Banking Update

NPCI - UPI to usher e-payments revolution

India is still a cash intensive economy with cash-to-GDP ratio of over 12%. As per various estimates c.95% of consumer transactions (volumes) and c.65% (value) in India are carried out in cash. This compares with 40-50% (volumes) and 10-20% (value) for advanced economies. However, with rising mobile and internet penetration, evolving technology, entry of new players in payments ecosystem, and initiatives taken by GoI and RBI, we believe the payments landscape in India would undergo a radical change by 2020. This would result in massive benefits for the economy wrt cost effectiveness in transactions and currency management, curtailment of unaccounted money and financial inclusion with effective directed benefits. NPCI, the umbrella organisation for retail payments in India, through its various products is creating an ecosystem that allows e-payments to proliferate. Its upcoming 'Unified Payments Interface' architecture can bring in a revolution with interoperable and instant payments through single interface and identifier.

- **Leveraging on rising mobile penetration is the key to rapidly expand acceptance infrastructure:** The issuance landscape has shown exemplary growth particularly post 'Pradhan Mantri Jan Dhan Yojana' which added over 195mn new bank accounts and 167mn cards. However, given the scale and diversity of India, the acceptance infrastructure is largely underdeveloped with 15 ATMs per 100k adults and 1.2mn Point of Sale (PoS) terminals for estimated 14mn merchants. Creation of low cost and simplified acceptance infrastructure is the key to accelerate the penetration of e-payments in the economy. With India having nearly a billion phones and 150mn smartphones (expected to go to 500mn in next 4-5 years), massive scale can be achieved if effective use of mobile is made compared to creating costly physical acceptance infrastructure.
- **UPI is a next generation payment system with not many parallels:** 'Unified Payment Interface (UPI)' has the potential to revolutionise retail payments in India and doesn't have any close parallel in the world. Its key features are: a) Interoperable and Instant payments: its allows money to be transferred instantly across bank accounts in the entire banking system much the same way we send SMS on different mobile networks, b) single identifier: payments can be done by providing only one identifier like mobile no. / Aadhaar no. / virtual address (for bank accounts and cards) like 'puneet@hdfc' , c) Single interface: multiple bank accounts can be linked to a single mobile banking application provided by the Payment service provider (PSP) instead of using multiple apps, d) Push and Pull payments: The payments can be initiated either by sender (payer) or receiver (payee), e) 1-Click 2FA: The transactions would be carried out in a secure, convenient (single click), and integrated fashion and f) Scalable architecture along with innovation opportunities: System is designed for scalability and mass adoption and allow PSPs to innovate their interface (app) with various features and offerings.
- **UPI - Significant potential benefits; parameters of customer stickiness to undergo a change; innovators would be the winners:** One study commissioned by MasterCard pegged annual cost of currency operations in India at ₹210bn for RBI and Banks. Move towards e-payments economy can result in significant benefits a) contained cost of currency management, b) higher operating efficiencies for banks and merchants, c) cross sell opportunities as banks would have data to analyse spending behaviours, d) higher tax compliance along with clear audit trails and e) financial inclusion and effective directed benefits. It would also result in higher competition among banks particularly due to features like interoperability and single interface. It has potential to reshape the parameters of customer's stickiness from holding core savings account towards high quality payment services. Hence we believe innovators and high quality payments service providers would be winners.

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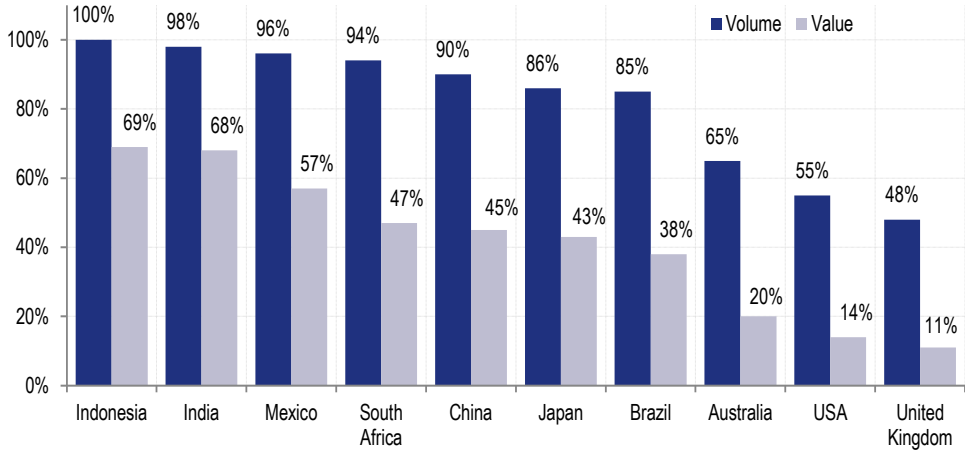
Mobile penetration offers huge opportunity in expanding e-payments ecosystem in India

- **India is still a cash heavy economy:** As of 2014, India's cash-to-GDP ratio was at 12%, which is much higher than that of developed countries like UK (4%) and USA (7%). Similarly, the number of non-cash transactions per citizen is very low in India (6 transactions per inhabitant) when compared to other emerging markets. One of the key reasons is that India has an underdeveloped acceptance infrastructure. India has only c.194k ATMs which translates to c.15 ATMs per 100k adults. This compares badly with the World Bank data that shows China, South Africa, Brazil and Russia having c.50, 62, 130 and 150 respectively. Penetration of Point of sale (PoS) devices is also very low with only 1.2mn installed PoS machines for c.14mn estimated merchants.

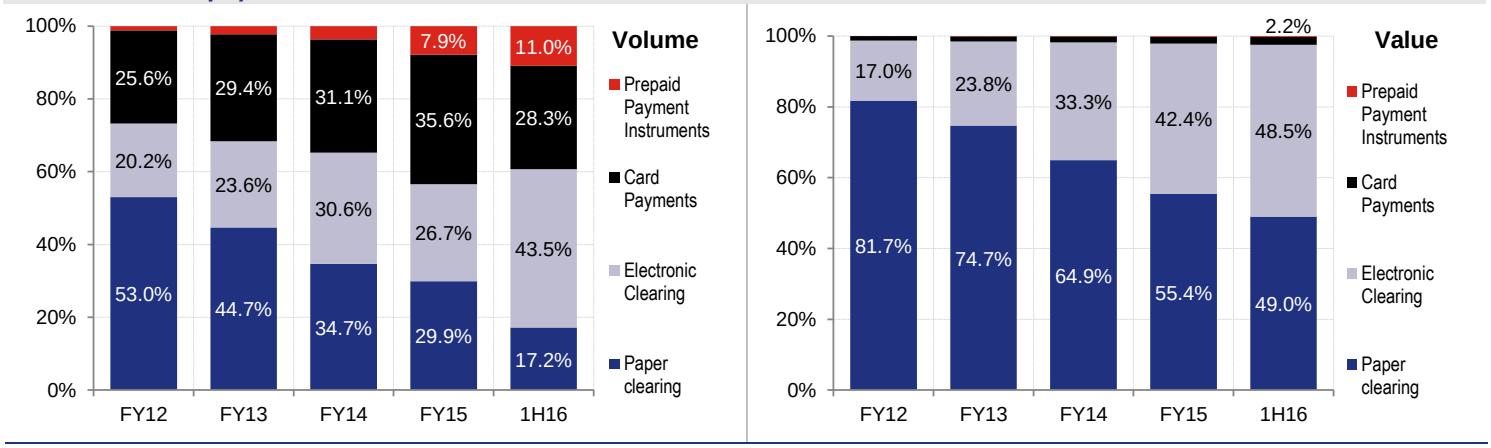
Exhibit 1. Comparison of the proportion of cash in consumer transactions



