remain a key component of this principle. However, many stakeholders believe that NFC is no longer viewed as an exclusive technology that will drive mobile adoption and are looking at non-NFC solutions. Although, the mobile market is highly fragmented, the various emerging technologies have the potential to benefit the payments systems by improving overall efficiency and security in

[7] *Fast Identity Online (FIDO) is an organization formed to enable interoperable strong authentication and authorization between mobile phones and cloud services. The FIDO Alliance was co-founded by Validity, PayPal, Infineon, Lenovo, and Nok Nok Labs and launched in February 2013.*

the long-term. This is expected to result in several competing models eventually co-existing based on their venue and risk profile. For example, QR codes may work well for micropayments in a closed-loop proprietary payment system. NFC solutions may be best applied in cases that require enhanced security features such as transit, where speed and convenience of processing a high volume of transactions is necessary. Some interesting investments made by companies worldwide in innovative technologies are mentioned below:

- In 2012, Apple had acquired AuthenTec for $356 million. This company primarily provides mobile security software licenses and fingerprint sensor technology to companies that included Alcatel-Lucent (ALU), Cisco (CSCO), Dell (DELL), Fujitsu, Hewlett-Packard (HPQ), Lenovo (LNVGY), LG, Motorola (GOOG), Nokia, Orange SA, Samsung, and Texas Instruments (TXN). AuthenTec's fingerprint technology was also used in Japan for the authentication of mobile payments made with mobile phones. With fingerprint technology expected to replace online passwords and pins, the technology is expected to replace passwords in mobile payments. In fact, with Apple's acquisition, many research companies and analysts are expecting the implementation of fingerprint technology in Apple's iPhone5S. Apple would be able to leverage its growing Passbook ecosystem along with its more than 500 million iTunes account that have a credit card on file to jumpstart the mobile payments in an easy to use and secure way. Analysts are also stating that if Apple does introduce this new technology in its phones, other companies would follow suit.

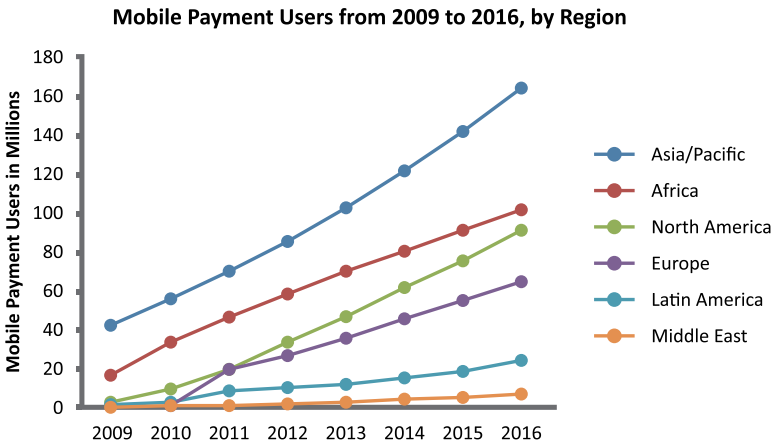
- Japanese manufacturer, Toshiba Corporation has launched new NFC controller for mobile devices that will begin mass production in October 2013. The controller enables multiple concurrent connections with three different secure elements, the chips that store and protect sensitive data like payment information. This could eventually help with issues over which stakeholder 'owns' the secure element, a problem plaguing the deployment of NFC-enabled payment platforms currently.

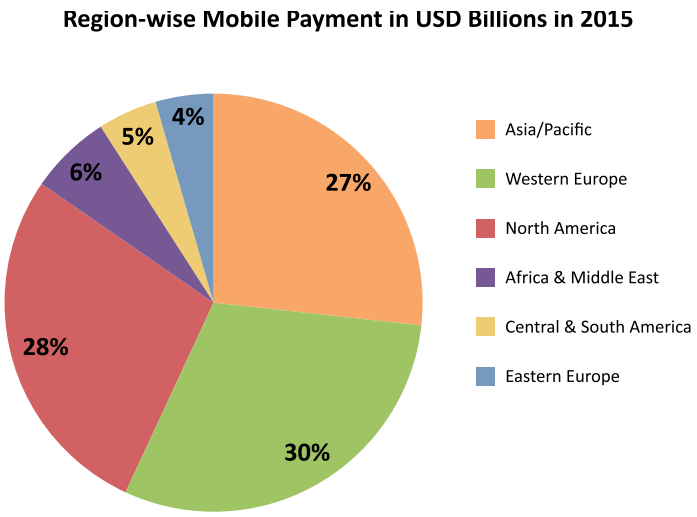
- Net Element International (NETE), a technology-driven group specializing in electronic commerce and mobile payment processing entered into an investor accreditation agreement to develop new technology for mobile payment and transactional services technology with the Skolkovo Foundation, a government funded research and development centre in Moscow.

