

World Bank Fast Payments Toolkit

Case Study: India

IMPS | 2010

UPI | 2016

Payment Instruments



Credit
Transfer



Direct Debit



e-Wallets

Use Cases / Services



Merchant
Payment



Bulk/Batch
Payment



Bill
Payment



Request to
pay



Foreign Inward
Remittances



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Glossary of terms

S. No.	Term	Definition
1	GDP	Gross Domestic Product at current price
2	Income Category	Classification as per World Bank based on Gross National Income (GNI) per capita
3	CPMI	Committee on Payments and Market Infrastructure
4	FPS	As per CPMI, fast payment System is defined as payments in which the transmission of the payment message and the availability of final funds to the payee occur in real time or near-real time and on as near to a 24-hour and 7-day (24/7) basis as possible
5	Oversight	Regulating or governing body supervising the payments system
6	Operator	Institutions responsible for the operation of the payment system
7	Alias	Alternative to bank account numbers for increased convenience of the customer. For e.g., mobile number, national identification number
8	Access Channels	Modes used by customer to initiate transaction on FPS. For e.g., branch, internet, mobile
9	Individual Payment Type	Person to person (P2P) – Payment between individuals for non-business purposes
10	Business Payment Type	Person to Business (P2B) – Payment from an individual to a business entity Business to Person (B2P) – Payment from a business entity to an individual Business to Business (B2B) – Payment between two business entities
11	Government Payment Type	Person/Business to Government (P/B2G) – Payment from person/Business to a government institution Government to Person/Business (G2P/B) – Payment from government institution to a person or business entity
12	Credit transfers	Credit transfers are payment instruments based on payment orders or possibly sequences of payment orders made for the purpose of placing funds at the disposal of the payee
13	Direct Debits	Direct debits are payment instruments in which the transaction is pre-authorized, and funds are blocked in account for a debit to be initiated at a future date. In direct debits, payer's account is debited on execution of mandate by merchant or payee
14	E-money	E-money is a prepaid value stored electronically, which represents a liability of the e-money issuer (a bank, an e-money institution or any other entity authorized or allowed to issue e-money in the local jurisdiction) and which is denominated in a currency backed by an authority

Abbreviations

S.No.	Term	Expanded form
1	AML	Anti-money Laundering
2	BHIM	Bharat Interface for Money
3	BPSS	Board for Regulation and Supervision of Payment and Settlement Systems
4	CDD	Customer Due Diligence
5	CFT	Combating of Financing of Terrorism
6	CCIL	Clearing Corporation of India Limited
7	ERM	Enterprise Risk Management
8	IMPS	Immediate Payment Service
9	NEFT	National Electronic Funds Transfer
10	NFS	National Financial Switch
11	NPCI	National Payments Corporation of India
12	PFMI	Principles of Financial Market Infrastructure
13	PSS	Payment & Settlement Systems
14	RBI	Reserve Bank of India
15	RTGS	Real time Gross Settlement
16	SGF	Settlement Guarantee Fund
17	TPAP	Third Party Application Provider
18	UPI	Unified Payments Interface

Select parameters



GDP

GDP – \$2.875 trillion



Income Category

Lower middle



Population

1.366 billion



Access to mobile phone*

68.52%



Access to internet*

14.13%



Bank account*

79.87%



Branches per 1,00,000 adult

14.72



Made or received digital payment in last 1 year*

28.69%



Received government wages or transfer in account*

13.06%

Source : World Bank – 2019, Income Category: World Bank – June 2019

Currency Exchange Rate USD 1 = INR 70.42 <2018 Average, World Bank>

Others – World Bank 2017

* For age >15 years

How to read this report

- This **deep dive report** relates to **IMPS** and **UPI** systems in **India**
- It has been developed based on **primary interviews** with key stakeholders such as **regulators, operators** and **participants** in the system as well as by leveraging **secondary sources**
- Key secondary sources include RBI website, NPCI website, and guidelines published by NPCI
- The table below presents a legend to assist readers as they navigate through different sections of the report

Legend



The first slide of every section includes a chapter summary to provide readers with an overview of the section contents



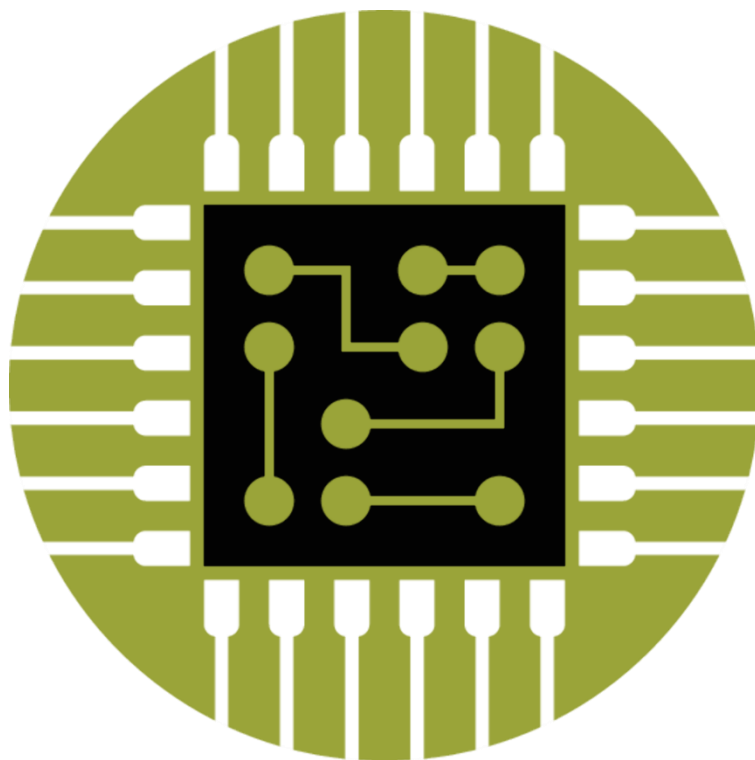
The green box with the adjacent icon indicates **section/sub-section summary across** the report. Reader may choose to read through this for a **high level overview on the selected topic**

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A. Executive Summary

IMPS and UPI | India FPS



- Immediate Payment Service (IMPS), launched by National Payments Corporation of India (NPCI) in 2010, is a **real-time** inter-bank payment system that is available **24*7*365**
- RBI's evolving focus over the years led to creation of enabling peripheral ecosystem, followed by launch of IMPS, moving onto creating a vision for 'less-cash' India through higher accessibility and a unified interface
- UPI is a **24*7*365 real-time** fund transfer system that links multiple bank accounts into a single mobile application, facilitates fund routing & merchant payments, and enables use of virtual addresses
- IMPS was developed over a period of 6-7 months whereas UPI was developed over a period of approximately 9 months

Key features of IMPS are

- Both banks & non-banks allowed as participants
- Deferred Net settlement
- ISO 8583 messaging format
- Agent network supported

Key features of UPI are

- Customers can initiate transfers from any PSP
- Deferred Net settlement
- XML messaging format
- Third party applications allowed