Source: PWC report on 'Disrupting cash: Accelerating electronic payments in India'

- **Cost of cash is high for the country:** The operational cost of cash includes the direct expense of producing, collecting, storing and safeguarding it; counterfeiting costs; and the time spent processing cash payments in merchant tills, business back offices, government agencies and banks. While banks and merchants directly incur most of these costs, the economy bears them indirectly in the form of fees, foregone interest and higher consumption prices. More importantly, prevalence of cash often allows an 'informal' or 'shadow' economy - one that is not taxed, monitored by government, or included in the GDP - to grow or dominate. A 2014 report on 'The Cost of cash in India' commissioned by MasterCard pegged the estimated annual cost of currency operations in India at ₹210bn. Compared to cash transactions, electronic transactions are cost efficient and leave a clear audit trail which helps to bring transparency in the system.
- **Within non-cash retail payments, paper clearing is still 50% of transactions value (though declining rapidly); Electronic payments are on the rise:** Though cheques still form a significant portion of retail payments, being 50% of transacted value in 1H16, it has declined rapidly over past few years, given the share was as high as 82% in FY12. In volume terms, share of paper clearing has come down from 53% in FY12 to 17% in FY15. On the other hand, electronic payments are consistently growing with introduction of numerous platforms like RTGS, ECS, NEFT etc. and other retail products like cards, IMPS, PPIs etc. In 1H16, electronic payments constituted 83% of total non-cash retail payments in terms of volume. Aided by the steeply increasing number of internet users and smartphone users in India, platforms like IMPS, NEFT, have seen a significant jump in transactions. In 1H16, total value of electronic clearing transactions equaled that of paper clearing transactions for the first time.

Exhibit 2. Retail payments in India: Transactions volume and value mix

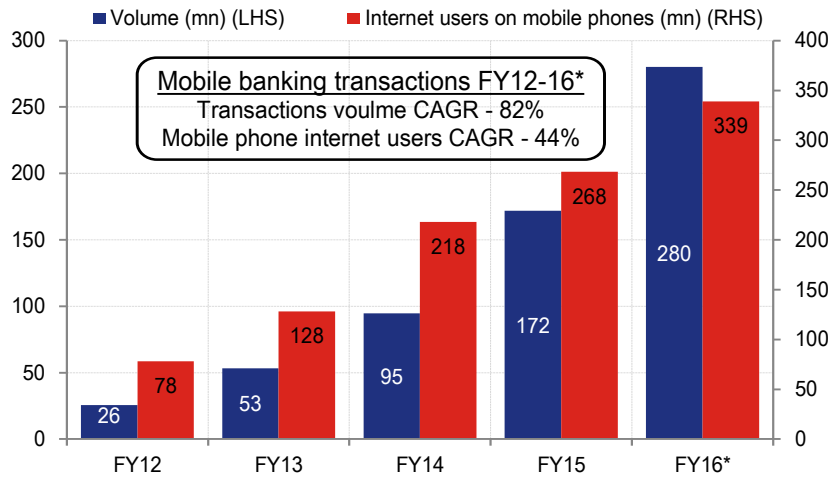


Source: RBI, JM Financial

- **Leveraging on rising mobile penetration is the key to rapidly expand acceptance infrastructure:** The issuance landscape has shown exemplary growth particularly post 'Pradhan Mantri Jan Dhan Yojana' which added over 195mn new bank accounts and 167mn cards. The total issued cards in India have crossed 600mn in FY15 but remain low compared to 4.2bn cards issued in China. Given the scale and diversity of India, underdeveloped acceptance infrastructure is a major hurdle for faster growth in card penetration. For an estimated 14mn merchant, only 1.2mn Point of Sale (PoS) terminals have been installed. Further, these POS terminals are predominantly in metros and Tier 1 cities with concentration around large stores selling products & services availed by a small segment of society. For the smaller merchants who execute 2-3 transactions per week on the PoS device, it becomes difficult to recover the cost ($150-$200) of these devices. Thus, creation of low cost and simplified acceptance infrastructure is the key to accelerate the penetration of e-payments in the economy

  With India having nearly a billion phones and 150mn smartphones, mobile penetration can provide a viable alternative to setting-up of costly PoS terminals at small merchants and remote locations. With products like *99#, IMPS, mWallets, technology has enabled mobile phones to initiate and authenticate payment transactions in an easy and secure manner. Adoption of mobile based applications for online transactions has risen steeply in past few years driving the sharp growth in mobile banking volumes (Exhibit 3). As per RBI data, Mobile banking transactions volume in India in FY16 till the month of October has already surpassed the full year number for FY15 (172mn). If leveraged through innovative products and platforms, mobile phones can thus offer a uniquely massive scale to push electronic transactions. For example, Paytm, a mobile wallet by One97 communications, currently claims more than 100mn users as compared to the 22.5mn credit cards (as on Sep' 2014) issued to date by 31 cards issuers in India.

Exhibit 3. Trends in Mobile internet users & Mobile banking in India



Source: TRAI, RBI, JM Financial. FY16 are annualised numbers.

- **UPI + smartphone penetration offers credible solution for expanding acceptance infrastructure:** UPI is a next generation payment system that provides an eco-system driven scalable architecture and a set of standard Application Programming Interface (API) specifications to facilitate online payments through single interface /App on a smartphone. This allows for innovation in newer forms of identity, authentication, and banking (for e.g. authenticating biometric/iris information of an individual). With Smartphones, the products and offerings of Mobile banking could be reshaped as any merchant (with a basic smartphone) can now be acquired by a bank without the need to install a PoS machine at the place of business. UPI, thus, has the potential to turn every smartphone into an issuance as well as acceptance infrastructure to carry out an electronic transaction in an easy and secure manner. It can leverage on the increasing smartphones base in India which stands at 150mn and is slated to cross 500mn in next 4-5 years. Further, the growing e-commerce market offers a massive bandwidth for innovation in mobile payments.

- **UPI - Significant potential benefits; innovators would be the winners:** Move towards e-payments economy can result in significant benefits with a) contained cost of currency management, b) higher operating efficiencies for banks and merchants, c) cross sell opportunities as banks would have data to analyse spending behaviours, d) higher tax compliance along with clear audit trails and e) financial inclusion and effective directed benefits. UPI's ability to integrate all existing platforms and players into a true interoperable system will empower participants to innovate without the risk of isolation from existing eco-system. Further, with UPI ensuring seamless money transfer across banks, banks will have to compete to retain its low cost retail deposit base. With Payments banks bringing in additional competition, customers will move to entities providing broader and easier payment options with the most advanced interface. The payment bank licensees include some companies which are already invested in electronic payments (PayTm, Airtel money, Vodafone m-pesa), enabling infrastructure (Fino PayTech) and IT products & services (Tech Mahindra). Thus, UPI can trigger a competition where only the most consistently innovative players will win. Going ahead, pervasiveness, interoperability, ease of use and cost-effectiveness will be the vectors in development of payment eco-systems.