- Clip, a in San Francisco and Mexico City-based start-up, has raised $1.5 million in funding to build a mobile payments system for the Spanish-speaking world. The solution resembles that of Square, but it is focused on the needs of local markets such as Mexico. The company raised money from a group of investors that include 500 Startups, Alta Ventures, ACCION, and Karl Mehta. Clip has created a payment and credit card reader that fits into the headphone jack of an iOS or Android device. To use the device, you open a free Clip app, enter the amount to be charged, and then swipe the card through the encrypted card reader. Clip asks customers for their cell phone number and sends a 4-digit SMS code (text message) that the customer then enters into the Clip app. If the code matches, the customer signs and receives their receipt via SMS or email.

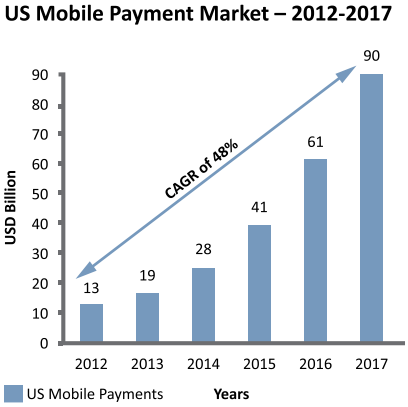
3.3 Region-wise Growth

USA: North America's mobile transaction value is forecast to grow 53 per cent in 2013, reaching $37 billion, up from $24 billion in 2012. The region has been impacted by low adoption of NFC payment services and many merchants launching mobile apps in a copycat fashion without a clear winning strategy. Major US credit card networks have formed strategic partnerships with MNOs, issuers, merchants and mobile payment technology vendors, as well as, investing in mobile start-ups. They are focussing on cloud-based digital wallets and merchant loyalty programmes. Debit card networks are also thriving in the US markets since the online and mobile prepaid options offer the unbanked and under-banked access to financial services without requiring a traditional bank account.





The US has a payment network 'Automated Clearing House (ACH)', which is a secure payment transfer system that connects all US financial institutions. Many mobile ecosystem stakeholders have actively considered ACH as a viable alternative in the mobile/digital wallet evolution. FIs and non-bank payment providers are developing internet and mobile applications to implement P2P payment products that are processed through the ACH network, creating opportunity for future growth as more consumers use their smartphone apps and browsers for mobile P2P and internet purchases. Several companies in the mobile payments ecosystem are planning to offer an alternative payment method for retail purchases by leveraging this system. Merchants consider the use of the ACH at the POS as less costly alternatives to credit and debit.



ACH is expected to another component for expanding consumer choice in the future, particularly for recipients of electronic benefits and transfers (EBT) and other government benefit payments. FIs in the US are expanding their mobile banking platforms to include mobile remote deposit capture (mRDC), P2P payments, and corporate mobile banking services. P2P payments have helped FIs expand their role as a facilitator of mobile commerce by enabling money transfers between FIs or through retail payment networks. To address the privacy and security issues the US mobile payment stakeholders are adopting the EMV chip technology which is important to the security of NFC card-based mobile payments because NFC uses the underlying EMV technology infrastructure, and relies on the same dynamic data authentication (DDA) for mobile payment security.

South and Central America: The region is hugely under-served by banks, therefore mobile payments have been influential in peoples' day-to-day life in the form of banking services, person-to-person payments and remittances. The main growth area in this part of the world is expected to be in SMS payments for purchases, money transfers and bill payments. IE Market Research predicts that by 2015, the gross value of mobile payments is expected to reach $46.1 billion contributed by 71.2 million mobile payments users in South and Central America.

Asia Pacific: India, with $70 billion of inward remittances, was among the top five countries for recipients of remittances as quoted by the World Bank followed by China with $66 billion and the Philippines $24 billion. Asia Pacific's mobile transaction value is expected to grow 38 per cent in 2013 to reach $74 billion. Indicating that there is a huge potential for mobile remittance markets, deployments in developed markets such as South Korea and Singapore and in developing markets such as India are expected to drive healthy growth in this region. Gartner expects that the Asia Pacific will overtake Africa to become the largest region by transaction value, reaching $165 billion by 2016.