- Both IMPS and UPI support **individual, business** and **government** transactions. Additionally, UPI also supports non-financial transactions such as balance enquires
- IMPS and UPI support **numerous channels and use cases** they support which improves customer stickiness and convenience because customers don't need to shift to alternative platforms for payments often

B. Detailed Report

1. Overview

Chapter sections:

- 1.1. Background
- 1.2. Objectives
- 1.3. System Development
- 1.4. Key Timelines



Chapter Summary:

- There were two main electronic payment systems i.e., RTGS and National Electronic Funds Transfer (NEFT) – batch mode processing system - which were operated by the Reserve Bank of India (RBI) prior to the launch of IMPS
- RBI focused through the mid-2000 to develop a peripheral sound and secure ecosystem for electronic payment systems, especially through a defined **legal and regulatory** framework
- Having the legal and regulatory framework in place for the payment systems, **a separate umbrella entity for retail payment system operations** was proposed by the RBI in order to bring uniformity in structure and payment operations, ensure improved information dissemination by consolidation, and foster innovation. It was also aimed at enabling RBI to focus on settlement services for clearing systems, besides being the regulator and supervisor. Hence, the **National Payments Corporation of India (NPCI)** was incorporated under the guidance of RBI and the Indian Banks' Association
- By the time the above measures were implemented, adoption of smartphones had started to increase. Hence, need **to leverage mobile as a platform for payments along with facilitating real-time 24*7*365 payment service** was observed. With this vision, RBI handed over the development and operations responsibility to NPCI. NPCI launched the system in 2010 with the support of a vendor, Euronet, for system development. The system was developed in ~6-7 months
- IMPS **faced challenges initially** because of complexity, especially with Mobile Money Identifier (MMID) which had to be used for performing transactions, and also because of apprehensions about mobile being a secure payment channel by the users. The MMID issue was eventually resolved
- By 2015, there was a surge in the mobile banking solutions and penetration of smartphones had also picked up by then. With this background, RBI and NPCI **envisioned to launch a solution aimed at customer convenience by providing a standard interface** for communication across different mobile banking applications of banks, thus facilitating interoperability. This was also in line with the RBI vision at that point which included aspects of acceptability, interoperability and customer convenience
- Towards this end, NPCI launched **Unified Payments Interface (UPI)**, a **24*7*365 real-time** fund transfer system, in 2016. The system was developed with the support of a vendor, RS Software, and took ~9 months for development

1.1. Background



- RBI’s evolving focus over the years led to creation of enabling peripheral ecosystem for the launch of IMPS and UPI
- IMPS was a result of the RBI’s vision to launch a mobile-first platform that is available 24*7*365 for real-time fund transfer
- With the basic infrastructure in place, RBI’s focus increased towards interoperability and convenience. Towards this end, an interoperable real-time 24*7*365 mobile payment system, UPI, was launched by NPCI in 2016 that promoted convenient payments through easy-to-remember aliases

Immediate Payment Service (IMPS), launched by National Payments Corporation of India (NPCI) in 2010, is a **real-time** inter-bank payment system that is available **24*7*365**. Prior to IMPS, there were two primary electronic payment systems i.e., RTGS for large-value interbank transfers and NEFT for batch fund transfers. IMPS was a result of the Reserve Bank of India’s (RBI’s) vision to launch a mobile-first platform that is available 24*7*365 for real-time fund transfer. The system was extended to other channels as well over the years

During the initial years, growth of IMPS was inhibited owing to a cumbersome registration and transaction process. With the basic infrastructure in place by early 2010s, focus was increased towards acceptability, interoperability and customer convenience. The penetration of smartphones had also increased by 2015. These factors also contributed to the conceptualization of Unified Payments Interface (UPI) which was launched by NPCI in 2016

UPI is a **24*7*365 real-time** fund transfer system that links multiple bank accounts into a single mobile application, facilitates fund routing & merchant payments, and enables use of virtual addresses

RBI’s evolving focus over the years led to creation of enabling peripheral ecosystem, followed by launch of IMPS, moving onto creating a vision for ‘less-cash’ India through higher accessibility and a unified interface

Vision 2005-08		Vision 2009-12		Vision 2012-15		Vision 2016-18		
Safety, Security, Soundness and Efficiency		Safety, Security, Soundness, Efficiency, Accessibility and Authorization		Accessibility, Availability, Awareness, Acceptability, Affordability, Assurance and Appropriateness		Coverage, Convenience, Confidence, Convergence and Cost		
Related Key Measures	Proposed legal framework for payment and settlement systems	Separate entity for Retail Payment Systems Operations to bring uniformity in structure & operations, and foster innovation	Authorization of System Operators	Considered need to extend NEFT availability or to develop a new system for 24*7*365 payments	Rationalize guidelines for enhanced accessibility (esp. PPIs, KYC, etc.)	Encourage standardization and interoperability	Encourage further adoption of mobile banking	Promoting convergence through UPI as interoperability, especially for merchant payment recognized as an issue
	Payment & Settlement Systems (PSS) Act, 2007 enacted	NPCI incorporated in 2008	NPCI authorized as payment system operator in 2009	NPCI tasked on 24*7*365 electronic payment system (IMPS)	Inclusion of PPIs in IMPS	NPCI worked onto launch of UPI		
Outcomes								

Source: NPCI | RBI
 Vision is in reference to Payments & Settlement Systems Vision of RBI

Above mentioned measures & outcomes are not exhaustive & are the ones which are significant from FPS perspective

1.2. Objectives



- The overarching objective of IMPS and UPI has been facilitation of financial inclusion and promotion of digital payments
- A key objective of IMPS in 2010 was need for a 24*7*365 system and to explore mobile as a payments channel as smartphones were beginning to become mainstream
- UPI's objective was primarily to build a standard interface which would enable greater penetration and usage of electronic payments through enhanced interoperability and customer experience

RTGS ••• NEFT

- Real-Time Gross Settlement (RTGS) System for high-value interbank fund transfer
- National Electronic Fund Transfer System (NEFT) – a non-real time batch transfer system (not 24*7*365 at the time of IMPS launch); complements IMPS as it is now 24*7*365 available and can act as a backup for IMPS and vice versa in case of any operational issues
- NEFT has morphed into a hybrid system - as it larger than typical low value and lower than typical higher value. NEFT is seen as a back-up for RTGS



Objectives



To build a **robust and cost effective real-time retail payment service available round-the clock** (also on holidays)



To **facilitate financial inclusion** process and to provide banking services to even the last mile customer



To **sub-serve the goal of RBI** in electronification of retail payments



To provide a **channel independent** access mechanism



To build an **interoperable fund transfer service** involving various stakeholders such as banks and non-banks (PPIs)



Objectives



Aimed at **customer convenience by providing a standard interface** for communication across different mobile banking applications of banks thus **facilitating interoperability**