NPCI to play significant role in developing the payments eco-system in India

- **NPCI – creating domestic payment capabilities:** NPCI is the umbrella organization for all retail payment systems in India and manages a portfolio of products and services ranging from RuPay, India's first domestic card scheme, to National Financial Switch, which allows full interoperability within ATMs. It also includes various 'Aadhaar' linked platforms to facilitate financial inclusion programs and has effectively disbursed over ₹200bn targeted subsidies. Having handled a maximum of 13mn transactions in a day, NPCI is working on a futuristic switch with capacity to handle 100mn transactions per day as it projects volumes of transactions to grow 4-5 fold over next 5-6 years. Mr. A.P Hota, MD & CEO, was a career central banker for 27 years before he joined NPCI in February, 2009 and took over as MD & CEO in August, 2010. Under his leadership and outlined vision, NPCI aims to touch every Indian by 2020.

Mr. A.P. Hota
Managing Director & CEO

Exhibit 4. NPCI offerings and upcoming product roll out

Product	Launched on	Description and Usage
Cheque Truncation System (CTS)	Feb-08	CTS is based on online image-based cheque clearing system where cheque images and magnetic ink character recognition (MICR) data are captured at the collecting bank branch and trasmitted electronically. Cheque Truncation System (CTS) has fully migrated in 3 grids- southern, western & northern grid from MICR centres. CTS is faster, secure, and it makes possible T+1 clearing for cheques presented anywhere in India and provides host of other benefits like operational efficiency, reliability and convenience.
National Financial Switch (NFS)	Dec-09	Taken over from RBI in 2009, National Financial Switch (NFS) is the largest network of shared automated teller machines (ATMs) in India. Switching fee is charged by the NPCI for routing ATM transactions through connectivity between banks' switches. This enables customers to use any ATM of a connected bank. 95 member banks and over 470 sub-members enable customers to transact at over 210,000 ATMs across India. A transaction done on an ATM not owned by the card issuer bank has to necessarily route through the NFS platform.
Immediate Payment Service (IMPS)	Nov-10	IMPS is an innovative real time payment service that is available 24x7. IMPS offers an instant, 24X7, interbank electronic fund transfer service through mobile phones. This facility is provided by NPCI through its existing NFS switch. As of date, 110 member banks and over 89.8mn Mobile money identifier (MMID) form the network. Currently, interbank mobile fund transfer transactions are also channelised through NEFT mechanism under RBI. However, Under NEFT, the transactions are processed and settled in batches, hence are not real time.
RuPay Cards	Mar-12	Rupay Card is the domestically developed equivalent of the Visa and MasterCard and offers full-service debit card services. It differentiates itself with cost effectiveness through large domestic processing capabilities and its growing acceptance for transaction across all major mediums. As of Oct '16, with 220mn issued cards, RuPay network had covered nearly all ATM's and 97% of all Point of Sale (PoS) terminals in India.
National Automated Clearing House(NACH)	Dec-12	NACH is a web based solution to facilitate interbank, high volume, electronic transactions which are repetitive and periodic in nature for Banks, Financial Institutions, Corporates and Government. NACH System can be used for making bulk transactions towards distribution of subsidies, dividends, interest, salary etc. and also for bulk transactions towards collection of payments pertaining to utilities, loans, investments, insurance etc. With over 900 NACH unique banks and more than 1050 credit/debit members, NACH platform manages monthly transactions of nearly `400bn
Aadhaar Enabled Payment System (AePS)	Jan-13	AePS is an easy to use, safe and secure payment platform which uses Aadhaar number & finger prints to perform basic banking transactions like balance enquiry, cash deposit, cash withdrawal and remittances through a Business Correspondent
Aadhaar Payment Bridge System (APBS)	Jan-13	APB uses Aadhaar number as a central key for electronically channelizing the Government subsidies and benefits in the Aadhaar Enabled Bank Accounts (AEBA) of the intended beneficiaries. It is being used by the Government Departments and Agencies under Direct Benefit Transfer (DBT) scheme launched by Government of India.
Bharat Bill Payment Scheme (BBPS)	To be launched soon	Bharat Bill Payment System (BBPS) will offer interoperable bill payment service to customers online as well as through a network of agents on the ground. BBPS will function as a tiered structure for operating the bill payment system in the country for repetitive payments for everyday utility services such as electricity, water, gas, telephone and Direct-to-Home (DTH)
Unified Payment Interface (UPI)	To be launched soon	Unified Payment Interface (UPI) allows USSD, smartphone, Internet banking, and other channels to be integrated onto a common layer at NPCI which uses existing systems such as IMPS, AePS, etc. to orchestrate these transactions and ensure settlement across accounts. Third party API integration (merchant sites, etc.) can "collect" payment from "an address" avoiding the need to share account details or credentials on 3rd party applications or websites

Source: NPCI, JM Financial

UPI to revolutionise e-payments

- **What is UPI?**

  UPI provides architecture and a set of standard Application Programming Interface (API) specifications to facilitate online payments. It aims to simplify and provide a single interface across all NPCI systems besides creating interoperability and superior customer experience.

- **UPI Ecosystem:** The UPI Ecosystem will be made up of three participants, a) Payment Service Providers (PSPs), b) Banks and c) NPCI. Payment service providers (PSP) are RBI regulated entities that are allowed to acquire customers and provide payment (credit/debit) services to individuals or entities. Hence all Banks and payments banks can act as PSPs. Depending on RBI's approval PPIs may also be allowed to act as PSPs. All PSPs and banks will be connected to the UPI platform which will control the flow of messages/information between the participants in a secure and timely manner. Banks may play a dual role by becoming a PSP as well as the remitter/beneficiary bank. Hence even if ICICI bank's mobile app will integrate as a PSP with the UPI, on the other end, ICICI bank will continue to act as a remitter and beneficiary bank connected to UPI in its own role.