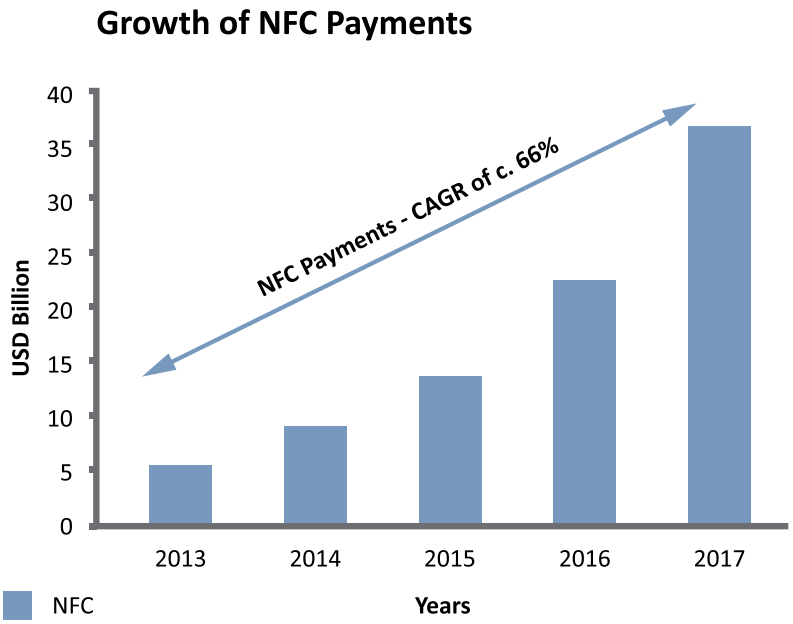
Africa: A report by World Bank indicated that Kenya is ahead of the curve in fostering an ecosystem of mobile payment services. Africa's transaction value is forecast to reach $160 billion in 2016. In 2012, Nigeria, with $21 billion inward remittances, was among the top five countries for recipients of remittances as quoted by the World Bank. It is anticipated that Africa will still experience strong growth through the forecast period; companies are still searching for the most suitable business model for mobile money in their local markets.

Europe: Berg Insight, a research company, stated that Europe is expected to embrace mobile payments more readily than Americans and projected the wallet market to grow to €45 billion in 2017. Western Europe's transaction value is expected to reach $29 billion in 2013, up from $19 billion in 2012. The market will experience steady growth through the forecast period, but the forecast growth has been impacted by a reduction in the average number of transactions per user in 2012 as several services struggled and others launched only toward the end of the year. These factors have postponed growth for at least a year.

3.4 Growth Prospects for Different Types of Mobile Payments

Interestingly, Portio Research and Berg Insight have also thrown some light on the growth rates of the different type of mobile services across the world. Some of their findings are discussed below:

- **NFC or tap-and-go payments:**



Worldwide, mobile transactions values have shown buoyant growth and so has the adoption of NFC payments, as more NFC-enabled phones are being launched in the market. Global sales of handsets featuring NFC is predicted to grow at a compound annual growth rate of 48.2 per cent and annual shipments will reach one billion units by 2017, according to a new report from Berg Insight. It is believed that the practical usage of NFC technological will continue to grow over time, with newer applications including information exchange, device pairing, access control, electronic ticketing and secure contactless payments. The NFC technology is adopted in developed markets (particularly Western Europe and North America) since it provides potential access to a large number of retail POS terminals. SMS cannot match this as a transaction technology. Despite this, research companies such as Gartner have predicted that NFC transactions will account for a smaller than expected proportion of that total and the overall market value has also been reduced since it has yet to overcome several technical and practical hurdles. Many stakeholders are looking out for complementary and/or competing mobile payments schemes where the alternative mobile payment method may be more cost-effective and more suitable to a certain venue or service, until consumer demand for NFC reaches critical mass. This is primarily since the implementation of the POS terminals from the merchants' side has been slow despite the terminal manufacturers having incorporated NFC functionality into their new POS terminals. Having said this, it is a fact that NFC offers benefits, which other mobile technologies may not. Unlike cloud and QR code technologies, NFC is standard-based for chips and the secure element. NFC is well-suited as a cash replacement for small dollar purchases. It can enhance opportunities for loyalty programmes with two-way communication. Coupled with the secure element in the mobile device, NFC can process prepaid debit, electronic benefits and transfer (EBT) and transit payments, enhancing efforts for financial inclusion of the under-banked.