Key enhanced features launched through UPI

Ease of customer registration

Simplified payment initiation through UPI ID

Unified interface and interoperability

Customizable as per application requirements

1-click 2-factor authentication

Facilitates collect requests

1.3. System Development



- Taking RBI's guidance forward, NPCI developed IMPS with the support of Euronet within 6-7 months and launched it in 2010
- NPCI developed UPI specifications and partnered with an external vendor RS Software for system development. The system was developed within approximately 9 months and was launched in 2016
- There was participation from member banks and other ecosystem participants for inputs and validation during the development phase



Infrastructure Setup and Development Process

- IMPS was built as a new system because:
 - NEFT was not a real-time 24*7 platform. Hence, liquidity management issues had to be resolved apart from technological changes
 - Moreover, technology had advanced over a period and the solution was being envisaged as a mobile-first platform. Hence, NPCI was given the mandate by RBI to develop a new system with focus on innovation
- When IMPS was launched, it was based on the existing National Financial Switch (switch for ATM transactions) operated by NPCI. Gradually, IMPS operations were shifted to its own switch (called Bharat switch)
- NPCI had appointed a vendor (Euronet) for development. NPCI had already partnered with Euronet for the National Financial Switch
- IMPS was custom-built by Euronet for NPCI
- Banks, being shareholders in NPCI, were involved during the development phase. Non-bank participation was less at the time of development since initially the system did not allow non-bank participation

Implementation Timelines

Development Timeline

IMPS was developed over a period of 6-7 months



Infrastructure Setup and Development Process

- As mobile phones became more prevalent, UPI system was conceived. UPI offers an architecture framework and a set of standard API specifications to facilitate online payments. It aims to simplify and provide a single interface across various NPCI systems, thereby creating interoperability and superior customer experience
- Design and specifications were written in house by NPCI and an external vendor, RS Software, was selected for development
- NPCI had issued Request for Proposal (RFP) and RS Software was appointed through this process
- UPI was custom-built by RS Software for NPCI
- There was participation from member banks and other ecosystem participants for inputs and validation during the development phase. Apart from ecosystem participants, lot of international experience of faster payments was drawn from countries such as UK and Australia prior to the development phase
- Prior to rollout, NPCI conducted a pilot launch with 21 member banks

Implementation Timelines

Development Timeline

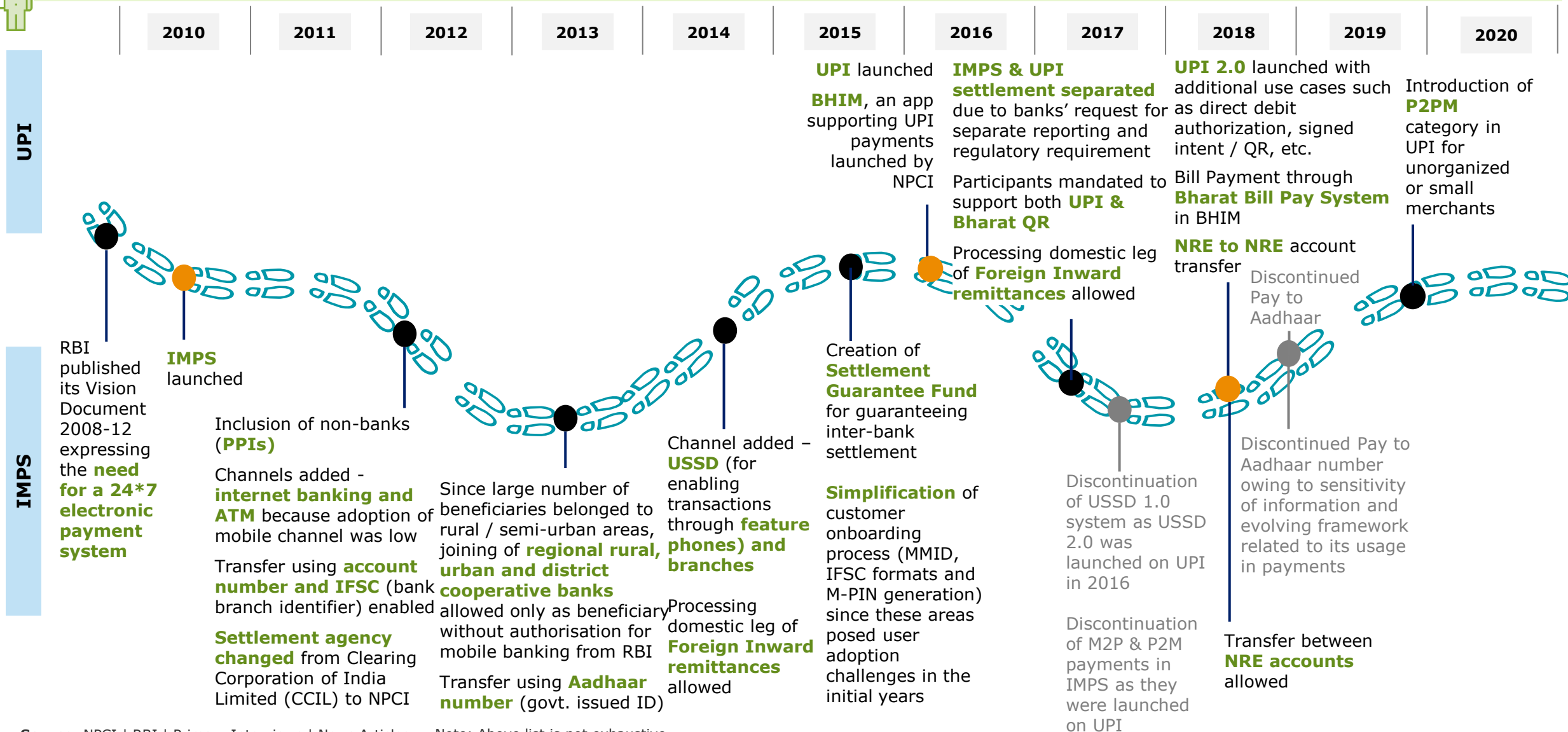
UPI was developed over a period of approximately 9 months

Source: NPCI | Primary Interviews | Cook, William, and Anand Raman. 2019. "National Payments Corporation of India and the Remaking of Payments in India." Working Paper. Washington, D.C.: CGAP. This is an adaptation of an original work by CGAP/World Bank.