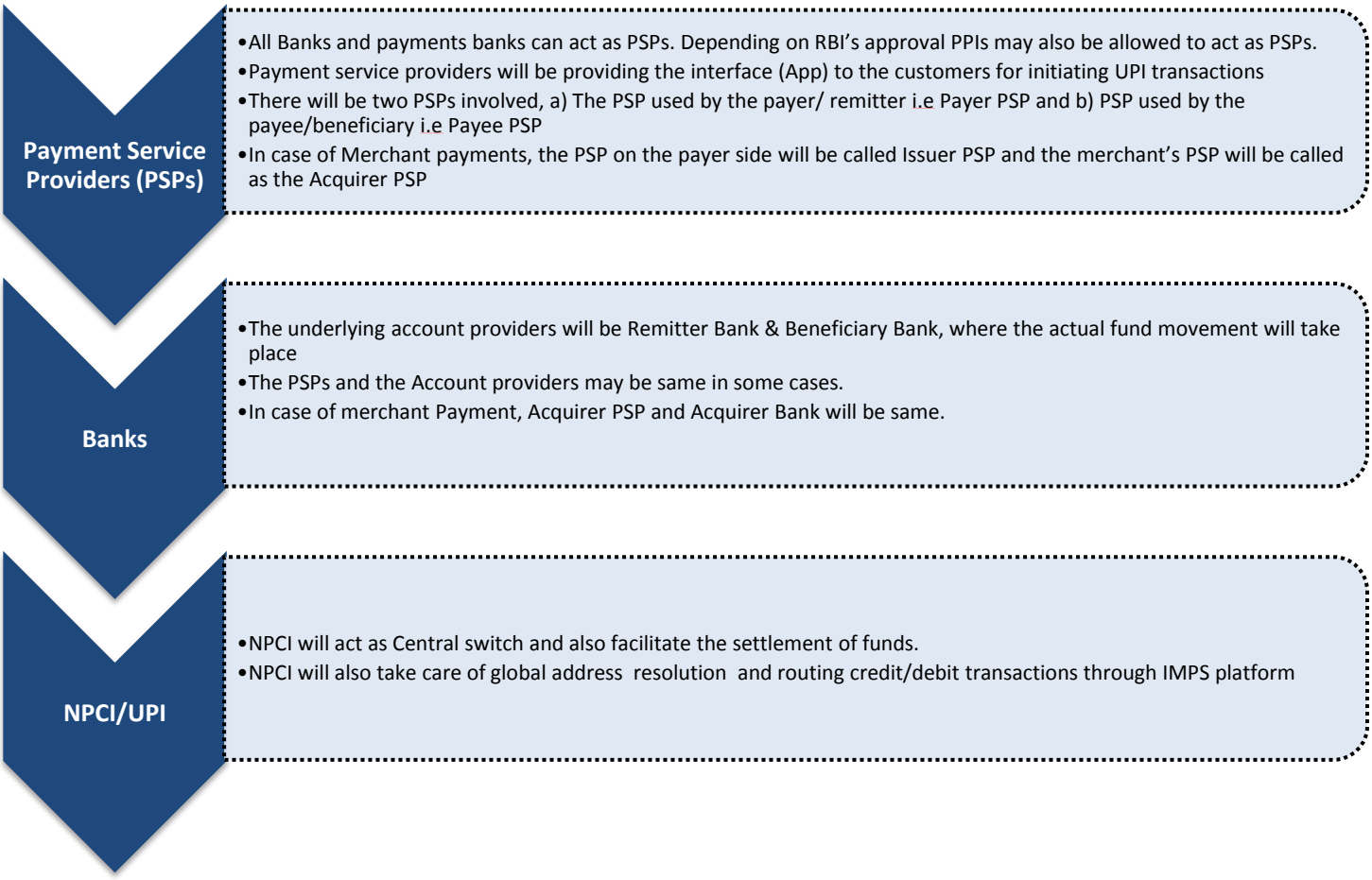


Exhibit 5. UPI - Key features

Interoperability	•As per the dictionary ,interoperability means the ability of systems to provide services to and accept services from other systems and to use the services so exchanged to enable them to operate effectively together. UPI architecture will allow interoperability across payment channels, devices, and institutions for inclusive participation. Similarly, it allows full interoperability between multiple identifiers such as Aadhaar number, mobile number, and new virtual payment addresses. Thus UPI would allow money to be transferred instantly across bank accounts / wallets in the entire system much the same way we send SMS on different mobile networks.
Easy Instant Payments	•Through UPI architecture and using IMPS (Appendix 1), transactions would be processed instantly 24x7.
Single Identifier	•Under the UPI architecture virtual payment addresses would be created. The term 'Virtual Payment Address' is used to depict an identifier that can be uniquely mapped to an individual account using a translation service. In addition to Aadhaar number and Mobile number as global identifiers (mapped by NPCI), PSPs can offer any number of virtual addresses to customers so that they can use the virtual address for making and receiving payments. It is explained in detail below.
Single Interface	• With UPI, users will be able to integrate all accounts/wallets with different banks and prepaid payment instruments (PPIs), which are regulated by RBI, in a Single mobile Application provided by PSP of their preference. This enables the user's preferred PSP App to carry out all his payment transactions across multiple accounts and thus provides a single interface for all payments.
Push & Pull Payments	•The payments can be both sender (payer) and receiver (payee) initiated and are carried out in a secure, convenient, and integrated fashion. Pay Request: A pay request is a transaction where the initiating customer is pushing funds to the intended beneficiary. Payment address include mobile number, Aadhaar number, Account number & IFSC and Virtual address. Collect Request: A Collect Request is a transaction where the customer is pulling funds from the intended remitter by using Virtual Address. Payment Address includes Virtual Address only. (Explained in detail below)
1 Click 2FA	•UPI will follow a one click 2 factor authentication. When UPI will be initiated using a mobile phone, the device fingerprint will in itself be the First factor for authentication. Device fingerprint here can mean details like IMEI number for the device or any technical details which are unique to the device and mapped with the account number of the user. Second factor will be a PIN number which will have to be keyed in. This removes the obstacles of generating an OTP or providing CVV details in card transactions in addition to PIN.
Scalable Architecture	•UPI is a next generation payment system that provides an eco-system driven scalable architecture and a set of APIs taking full advantage of mass adoption of smartphones. This allows for innovation in newer forms of identity, authentication and banking. Thus, using the same system, the need for PIN as a 2nd Factor for authentication may be replaced by Biometrics like fingerprint and Iris for an easier user experience.

Source: NPCI, JM Financial

Single Identifier A payment address would be an abstract form is a handle that can uniquely identify account details. In this architecture, all payment addresses are denoted as "account@provider" form.

Addresses can be of two types a) Global Addresses like Aadhaar Number and Mobile number which are mapped and resolved by NPCI during the transaction flow, b) Virtual Addresses provided and resolved by the Payment system providers (PSPs). Address translation may happen at provider/gateway level or at NPCI level depending on the type of address.

PSPs can offer any number of virtual addresses to customers so that they can use the virtual address for making and receiving payments. For a customer with multiple accounts across banks and Prepaid Payment Instruments (PPIs) a unique virtual address will be created for each of his account with the entities. Third party API (Application programming interface) integration at merchant sites can "collect" payment from "an address" avoiding the need to share account details or credentials on 3rd party applications or websites.

Virtual payment addresses provide innovative mechanisms for customers to create addresses with attached rules for limiting amount, time (e.g., one time use addresses), and payees which thus adds another layer of security. Further, Virtual addresses offered by the provider need not be of permanent nature. For example, a provider may offer "one time use" addresses or "amount/time limited" addresses to customers. In addition, innovative usage of virtual addresses such as "limit to specific payees" (e.g., a virtual address that is whitelisted only for transactions from IRCTC) can help increase security without sacrificing convenience. PSPs can allow their customers to create any number of virtual payment addresses and allow attaching various authorization rules to them.

Creation of a National Financial Mapper: NPCI has widened the scope of its erstwhile Aadhaar Mapper by renaming it the National Financial Mapper and including in addition to Aadhaar number, an individual's email and mobile number which will be mapped to individual bank account. National Financial Mapper will enable banks to remit money to individuals based on any one identifier including mobile number, email or Aadhaar without knowing the destination account details. Within a short period, the National Financial Mapper has grown to almost 200bn unique entries. Unified Payment Interface allows PSPs to take full advantage of this mapping and allow their users to send/receive money by just providing a destination mobile number.