According to Portio Research's five-year forecast period, the value of transactions conducted via NFC has been reduced by more than 40 per cent due to disappointing adoption of NFC technology in all markets in 2012 and the fact that established services such as Google Wallet and Isis are struggling to gain traction.

The figure on the previous page charts the expected growth with respect to the share of NFC of the total mobile payments market (in terms of transaction value). Growth is expected to increase from 2016 when the penetration of NFC mobile phones and contactless readers increases. Approximately 167 million NFC-enabled handsets are expected to be shipped in 2013. In 2017, approximately 1.67 billion NFC-enabled handsets are expected to be in use around the world. By 2017, almost 20 per cent of worldwide mobile payments will be transacted using NFC technology. NFC payments will surpass $391 billion in volume in 2017.

Contrarily, some research companies believe that NFC payments will surge in North America, Europe and the Asia Pacific region between 2012 and 2015 in line with the growth of smartphones and as consumers become more familiar with the concept of using their mobile phones as a payment options. Interestingly, Google and Isis NFC mobile wallets may have helped gain traction with some merchants. Mobile stakeholders are working with solution providers to build NFC mobile payment platforms based on all three secure element options - SIM card, embedded NFC chip, and micro SD chip. This is expected to support all payment methods and networks, comply with business rules and standards, and reside in a secure container in the mobile device to interface with mobile payment applications. Recently introduced payment options using mobile phones integrate NFC technology with a cloud-based system. With this approach, cardholders' account details will no longer be stored on a secure element within a mobile phone, but will instead be maintained in the cloud. However, successful combinations of NFC and cloud will require solutions to help mitigate the security risks involved in data transmission. A hybrid approach that combines NFC and cloud for m-payments would remove the need for the physical secure element on a mobile phone, making the application of NFC services simpler and cheaper. However, integrating NFC with cloud-based systems will still require implementation of international payment standards such as PCI DSS to mitigate the security risks involved in data transmission.

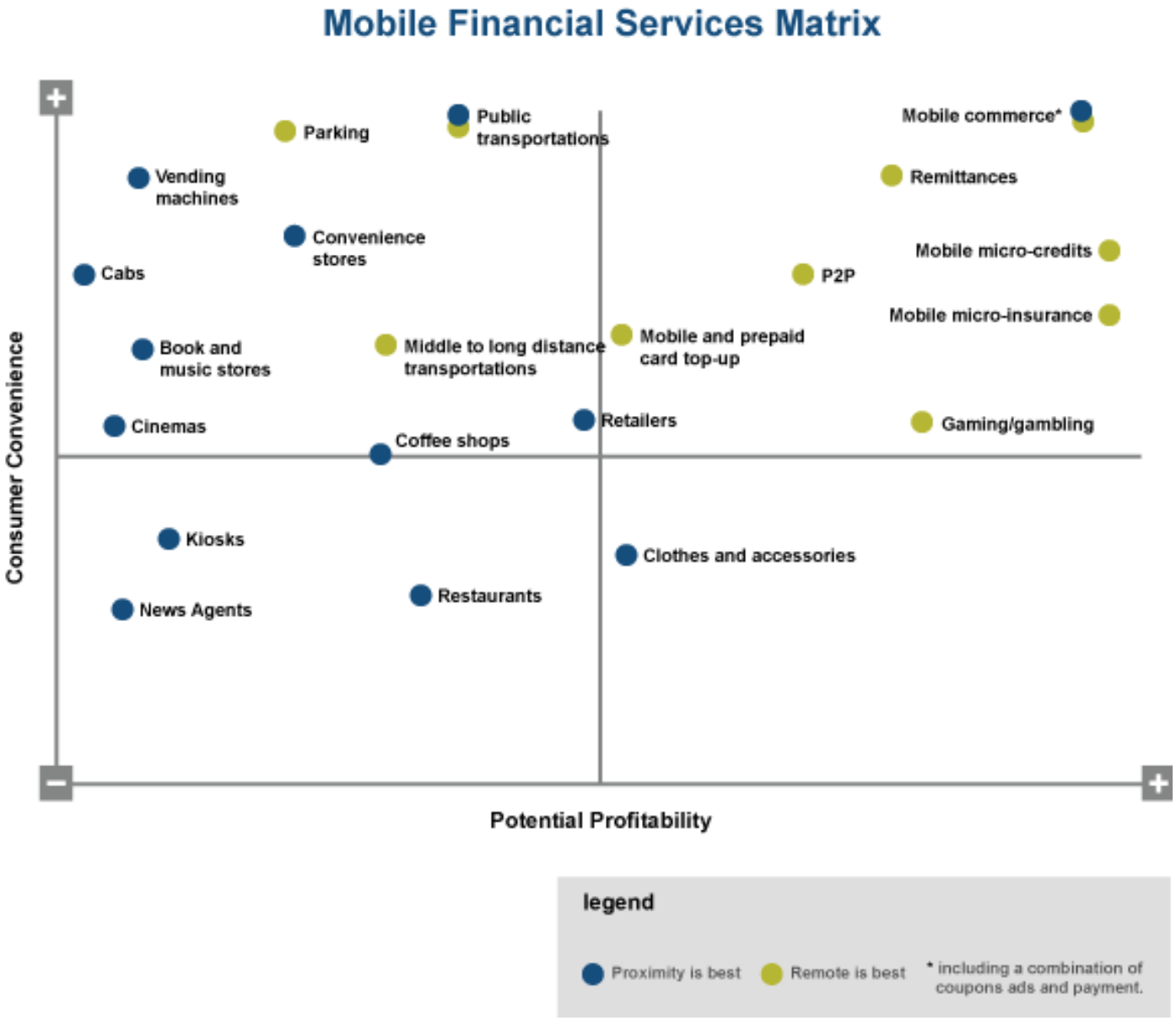
- **QR codes:** Since many merchants believe that setting up an NFC infrastructure is quite expensive, they are offering closed-loop prepaid account solutions using QR code applications to make mobile payments. QR codes are non-proprietary and relatively quick and easy to implement. The challenge here is that the customer still needs a custom app and QR code for each merchant or group of merchants, who must agree to a common set of technology standards and/or a common app.