1.4. Key Milestones



There have been series of enhancements and innovations in IMPS and UPI in order to enhance customer experience



Source: NPCI | RBI | Primary Interviews | News Articles

Note: Above list is not exhaustive

2. Business and Operating Model

Chapter sections:

- 2.1. FPS Structure
- 2.2. Participants
- 2.3. Payment Instruments and Transaction Types
- 2.4. Aliases, Access Channels & Agent Networks
- 2.5 Scheme Pricing and Fee Structure
- 2.6 Use Cases



Source: NPCI | RBI | Primary Interviews

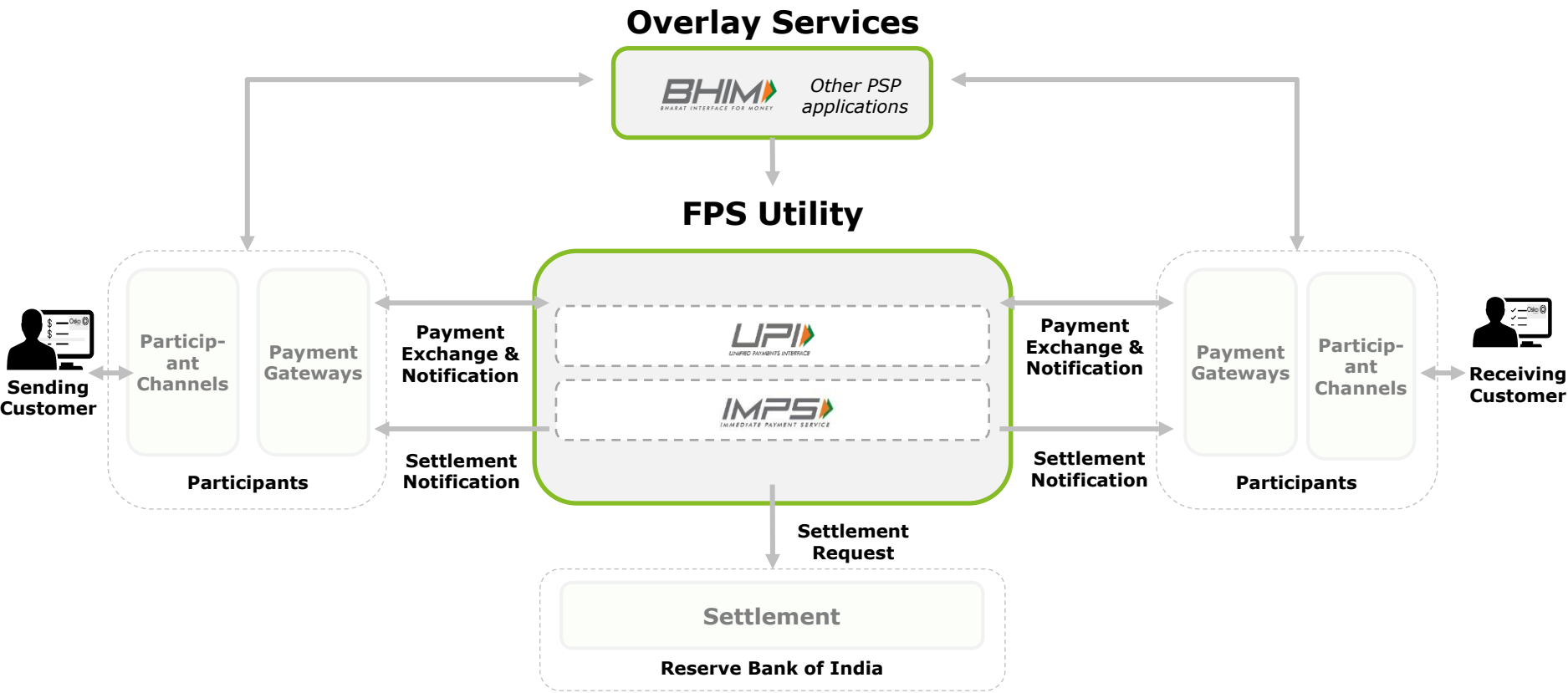
Chapter Summary:

- **NPCI** is the **owner and operator** of IMPS and UPI. **Banks and non-banks (PPIs)** are allowed to directly participate in however membership and settlement is via a sponsor bank in case of PPIs. UPI also allows 3rd party application providers to participate by connecting to banks which facilitated a foray of fintechs into the payment system who brought greater technological know-how and better customer experience. Moreover, UPI facilitated complete interoperability in terms of a customer being able to initiate a transaction from any UPI app (irrespective of the bank where the customer holds an account) by differentiating the role of banks as payment service providers and one for fulfilling the banking function of debiting/crediting the account
- There have been significant learnings from IMPS and UPI from a channel perspective. Starting from a mobile-based channel in 2010 which impeded the growth of IMPS to leveraging the same mobile channel for success of UPI in 2016 re-emphasized the importance of matching the system features with the readiness of the market for its acceptability. It also highlighted the importance of early course correction which was seen in the case of IMPS when it was expanded to other channels, eventually leading to the desired growth levels. **Multiplicity of channel** availability by combining IMPS and UPI (from smartphone to feature phone to web-based) increased the reach, especially in a diverse customer segment market. Proximity based channels in UPI also helped to onboard offline brick and mortar merchants in the realm of digital payments
- IMPS supports transactions through **agent network**. Agents (business correspondents and PPIs) proved to be a convenient alternative to formal bank branches and increased the reach amongst the digitally excluded segment
- IMPS supports mobile number and MMID as an alias, whereas UPI additionally supports UPI ID (virtual address). A key takeaway has been that **aliases are effective if simple, easy to remember and convenient to generate**
- Transaction user **charges for users depend on banks / PPIs**. There have been interventions by NPCI and government from time to time for matters such as prohibition of surcharge (w.r.t other debit payment modes) to customers by TPAPs, merchants, etc. for opting UPI payments. Inter-participant charges such as interchange fee, PSP fee, etc. are determined by IMPS/UPI steering committees
- A success factor of IMPS and UPI have been the **numerous use cases** they support which improves customer stickiness and convenience because customers don't need to shift to alternative platforms for payments often. . Moreover, a key takeaway from the journey in India has been that apart from the time of launch, it is also essential to keep innovating and **continuously enhancing** the system to support more use cases or to improve the features of existing use cases over the years to ensure sustainability of the system

2.1. FPS Structure



- The IMPS and UPI infrastructure is owned and operated by NPCI
- NPCI also provides clearing services and acts as a settlement agency
- Settlement takes place in RBI's RTGS system



The IMPS and UPI infrastructure is owned and operated by the NPCI. NPCI also provides clearing services and acts as a settlement agency that arranges the necessary interbank settlement of credits and debits to the banks' respective current accounts with RBI