At the backend, when the transaction comes to NPCI, it will translate the funds transfer instruction to the right bank and send money to the right person using the mapper. Payment service provider is expected to map the payment address to actual account details at appropriate time. Providers who provide "virtual addresses" should expose the address translation API (Application programming Interface) for converting their virtual addresses to an address that can be used by NPCI.

Exhibit 6. Example of Virtual Addresses and the responsibility for resolving them

Identifier used for transaction	Resolved by (NPCI/PSP)	Representation	Example
IFSC code and account number combination	Resolved by NPCI	account-no@ifsccode.ifsc.npci	12345@HDFC0000001.ifsc.npci
Aadhaar number	Resolved by NPCI	aadhaar-no@aadhaar.npci	234567890123@aadhaar.npci
Mobile number	Resolved by NPCI	mobile-no@mobile.npci	9800011111@mobile.npci
RuPay card number	Resolved by NPCI	card-no@rupay.npci	1234123412341234@rupay.npci
Bank itself is the PSP	Resolved by bank	account-id@bank-psp-code	12345678@icici
PPI provider issued card number (eg. wallets)	Resolved by PPI provider	ppi-card-no@ppi-psp-code	000012346789@myppi
One time or time/amount limited tokens issued by PSP	Resolved directly by that PSP	token@psp-code	ot123456@mypsp
User id provided by PSP	Resolved directly by that PSP	user-id@psp-code	joeuser@mypsp

Source: RBI, JM Financial.

Single Interface: With UPI, users will be able to integrate all accounts/wallets with different banks and prepaid payment instruments (PPIs), which are regulated by RBI, in a Single mobile Application provided by PSP of their preference. This enables the user's preferred PSP App to carry out all his payment transactions across multiple accounts and thus provides a single interface for all payments. For eg. A user who prefers the interface of Axis Bank's mobile application (App) may add his HDFC bank and ICICI bank account into that App as a payment option in the dropdown menu. While making a payment to any online merchant using Axis Bank's App, he will always have the option to provide a virtual address linked to any of his bank account. He may choose any one account based on his preference or any discounts/incentives offered to him for using that account.

Push & Pull Payment: UPI allows the user to "pay" someone (push) as well as "collect" payment from someone (pull).

Pay Request: A pay request is a transaction where the initiating customer is pushing funds to the intended beneficiary. Payment address includes mobile number, Aadhaar number, Account number & IFSC and Virtual address.

Collect Request: A Collect Request is a transaction where the customer is pulling funds from the intended remitter by using Virtual Address. Payment Address includes Virtual Address only

Collect requests can be sent to others (person to person or entity to person) with "pay by" date to allow payment requests to be "snoozed" and paid later before expiry date. UPI allows this functionality to both the Corporate & Retail customers. Banks can now offer their Corporate Clients real time Pull based solutions which has never existed in the country before. In case of a corporate, multiple use cases are possible from ECS to credit card bill collections. For eg. An E-commerce entity may initiate a pull amount request instead of collecting advance from the customer and the customer may approve the request as soon as the item is delivered.

- **Why the need for an integrated payment interface?** Current schemes do not offer any mechanism to use a single "virtual payment address" that can be used for an electronic transaction at merchant point in an interoperable way across all banks and other RBI regulated players like mWallets, mobile money. Thus, for making a payment through a digital wallet, it is currently necessary that the merchant has been onboarded by the wallet or its partner gateways which leads to the exclusion of millions of small and remote merchants from the eco-system of electronic payments. Also, there is no unified layer that makes mobile applications to seamlessly integrate with real time payment systems for offering instant money transfer across all accounts held by a consumer in different banks and digital wallets.

Exhibit 7. Limitations in current methods of instant payments and Solutions offered by UPI

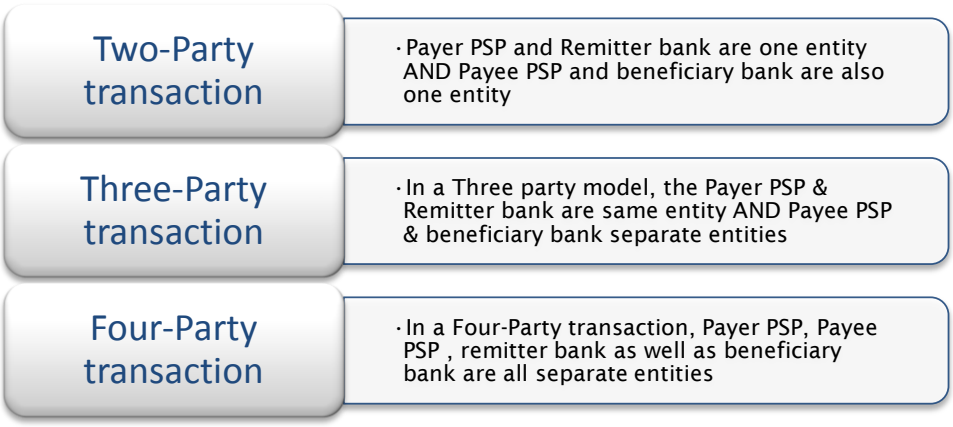
	Limitations faced by existing method of Instant Payments			Solutions offered by UPI
Characteristic	**Proximity Payments by Cards**	**On-line payments through Cards/Internet Banking**	**Immediate Payment Service (IMPS)**	**Unified Payments Interface**
Pull Based *(Initiated at merchant's point)*	PIN entry & Physical POS device required at Merchant's end	**Internet Banking:** Pull based possible, but complex process of credentials entry. User ID & Password (First Factor), Passphrase/Question/OTP (as Second Factor)	Pull based Merchant transactions are available only through the OTP route at present. OTP generation is however not standardized and impacts proliferation	Both Push & Pull based transactions are possible for both Retail & Corporate/Merchant customers. With inadequate card acceptance infrastructure penetration, this comes as a boon for the small and medium sized merchants.
		Cards: Pull based, long entry of Card Number, CVV, Expiry Date (1st Factor) & OTP as (Second Factor)	Retail Pull based transaction is not possible	
Flexibility	Limited : Only Cards can be used on POS device	Not flexible, credentials need to be captured on Issuer's end	Only Mobile & MMID based transactions are possible for Pull as now.	Payments can be done using multiple identifiers like Mobile Number, Aadhaar Number, Virtual Address etc. Request can also initiated on one interface & can be authorised on a different interface
		OTP as Second factor (Issuer initiated to customer)	Push (user initiated) can be offered in multiple ways like Mobile Number/MMID, Aadhaar Number & Account Number/IFSC combination	
Fund Transfer through Single Identifier	Cards are not used for Fund Transfers	Account & IFSC is required	Mobile Number & MMID or Account & IFSC is required for IMPS based transactions. However, Aadhaar based transactions are based on single identifier	Customer has the option to use Global Address or Virtual address. Global address like Mobile Number & Aadhaar Number will be stored at NPCI Central Mapper and mapped against relevant Account information Virtual Address will be Locally resolved by the Payment Service Provider which is also mapped to the Account details provided by the customer at the time of registration.
Mobile based Payments	Not seamless, complex interfaces & limited suppliers	Depends on the simplification of the Mobile App	Offers seamless mobile based payments	Designed for mobility & offers seamless experience
1 Click-2 Factor Authentication	Not possible as physical card is required	If card details are stored, then it is possible. But it poses a security threat as there are chances of breach of card data	Two factor authentication is mandatory	Single click two factor authentication is possible as **Device Fingerprint** (IMEI number of device etc.) will be the first factor & PIN will be the second factor of authentication
Current Market Trend	Cards will be moving to Digital Wallets	People are moving away from traditional modes to digital modes	Seamless pull based transactions need to be evolved	Designed to embrace the smartphone boom in India & the trend of customers moving to digital mobile based solutions

Source: NPCI, JM Financial

How will UPI work?