- **Mobile banking:** There were 516 million people banking by mobile device at the end of 2012. This is expected to surpass one billion in 2014 and bypass 1.5 billion in 2016. Bill payment, which is a sub-set of mobile banking services, is expected to grow 44 per cent in 2013 and have consistent growth. This is due to higher value per transaction figures as more consumers in developed markets perform bill payments via mobile banking services along with consumers in emerging markets who are transacting at higher values than originally forecast. Bill payments will account for about 5 per cent of the total value forecast for 2017.

- **Mobile remittance:** International mobile remittance is another growing segment of the mobile commerce space. Worth almost $25 billion in 2012, the value of this market will surpass $50 billion in 2016 and $70 billion in 2017.

3.5 Opportunities

Capturing the opportunities would require a broad-based strategy that encompasses multiple aspects of the mobile financial services market, from mobile payments to value-added services that enable mobile commerce. Therefore, different stakeholders have to create business models which will create a perfect mix of customer convenience and potential profitability. The figure below explains the various levels of profit-making opportunities for banks and mobile network operators. Based on this, listed below are the different opportunities for the different stakeholders in the mobile payment ecosystem.



- **For MNOs:** MNOs can expand their strategies to encompass prepayment and post-payment activities — the "before" and "after" markets. "Before" services include geo-location services, targeted ads, promotions, social marketing, and other services designed to raise consumer awareness and influence their purchase preference. "After" services include remarketing, loyalty programmes, customer support, and cross-selling/upselling activities. They could create a mobile commerce "hub" that brings together multiple merchants, brands, and service providers behind a common payments platform. Leveraging customer data across such a hub could raise the bar on the type of loyalty and other marketing programmes that merchants can offer. This customer data could provide value added services and increase their revenue streams. Further, if MNOs are able to manage risk (independent of payment type) then they have the opportunity to change the payments landscape and provide consumers (and merchants) with the ability to form new payment arrangements. If a consumer could be authenticated, then they no longer need to carry around any financial information with them, indicating that the account information could be managed separately. Although this is not a new concept, past "wallet" failures were based upon a MNO model which attempted to "control access" and "payment instruments". Alternatively, an "authentication" model would put MNOs into a role where they support existing processes and payment streams (rather than intermediate them) and remove them from many of the regulatory hurdles which surround payments.