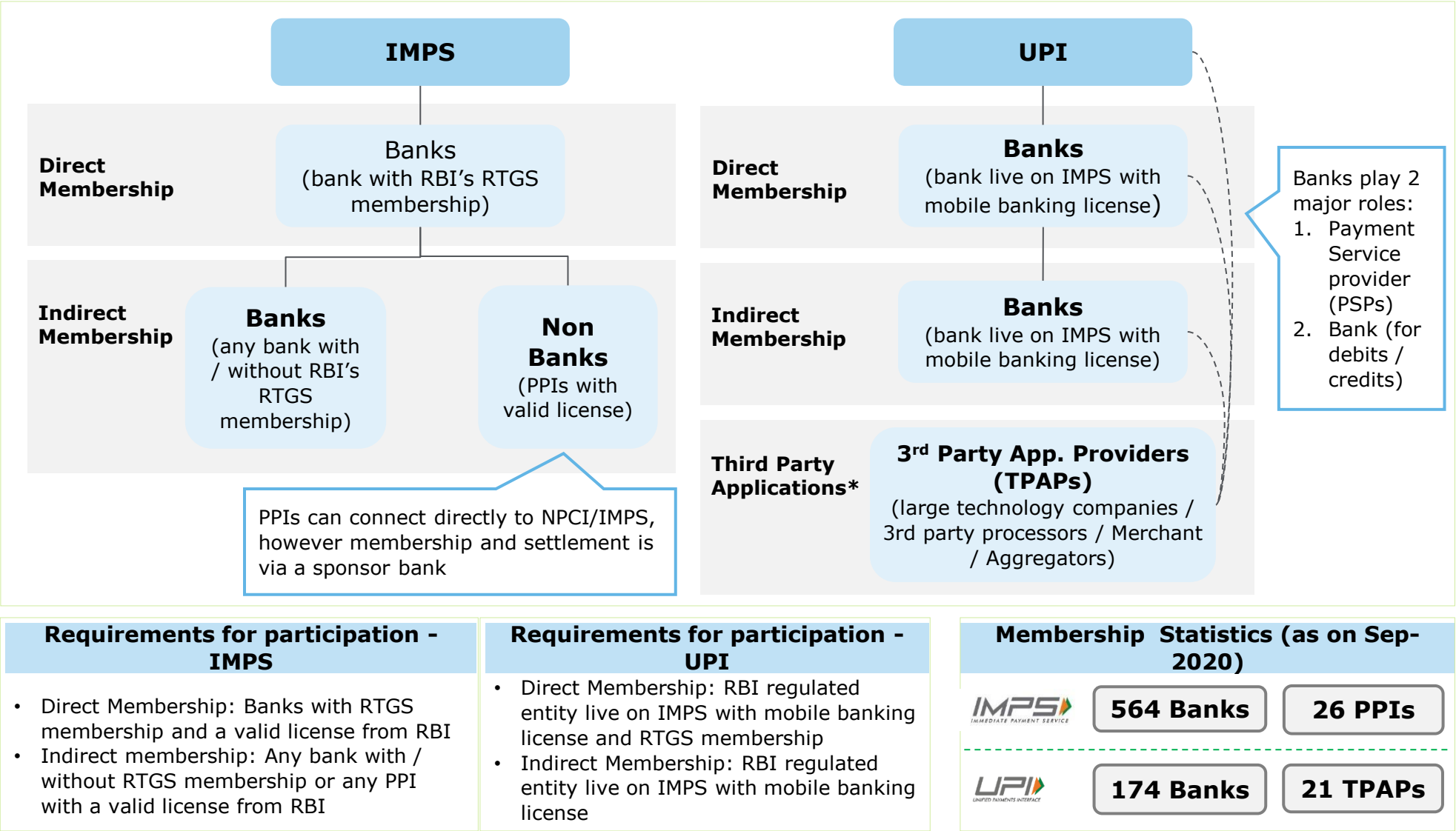
Bharat Interface for Money (BHIM) is an overlay service developed by NPCI with the support of a vendor, iSPIRT, which acts as an interface / application for accessing UPI service

The settlement takes place in the RBI's RTGS system. The settlement obligations are shared by NPCI for settlement in RBI's RTGS system

2.2. Participants (1/3)



- Initially, only banks were allowed to participate in IMPS. Eventually, RBI and NPCI allowed participation of non-banks (PPIs) as well in order to expand the reach
- With regards to UPI, non-banks were not allowed to participate as per RBI's guidance. In 2018, RBI released detailed guidelines with respect to interoperability and onboarding of PPIs in UPI
- Moreover, UPI also allows 3rd party application providers to participate by connecting to banks which facilitated a foray of fintechs into the payment system who brought greater technological know-how and better customer experience



Source: NPCI

*In some cases such as multi-bank PSP approach, NPCI provides direct APIs to TPAPs to connect, however TPAPs partner with banks as PSPs. In case any TPAP wants to connect directly apart from the multi-bank PSP approach, then limited functionalities can be offered by TPAPs

2.2. Participants (2/3)



- UPI also facilitated complete interoperability in terms of a customer being able to initiate a transaction from any UPI app (irrespective of the bank where the customer holds an account). A key step for achieving this interoperability was to distinguish the role of banks as payment service providers and one for fulfilling the banking function of debiting/crediting the account

IMPS:

- Initially only banks were allowed. Since 2012, non-bank PPIs have also been on boarded with the objective of increasing reach and penetration
- Bank and non-bank PPIs especially facilitated remittances by migrants from rural / semi-urban areas. A key reason was the relaxed KYC requirements for PPIs upto a certain limit which enabled those who did not have access to formal banking channels for want of proof of identity/address to perform electronic remittances
- While the non-bank PPIs are allowed to connect directly to the IMPS network, the settlements are allowed only through a sponsor bank (direct member) as opening of direct account access with RBI would require detailed policy reviews and changes
- Apart from PPIs, other banks also have the option of connecting to IMPS through a sponsor bank
- Sponsor bank needs to ensure the material aspects relating to operational feasibility, risk mitigation, fund settlement, and collaterals before and after sponsoring any sub-members

UPI:

- In line with guidance from RBI, only banks were allowed to participate. RBI released guidelines wherein fully KYC compliant PPIs (including bank and non-bank) have been allowed. Towards this end, 3 PPIs are in testing phase
- Banks majorly play two roles in the UPI network:
 - i. PSP Role: Perform customer onboarding (including UPI ID creation and device binding for authentication) and provide the front-end app. Customer can initiate transaction from any PSP app irrespective of the bank where the customer holds account
 - ii. Banking Role: Performing debit and credit. Remitting bank also issues and stores UPI PIN set by the customer
- Moreover, a key to the ubiquity of UPI apps has been participation of TPAPs. These are typically large technology companies / merchants / aggregators / fintechs, etc. who are allowed to connect to banks and provide UPI services. They brought in greater technological know-how and better customer experience. Controls have been put in place for allowing TPAPs such as the customer data can be stored by them in encrypted format, however, customer payment sensitive data is allowed to be stored at the PSP bank's end only
- The internal ombudsman is required to be set up by all big non-banks PSPs and grievance redressal has to be ensured. These PSPs also need to abide by the instructions on TAT as regards time taken. There is now a separate Ombudsman for Digital payments

Source: NPCI | RBI | Primary Interviews

Onboarding Process

Member Banks are provided with project plan and documentation to participate

- ✓ **Sandbox testing** (Only for banks with a new vendor for certification in UPI)
- ✓ **Certification** (Testing & certification depends on nature of development)
 - IMPS self certification tool has been developed (available 24*7) in order to allow banks to conduct testing anytime without dependency on NPCI team
- ✓ **Documentation** (Includes SLA, NDA and other documents as applicable)

Interoperability



- Transfers from bank to PPI allowed and vice versa
- Customers can initiate transactions from their own bank/PPI



- Transfers can be initiated from any PSP bank / TPAP
- Inter-PPI transfers are allowed in both IMPS and UPI