A typical collect request through UPI would originate from the Payee's PSP (Payment service provider) which can be any app he prefers and may be different from that of the bank in whose account the payee wishes to receive the credit amount. Conversely, a pay request would originate from the payer's PSP and follow a similar flow. UPI transaction can be Two, three or four party transaction based on the number of distinct entities involved at the front as well as the back-end.

Exhibit 8. UPI – Different models of UPI transactions



Source: NPCI, JM Financial

Case Study – Four Party Transaction: In the transaction below, Rajesh wants to collect an outstanding amount of ₹ 15k from Jay for a common purchase they had made earlier. (Rajesh is the Payee while Jay is the Payer)

Rajesh uses Axis Bank's Mobile App frequently and has accounts with both Axis Bank and IndusInd Bank. Rajesh wishes to collect the amount in his IndusInd Bank account and has added his IndusInd Bank account in the UPI functionality of his Axis Bank App.

Jay on the other hand, prefers using ICICI Bank's Mobile App and under its UPI functionality, has added his HDFC Bank savings account also. Jay wishes to pay Rajesh through HDFC Bank as new cashback offers are being doled out by the same. Hence he provides Rajesh with his virtual address "Jay3043@hdfc" for making payment.

The Transaction flow is as follows:

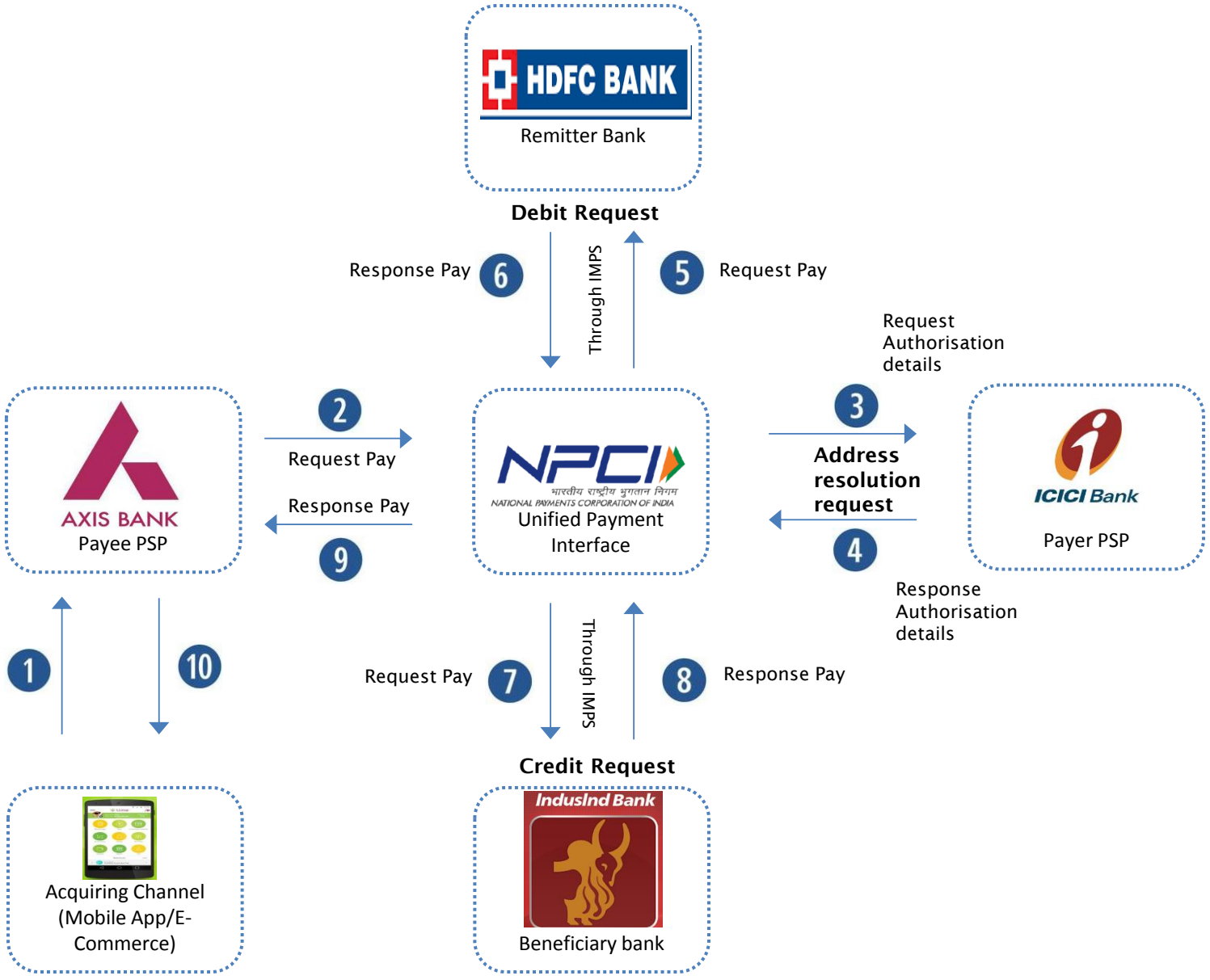
1. Rajesh sends a Collect Request through his Axis Bank App by entering the Virtual Address of the Payer customer, (in this case can be Jay3043@hdfc)
2. Payee PSP (Axis Bank in this case) sends the same to UPI
3. UPI sends it to the respective Payer PSP for address resolution and authorization. (ICICI Bank's app on Jay's Mobile)
4. Payer PSP sends a notification to the Payer customer for authorization. (In this case, Jay will receive a notification on his mobile in the ICICI bank App)
5. Customer enters the PIN & confirms the payment. Payer PSP sends the same to UPI. (In this case, After Jay enters his PIN and authorizes the transaction, ICICI bank's App will send a confirmation to UPI)
6. UPI sends the debit request to Payer bank. (HDFC Bank will receive a debit request from UPI in this case)
7. Payer bank debits the Payer's account and sends the confirmation to UPI. (Jay's HDFC account will be debited and confirmation will be sent to UPI)

8. UPI sends the credit request to the Beneficiary Bank (In this case, UPI will send the credit request to IndusInd Bank)

9. Beneficiary bank credits the customer's account and confirms the same to UPI. (Here, IndusInd will credit Rajesh's account and confirm to UPI)

10. UPI sends the successful confirmation to the Payee PSP and Payee PSP sends the confirmation to the customer (Rajesh will see a confirmation of amount credited to his IndusInd account in his Axis Bank App).

Exhibit 9. Example of a collect request transaction through UPI

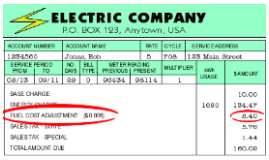


Source: NPCI, JM Financial.