- **For FIs:**

  - **Unbanked and under-banked consumers:** A report by Gartner in 2012 estimated that there are 2.5 billion people without a bank account in developing economies. In addition, other reports have also mentioned that a significant portion of the world's population that is under-banked. The striking feature about this population is that a majority of them have mobile phones and a significant portion of this mobile phone population own smartphones, indicating that their smartphones represent their primary connection to the internet. This population could be the likely target audience and driver for the adoption of mobile payments for activities such as making purchases, deposit checks and pay bills.

  - **Mobile remittances:** Regions and countries with large numbers of migrants in oil exporting countries continue to see robust growth in inward remittance flows, as compared with those whose migrant workers are largely concentrated in the advanced economies, especially Western Europe. Three regions in Asia Pacific region, India with $70 billion, China with $66 billion and the Philippines $24 billion, were among the top five countries for recipients of remittances quoted by the world bank. This indicates that there is a huge opportunity for the mobile remittance industry in these markets.

- **For other stakeholders**

  - **Need for new business models:** New solutions will be developed in response to the need for business models that meet the expectations of all stakeholders in the ecosystem. The variety of payment solutions may advance new schemes for revenue and cost-sharing that benefit customers and merchants.

- **Mobile app developers:** In the long run, with the substantial rise in app stores operating independently in the mobile ecosystem, assuming the growing adaptation of mobile payment services, the need for security for the mobile channels is expected to catapult. There is a huge opportunity for technology companies to create automated mitigation tools that will ease and facilitate preloading mobile antivirus software on phones and leveraging the ability of mobile phones to share real-time data (e.g., location and customer-entered authentication).

- **Payment system developers:** Merchants have in the past been reluctant to adopt mobile technologies due to the high set-up costs. Further, merchants have to constantly evaluate their investment with respect to liability responsibility for counterfeit fraud associated with mag-stripe data breaches and the benefit of reduced fraud, which in the case of mobile payments is high. Therefore, there is an opportunity for cloud-based payment services providers to offer cost-effective and rapidly deployable capabilities, since they leverage barcode technology and card tokenization which helps in reducing the likelihood and costs of dealing with fraud.

- **Opportunities for non-banks:** Non-banks have been given the opportunity to introduce innovation and creative partnerships to the evolution of the mobile payments ecosystem. Many start-ups and mature non-bank businesses are developing apps and providing lower cost solutions (compared to traditional card rails) for making and accepting mobile payments and for clearing and settling payments that leverage existing payment rails

- **Alternative mobile technology developers:** Since security and privacy have been the major issues with the success of the mobile payments industry, there is a potential for a more secure payments environment involving alternate mobile technology solutions, which are simpler and less costly for merchants and FIs. These include QR codes and cloud-based solutions that can store and manage payment credentials remotely, which could possibly address some of the issues associated with managing data in the secure element embedded in the mobile device. Stakeholders of this industry, such as payment processors, online payment service providers, mobile software solution vendors and application and hardware developers, are exploring new market opportunities and innovations in the mobile payments space, ranging from digital wallets to dongle plug-in smartphone card readers. Further, stakeholders believe that the creation of an open model could become a means to secure an interoperable mobile payments system capable of building scale through consumer and merchant adoption. They continue to provide the enabling technology for mobile payments or to serve as intermediaries in the payments supply chain. Alternative payments providers have gained the opportunity to develop solutions and applications that leverage a range of technologies, such as cloud, QR codes, and geo-fencing. This will significantly reduce the dependence on mobile carriers because they rely on software that does not store payment information on the mobile device, and therefore does not require access to the mobile network. However, internet access is typically necessary to complete a transaction.

- **For merchants**
  - **Value-added services**: Both NFC mobile and cloud-based digital wallets can allow for the generation of customized coupons, timely discounts, and loyalty and reward programme tracking and redemption directly from the mobile device. These value-added services can help in generating additional sales, strengthening brand loyalty, and offering additional points of interaction with the customer. Service providers have the opportunity to use mobile payment systems to include value-added services beyond payments.

- **Small Businesses:** Previously, many small businesses, especially those operating at remote locations were unable to accept credit card payments. However, through a mobile POS system, a cash-only business can start to accept credit card payments, they have managed to reach out to a wider customer base and increase their sales. Further, business will also be able to increase opportunities for consumers to receive targeted ads and promotions from merchants provided consumers are provided an option to opt-in for the same. Thus, consumers can receive ads and promotions on a mobile payment application, while they are in or near the store, not just when they are going through the store checkout. These targeted ads and promotions can catapult sales and increase customer loyalty.

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