2.2. Participants (3/3)



- The government, RBI and NPCI have played a key role in ensuring alignment of banks/non-banks to the vision and being on boarded
- One initiative to promote participant adoption in UPI during its 1st year was launch of BHIM app which is a common app based on UPI that can be branded by any financial institution and offered to customers. This solved twin objectives – one onboarding more banks including the ones who lacked technical expertise, and second ensuring consistent customer experience

Bharat Interface for Money (BHIM):

- BHIM is an app launched by NPCI in December 2016 that allows payment transactions using UPI
- It was also instrumental in the adoption of UPI system amongst the participants in the initial years
- Initially, there were apprehensions amongst some banks about allowing interoperability in terms of a bank customer transacting through other apps which would be independent of their banking relationship
- Since UPI is a voluntary service (banks are not mandated to participate), it became imperative for NPCI to enable the banks to overcome the inertia and adopt UPI as a channel for the system to be a success. At the same time, every bank on UPI aimed to create its own app and control the customer experience which would have led to inconsistent user experience. Smaller banks often did not have the resources to compete with larger banks in terms of technology
- The offices of the Prime Minister and Minister of Finance proposed that a common app be launched which could be branded by any financial institution and offered to its customers
- Moreover, with the announcement of demonetization, there was increase in the demand for digital payments and launching of apps by various banks would have increased the time to market
- Towards this end, NPCI proceeded to develop the app with the support of iSPIRT, an open-source developer community, and under the watchful eye of the government and/or regulator i.e., RBI
- The government aggressively marketed BHIM as India's national app. This in turn drove customer demand. As growing numbers of customers visited banks asking for their BHIM app, many otherwise resistant banks were incentivized to join UPI
- In addition to driving UPI adoption, the BHIM app provided a better, more standardized user experience and this became an attractive option for smaller banks that do not have the technical expertise



Adoption

- BHIM contributed **~2% of UPI transactions in FY 2019-20**
- However, during FY 2016-17 (first year of UPI launch), BHIM contributed **to ~35% of UPI transactions** by volume despite being launched ~8 months post the UPI launch
- **130 banks** were live on BHIM as of April-20

Source: NPCI | Primary Interviews | Cook, William, and Anand Raman. 2019. "National Payments Corporation of India and the Remaking of Payments in India." Working Paper. Washington, D.C.: CGAP. This is an adaptation of an original work by CGAP/World Bank.

2.3. Payment Instruments and Transaction Types











- IMPS supports bank account and PPIs. UPI supports bank accounts as underlying payment instruments. Support for PPIs in UPI is in the pipeline and RBI has issued guidelines in this regard
- Both IMPS and UPI support individual, business and government transactions. Additionally, UPI also supports non-financial transactions such as balance enquires.
- While there is maximum permissible transaction limit defined by NPCI, participants may set limits. Transaction limits have been increased as the system has stabilized and matured

Payment Instruments Supported

		IMPS IMMEDIATE PAYMENT SERVICE		UPI UNITED PAYMENTS INTERFACE	Interoperability
	Credit Transfer	✓	✓	✓	<ul style="list-style-type: none">• Account to account interoperability supported• IMPS supports account to wallet transactions and vice versa. Such interoperability was supported by handling fields such as account identifier with either account number or wallet number based on the instrument. Other aspects that had to be considered were the differences in rules such as permissible transaction limits or threshold balance requirements for PPIs, etc.• Wallet to wallet transactions are not supported as the priority was to allow transactions between bank account and PPIs• While UPI currently supports only bank account transfers, RBI has permitted KYC compliant PPIs to participate since 2018
	Direct Debit			✓	
	E-money	✓			

Payment Types Supported

Payment Types Supported					
Transaction Types					
		Individual	Business	Government	Non-Financial*
		✓	✓	✓	
	✓	✓	✓	✓	
Participants may set channel / transaction type / customer-wise limits					
Transaction Limit		INR 1-2 lakh per transaction			
		Individual: INR 1 lakh per transaction; 10 P2P transactions per bank account in 24 hours	Business and Government: INR 1 lakh per transaction; INR 2 lakh for verified merchants, capital markets, collections, insurance, foreign inward remittance and pre-approved disbursement		
	Transaction limits were lower during the initial years of launch and have increased as the system has stabilized and matured (such as IMPS limit has increased from INR 50,000 in 2011 to INR 2,00,000). Similarly, additional limit (INR 5,000) has been imposed on BHIM UPI for the first 24 hours after registration to minimize fraud risk				

Transaction Currency

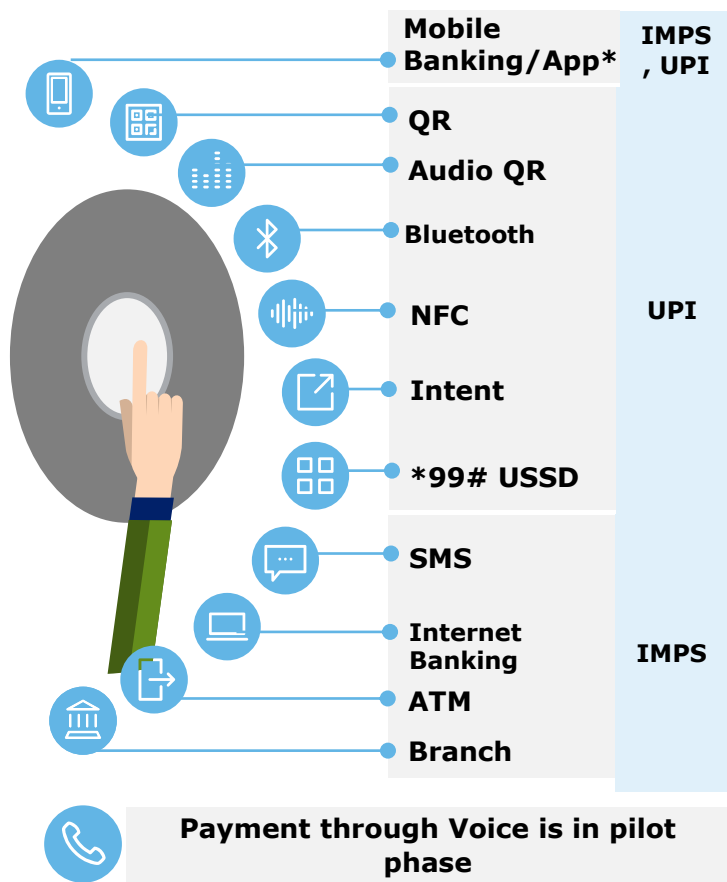


2.4. Access Channels



IMPS was launched as a mobile only interface, however it led to adoption issues owing to cumbersome registration process and concerns related to security of mobile payments during early 2010s. Hence, other channels were added which led to higher growth. UPI supports only mobile channel, primarily because acceptance and penetration of mobile channel had increased by mid 2016. Ease of use, enhanced checkout experience and multiplicity of channels have been the key success factors