Similarly, in case of a 'Pay request', the payer will initiate the transaction and UPI will play the same role of confirmation and authorisation between payer, payee, remitter bank and beneficiary bank. There is also a possibility that both payer and payee are using the same Payment service provider (PSP) in which case, the transaction will be a two party transaction instead of four. Thus, UPI transactions can be two, three or four party transactions depending on number of PSPs involved for executing the different legs of a transaction.

- **Suggested Use cases of UPI:** While UPI can be used for any value exchange between any-to-any (people, entity), some suggested use cases have been provided below. UPI can totally change the Micro-payment landscape in the country and push electronic payments to small merchants in remote corners. While premature to conclude today, with growing mobile usage and increasing smartphone penetration, UPI may bring down cash usage in overall economy by meaningful proportions.

Exhibit 10. UPI: Suggested use cases of UPI

Payment at physical stores/ merchants for products & services	• Vegetable/ Milk/ Newspaper Vendor • Grocery stores • Malls • Taxi/ Auto/ Bus/ Train/ Air fares • Restaurants/ Shops/ Petrol pumps • Fee payment to various educational institutes • Toll plaza payments • Trust/ Temple relief fund/ NGO donation	  
Utility payments	• Electricity/ Water/ Telephone/ Credit card bills • Apartment maintenance fee • Instalment of loans, e.g., Car loan EMI • Insurance premium	 
Payment to online merchants/ E-commerce	• Cash on delivery payments • In-App payments • Online trading • Mobile recharge from newspaper advertisement using 'Scan N Pay' • Ecommerce (Collection/Pull)-Payment through UPI after Checkout • Booking movie tickets	 
Peer to Peer	• Remittance (both push & pull) • Payment to person/ friends • Sharing of bills with friends • Salary payment to driver • Aadhaar/ mobile number based inward remittance to another bank account	

Source: NPCI, JM Financial

- **Examples of day-to-day operation of UPI:** As UPI reduces the time and efforts to transact alongwith adequate security procedures, e-payments will receive another push over cash in the near future. Some use cases of UPI can be,

1. Ram, a migrant worker living in Mumbai gets an account created in State Bank of India using paperless Aadhaar e-KYC option. He also provided his mobile phone during application. He adds his wife's Aadhaar number (who has an Aadhaar linked account with Allahabad bank) to his address book. No other information such as IFSC code, etc. is required to be stored for his wife. On the mobile application of his low cost Android phone, using a single click on his address book entry of his wife, he enters an amount and clicks 'send'.

2. Jaspreet has an account with a wallet provider Oxigen (PSP). He regularly books MyCab. As part of his profile with MyCab booking application, he has provided his payment address "jasprt007@Oxigen". He uses Oxigen mobile application and authorizes the cab company payee address (MyCab@bank1) to auto charge him within ₹1000. Now, every time he travels, he simply walks out of the cab and MyCab can charge Jaspreet automatically within the set limit. Both Jaspreet and MyCab can be on separate PSP networks and still transact conveniently.

3. Collect pay mechanism has enabled Sita's phone company and insurance company to send her the bill/premium collection request in an automated fashion to her virtual address registered with her bank's mobile application. With UPI having the ability to specify the "pay by" date, these companies can send these bills several days ahead of time to Sita and allow her to pay any time within the request expiry period. Her mobile phone sets reminders and allows her to pay these on time via a simple 1-click interface. When ECS like auto authorizations are used, above can be further simplified by providing a time limited (say, for 12 months) and amount limited (say, less than a particular amount) electronic mandate with PSP. In such cases, customers can be provided with the convenience of one time authorization instead of authorizing every time.

4. Abdul wants to buy train ticket from Mumbai to Delhi using his IRCTC account online. He had used his PSP application to create a new virtual address abdul2015.irctc@mypsp. Since this is just a virtual address (merchant bound and amount limited), no one else can use it to collect money from him. He logs into IRCTC and enter the travel details. With a single click buy (without entering any card or other details and no redirections on web pages), IRCTC initiates collect pay to NPCI via their PSP. Abdul enters his bank authentication credentials on his mobile device and does a single click authorization. On successful response of debit request by Abdul's bank, NPCI sends credit request to IRCTCs bank account (which was part of collect request) and ticket gets issued.

5. Sita places an order with Urbanladder for a leather sofa that costs ₹40000/-. Since it is custom made furniture, Urbanladder allows her to pay 70% as advance during order and remaining 30% on delivery. During checkout, she chooses "Collect Pay" option and provides her virtual address (sita.1234@yesbank) provided by her PSP, Yes Bank, to make advance payment. When this transaction gets settled, myCartDeal confirms the order. Once the furniture is ready, myCartDeal creates a new collect request with remaining amount (₹12000/-) with a "pay by" date and send it to Sita's PSP. Sita snoozes the request and leaves it in her mobile application's inbox since it needs to be paid only after delivery. Once the furniture is delivered, Sita clicks on her inbox item (second pending collect request) and authorizes the payment for ₹12000/-.

- **UPI to benefit the payments eco-system in multiple ways:** As costly acceptance infrastructure is preventing electronic payments penetration, UPI offers a cost-effective issuance and acceptance infrastructure for any merchant payment using a basic smartphone. UPI's system-wide benefits are:
  - Simplified Issuance Infrastructure: One can specify the beneficiary details in the form of A/C Number, Mobile Number, Aadhaar Number & also Virtual address depending on the privacy concerns of the customer. Mobile phone is used for authorization.
  - Simplified Acquiring Infrastructure: With India having nearly a billion phones and 150mn smartphones (expected to beat 500mn in next 4-5 years), massive scale can be achieved if effective use of mobile is made compared to creating costly physical acquiring infrastructure.
  - Drive Innovation: Innovations such as reminders, using multiple accounts via single mobile applications, using special purpose virtual addresses etc. allow users to enjoy superior User Experience. UPI allows current and new participants to innovate without the risk of isolation from existing eco-system. By providing a common platform, UPI will ensure that PSPs who focus on innovation will emerge as winners in the long run.
  - 1-click2 FA Transactions: Since mobile number is bound to the device, the mobile phone itself becomes the first factor of authentication and M-Pin/Biometric is used for second factor authentication.
  - Creating National Interoperability: Proactively creating this unified interoperable interface allows all players to innovate and provide superior customer experience and still provide a secure, standard based, interoperable payment scheme.
  - Transparency in economy - UPI can be an effective tool for GOI and RBI in pushing electronic payments by incentivizing its use and penalizing the excess use of cash. UPI will thereby help to improve transparency in the economy and reduce the high operational cost of cash to the system.

In addition, UPI will benefit the system participants by opening up opportunities to innovate on new customer offerings and ability to address and attract users across the system irrespective of their relationship with any bank. Further, it will be an advantage for small-scale banks that don't have the necessary infrastructure to set up their own digital products

Benefits of UPI

Banks

- Simplified (Single click 2FA)
- Universal App for Payments
- Leveraging existing infrastructure
- Security
- Payments basis Single/Unique identifier
- Opportunity to tap C2B segment
- Opportunity to tap E-Commerce & M-Commerce

Merchants

- Seamless fund collection from customers using Virtual Address
- No Risk of storing customer's virtual address like in cards
- Can tap customers not having credit/debit cards
- Suitable for e-commerce and m-commerce
- Single click 2FA facility to the customer leading to seamless Pull
- In-app payments (IAP)

End Users

- Increased privacy as customer will not have to reveal their personal details like Mobile number/Account number. Funds can be transferred with just the virtual address.
- Using Pull request, cash can be replaced in many cases such as Bill split sharing/cash on delivery etc.
- Single click 2FA makes it easy to transact by just entering M-PIN
- Pull request can be generated both in Web interface (Desktop) and mobile interface (App)
- Payments can be done by providing only one identifier like Mobile number / Aadhaar number / Virtual address.