Access Channels



- Starting from a mobile-based channel in 2010 which impeded the growth of IMPS to leveraging the same mobile channel for success of UPI in 2016 re-emphasized the importance of matching the system features with the readiness of the market for its acceptability. It also highlighted the importance of early course correction which was seen in the case of IMPS when it was expanded to other channels, eventually leading to the desired growth levels. Multiplicity of channels has enabled to increase the reach.
- Specifically in UPI, the flexibility provided to innovate at the interface through support for various technologies such as QR, NFC, Bluetooth, etc. gained traction from TPAPs who could leverage their know-how in these areas to bring innovative solutions which improved customer experience

Some key differentiated channels are:

- Proximity Based:** While QR is extremely popular amongst users, NFC has been challenged by infrastructure so far. Channels such as QR, Audio QR, Bluetooth, NFC have gained traction from TPAPs for innovating at the payment leg. Players such as Google launched Tez (Audio QR) and Spot (using NFC enabled smartphones) for enhanced customer experience at offline merchants. Moreover, such channels are also being used to offer additional merchant services such as creation of micro-sites for displaying menu on scanning the code, etc.
- In-App payments and Intent:** The source and destination of transaction is the same app in case of In-App transactions which enhanced checkout experience. When an intent / call is made by merchant for payment through UPI, UPI enabled apps installed / embedded on the mobile application and where the customer has registered and set UPI PIN should be mandatorily shown to user, so that the customer can select the UPI App of his choice to pay the merchant
- *99# USSD:** To facilitate transactions for non-smartphone and non-internet users, an interoperable platform based on USSD has been developed connecting all the telecom service providers. This was envisioned to be an initiative towards the financial inclusion agenda for reaching out to the digitally excluded segment. A short code (*99#) opens a session with NPCI regardless of the telecommunications provider, and messages are sent over NPCI rails to the relevant bank. Challenges were observed before the launch as lot of stakeholders from the telecom industry had to be on boarded and aspects related to revenue sharing had to be ironed out. User adoption of this channel has faced challenges over the years as well. Reasons range from less user awareness, customer charges, frequent session timeouts / higher failure rates, etc.

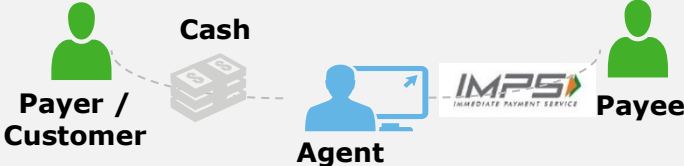
* UPI also supports In-App payments

Source: NPCI | RBI | New Articles | Cook, William, and Anand Raman. 2019. "National Payments Corporation of India and the Remaking of Payments in India." Working Paper. Washington, D.C.: CGAP. This is an adaptation of an original work by CGAP/World Bank.

2.4. Agent Networks and Aliases



- **Agent Networks:** IMPS supports transactions through agent network. Agents proved to be a convenient alternative to formal bank branches and increased the reach of digital payment services amongst the digitally excluded segment
- **Aliases:** IMPS supports mobile number and MMID as an alias, whereas UPI additionally supports UPI ID (virtual address). A key takeaway from IMPS which was incorporated in UPI and showed greater results was that aliases are effective only if they are simple, easy to remember and convenient to generate

Agent Network	
	
<ul style="list-style-type: none">• One of the key success factors of IMPS has been the agent network• Customers can make payments through an agent, who acts as a trustworthy middle layer to guide through a transaction• A key use case has been migrant remittances where the customers are not digital savvy to make payments independently and risk sensitivity is also high because remittances involve a major portion of their income	
Key types of Agents	
Business Correspondent (BC)	e-Wallet Providers
<ul style="list-style-type: none">• BC acts on behalf of banks and facilitate account to account payment transfers (apart from other activities approved by RBI) in areas where banks have limited presence• Entities / individuals eligible as per RBI guidelines can only act as agents	<ul style="list-style-type: none">• Facilitate transfers by opening an eWallet account for the customer and loading it with the amount of cash received• Subsequently, wallet to account IMPS transfers are initiated by these agents
<ul style="list-style-type: none">• Participants and agents needs to abide by the rules and regulations of RBI for BCs and PPIs. Moreover, since the transaction is pre-approved, there are no additional measures required from NPCI	

Aliases		IMPS	UPI
Mobile number and MMID	MMID is a 7-digit number, first four digits of which are: participant identifier and last 3 digits are unique to user	✓	✓
UPI ID	Virtual address in the format - username@psp		✓
Aadhaar Number (discontinued)	Individual Identification Number issued by Unique Identification Authority of India	✓	✓
<ul style="list-style-type: none">• A key success factor in UPI has been the use of virtual ID (i.e., UPI ID). While IMPS also allowed mobile number and MMID as aliases, it faced challenges during its initial years owing to complexity of MMID (difficult to remember) and its creation process. Subsequently the MMID format was simplified. Learnings were incorporated in UPI by introducing a simplified UPI ID and its seamless creation process which led to quicker adoption• NPCI stores mapping of mobile to UPI handle. The UPI ID data is mapped at PSP's end for address resolution. UPI handle is issued at NPCI with multiple level of linking• Saved contact numbers can be utilized to send money or raise collect requests where the mobile number can be prefixed to @UPI handle to act as UPI ID or can be checked whether the mobile number is available with the same PSP. Addresses with the '@UPI' suffix act as global identifiers for which address resolution is performed at UPI's end• Functionality to pay using Aadhaar number was discontinued as it is a sensitive information and the framework about its usage in the payment landscape is still evolving			

2.5. Scheme Pricing and Fee Structure

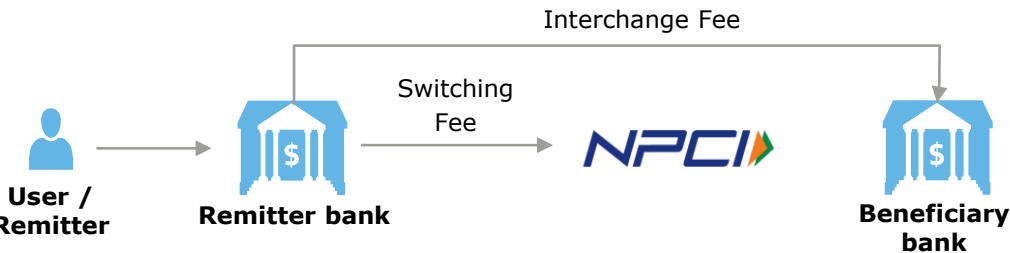


Transaction user charges for users depends on banks / PPIs. There have been interventions by NPCI and government from time to time for matters such as prohibition of surcharge (w.r.t other debit payment modes) to customers by TPAPs, merchants, etc. for opting UPI payments. In a recent announcement, the Government of India also proposed zero merchant discount rate (fee charged to merchants by acquiring bank) in order to push UPI payments. Inter-participant charges such as interchange fee, PSP fee, etc. are determined by IMPS/UPI steering committees