- **Set-up process and transaction flow for UPI:** After a one time setup of user profile and a virtual payment address, Customer can add any number of accounts in a single app from among the member Payment service providers. Once bank accounts are added and a security PIN is generated, customer can freely make payments from any of the accounts irrespective of the App being used for making the payment.

Step 1: Download any PSP App and create a Profile

- Customer discovers the PSP application on the platform specific App Store
- Customer downloads the PSP application. Application has NPCI libraries embedded into it. Customer starts the configuration process
- Customer specifies his mobile number
- PSP server sends an SMS to the mobile phone to strongly bind the device. (PSP Objective is to verify the mobile number of the customer). The SMS may be read automatically or entered manually in the application depending on the OS capability
- PSP authorizes the mobile phone basis the SMS. (The user now creates a 'profile' with the PSP and Selects a user name / Virtual Address
- Customer selects password / other unlocking mechanism for the application. The PSP must provide the option for "Change Password" and "Forgot Password" option in the app
- Customer adds in any other information that his PSP may require to complete the process

Step 2: Adding Bank Account

- The customer logs in to the PSP application & selects the option -"Add a Bank"
- The customer specifies / selects the bank name with whom he is having the account with (This could be done through a drop down of the banks certified on UPI & available in the PSP app)
- Mobile number is used implicitly basis the profile created
- An OTP request is initiated by the PSP app to the Issuer through UPI
- The app automatically reads the OTP or the customer enters it manually. It is once again verified with the Issuer through UPI
- When it is verified, the Issuer Bank sends the full details of the accounts including Account Number & IFSC registered for that mobile Number to UPI. The bank may also send Virtual value if it does not wishes to share the account number with third party PSP
- Customer selects the Account Number & IFSC which he wants to authorize for addition to the PSP application. Customer may be shown the masked data instead of full details
- The PSP app asks the user to enter the PIN to authorize
- The PSP stores the account details received by the Issuer Bank in its database which will be mapped against the customer's profile, Virtual Address, Mobile Number, Aadhaar Number etc.
- If the user has not setup PIN, they can request PIN to be setup during the account adding process. The user requests PIN to be setup for the account

Step 3: Generate PIN for transactions

- The customer logs in to the PSP application and selects the option to "Generate PIN"
- An OTP Request is generated by the PSP to UPI for the newly added account. UPI requests an OTP to the Issuer Bank on the basis of the account details entered by the customer
- The customer is asked to enter the last 6 digits of Debit card number, expiry date and the OTP (which is received by the customer)
- The PSP app, using the NPCI utility captures the last 6 digits of Debit card, Expiry Date & the OTP
- The issuing bank will only allow the PIN to be set after validating both factors -Card details / OTP
- The customer enters the requested PIN (using the NPCI helper application) (Perhaps, enters it twice to confirm)
- The PSP application sends it to the UPI and UPI sends it to Issuer bank by encrypting it with the public key using PKI
- The bank completes the request by decrypting the same with its Private Key and confirms the setting of the PIN

Appendix 1.

Immediate Payment Service (IMPS)

IMPS is real-time remittance service available anytime, anywhere across India. Using IMPS customers can transfer money real-time to any person or to a merchant, for any personal or commercial purpose.

Its instant interbank fund transfer capability is one of the key features driving exponential growth in the transactions through the platform. From mere 9,000 transactions supported by 18 banks in 2010, IMPS has grown to 19.41mn transactions in the month of October, 2015, with 173 enabled members.

IMPS can be used to transfer money through any of the below mentioned channels

- Mobile using SMS or the mobile banking app,
- Internet banking or
- ATM across any bank in India.

Payer can use payee's a) mobile number & Mobile Money Identifier (MMID), or b) account number & IFS code, or c) Aadhaar number, to transfer funds.

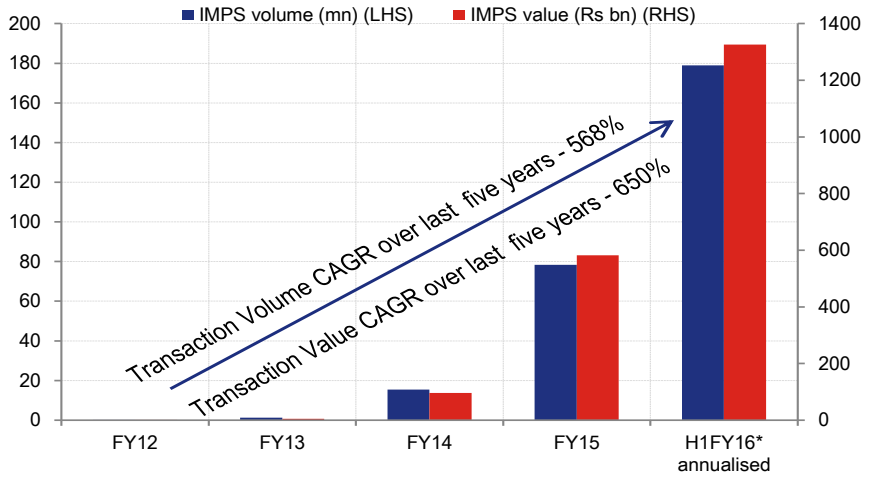
What is Mobile Money Identifier (MMID)?

Mobile Money Identifier (MMID) is a 7 digit number issued by bank linked to a unique account and mobile number. In order to receive MMID on an account, customer is required to register his mobile number with his respective bank and register for MMID linked to that mobile number. For an individual with more than one banking relationships, multiple MMIDs can be linked to same mobile number.

A multichannel and multidimensional platform, IMPS provides financial as well as non-financial services. Merchant payments and remittances come under the gamut of financial services. Under non-financial services, IMPS is enabled with query service linked to Aadhaar mapper on NUUP platform which basically helps to link Aadhaar number to different bank accounts.

Even UPI makes use of IMPS platform to send a debit request to remitter's bank and a credit request to beneficiary's bank.

Exhibit 11. IMPS: Trends in volume and value of transactions



Source: RBI, JM Financial

IMPS achieved milestone of crossing 100mn transactions for FY16 in the month of October

APPENDIX I

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(Formerly known as JM Financial Institutional Securities Private Limited)

Corporate Identity Number: U65192MH1995PLC092522
Member of BSE Ltd. and National Stock Exchange of India Ltd. and MCX Stock Exchange Ltd.
SEBI Registration Nos.: BSE - INZ010012532, NSE - INZ230012536 and MCX-SX - INZ260012539
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Compliance Officer: Mr. Sunny Shah | Tel: +91 22 6630 3383 | Email: sunny.shah@jmfl.com

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Buy	Total expected returns of more than 15%. Total expected return includes dividend yields.
Hold	Price expected to move in the range of 10% downside to 15% upside from the current market price.
Sell	Price expected to move downwards by more than 10%

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