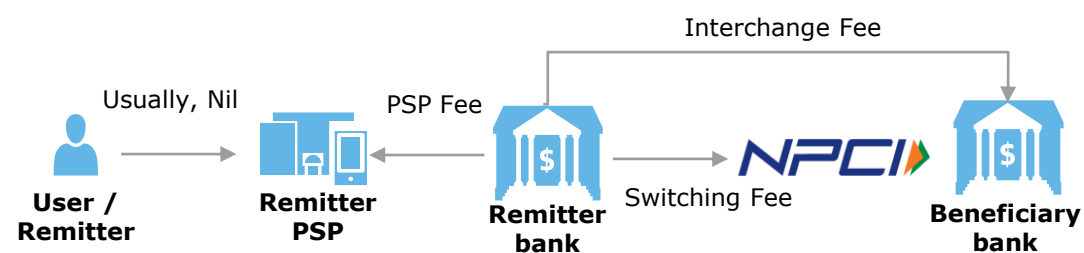
Transaction Fee

- User charges depend on banks/PPIs



Transaction Fee

- User charges depend on banks



Other Fee



- Participant Joining Fee
- Maintenance Fee: Participant contribution of 10% to NPCI in the proportion of participant's transaction throughput for the month
- Dispute to Arbitration

Fee charged by NPCI is set by the NPCI board, inter-participant charges are decided by the IMPS/UPI steering committee and transaction user charges are decided by the participants. RBI intervenes in pricing whenever it is essential. However, the prices that are set by RBI for NEFT do set a benchmark for other payment systems like UPI and IMPS.

2.6. Use Cases / Services (1/3)




A success factor of IMPS and UPI have been the numerous use cases they support which improves customer stickiness and convenience because customer's don't need to shift to alternative platforms for payments often


**Merchant Payments (P2M)**


- Merchant payments constitute ~40% of UPI transactions
- Once adoption of merchant payments increased in UPI, they were discontinued in IMPS
- P2M transactions can be initiated using:
 - Collect request originated by merchant (through request to pay, QR, In-App payment, etc.)
 - Push transaction (where customer knows merchant's UPI ID or account details)
- Innovation at payment leg (future debit authorization with provision to block the corresponding funds, request to pay, payments through QR, Audio QR, NFC, etc.) has been key for higher growth in UPI
- Whitelisted merchants are indicated to the customers on the app for ensuring security by confirming that the payment is being initiated towards the intended merchant
- Another category called 'P2PM' was introduced to bring unorganized or small merchants under the ambit of digital payments. Charges for merchants acquired under this category are same as P2P charges


Payment Instruments
Bank Account


Access Channels


Mobile



QR

Audio QR

Bluetooth

Intent


NFC


**Request to Pay**

- User can request using UPI ID or saved contacts; payer authorizes payment
- Users can define minimum and maximum validity time (else default is set)
- Alert before the collect requests gets expired
- Since the risk of frauds in such transactions are high, certain security measures added:
 - Option for customers to block UPI ID's to restrict future requests
 - Standardized SMS for customers
 - Option to save requests (Marked Safe)
 - Velocity check are performed and there is a cap on maximum transactions that can be initiated per day and week




Payment Instruments
Bank Account

Access Channels

Mobile

Non mobile


Transactions allowed through non-mobile channels; however, **authorization at mobile channel only**

**Bulk / Batch Payments**

- Bulk payments (e.g., salaries, etc.) are supported by banks and Fintechs through APIs (such as PayU, Cashfree, etc.) or file transfer

Payment Instruments
Bank Account, e-Wallets












Access Channels






Non mobile




2.6. Use Cases / Services (2/3)



Moreover, a key takeaway from the journey in India has been that apart from the time of launch, it is also essential to keep innovating and continuously enhancing the system to support more use cases or to improve the features of existing use cases over the years to ensure sustainability of the system

 Bill Payments  	
<ul style="list-style-type: none"> • Integration with Bharat Bill Payment System (BBPS): <ul style="list-style-type: none"> • BBPS facilitates e-presentation of bills and payments • IMPS and UPI are also enabled as payment methods • Functionality is provided in UPI through BHIM app to banks on BBPS as customer operating unit and live in BHIM as issuers. When customer initiates payment through BHIM, it is routed through UPI • Separate settlement files are generated in UPI for BBPS transactions for reconciliation • Any UPI PSP app can opt for BBPS service post fulfilling required criteria • Invoice in the Inbox: <ul style="list-style-type: none"> • Launched as part of UPI 2.0 • Provision for merchants to share invoices with customers prior to authorization. URL is embedded which can be accessed by clicking link in the request to pay / scanning QR / intent • Apps such as NPCI's BHIM (based on UPI) provide option for splitting bills 	Payment Instruments Bank Account, e-Wallets
	Access Channels <div>   </div> <div>   </div> <div>   </div> <div>   </div>



 Future Payments 	
<ul style="list-style-type: none"> • Transaction is pre-authorized (using 2FA) and funds blocked in account for a debit to be initiated at a future date • Payer's account is debited on execution of mandate by merchant or payee • Mandate digitally signed and stored at payer's account holding and PSP bank • Both push and pull mandate creation supported for P2M; only push allowed for P2P • Above mentioned one-time mandates launched under UPI 2.0; recurring transactions are in roadmap especially for use cases such as loan disbursements 	Payment Instruments Bank Account
	Access Channels <div>   </div> <div>  </div>

 Non-Financial Transactions 	
<ul style="list-style-type: none"> • UPI supports the following non-financial transactions viz. <ul style="list-style-type: none"> • Mobile Banking Registration • Check Transaction Status and History • Set/Change UPI PIN • PAN to account validation, etc. 	Payment Instruments Bank Account
	Access Channels <div>  </div>

2.6. Use Cases / Services (3/3)







UPI as a payment mechanism is also available for initial public offering (IPO) subscription. IMPS and UPI support processing of domestic leg of foreign inward remittance into member bank accounts. Cross-border transactions and recurring payments are in the roadmap

**Initial Public Offering (IPO) Subscription**

- UPI as a payment mechanism is available for all public issues for which Red Herring Prospectus is filed after January 01, 2019
- This is a step towards digitizing the offline processes involved in the application process
- Bidding:** Investor needs to fill in the bid details in the application form along with his/her UPI ID
- Blocking of funds:** The Escrow / Sponsor Bank initiates a request for the investor to authorize blocking of funds equivalent to applicant amount and subsequent debit of funds in case of allotment
- The request raised by the Escrow/Sponsor bank is electronically received by the investor as SMS/intimation on his / her bank provided mobile no. linked to UPI ID
- Upon validation of block request by the investor, intimation is sent to the Escrow/Sponsor bank
- Post Allocation:** Once the allotment is performed by the registrar to the issue, instructions are sent to sponsor bank to initiate process for credit of funds in the public issue escrow account and unblocking excess money


Payment Instruments
Bank Account

Access Channels

Mobile app

**Foreign Inward Remittance**

- IMPS and UPI support processing of domestic leg of foreign inward remittance into member bank accounts
- Such transfers can take place only to KYC compliant accounts and it is incumbent upon banks, at both ends, to abide by the FEMA & RBI guidelines
- In such cases, foreign bank's partner or intermediary bank in India initiate IMPS transaction using Beneficiary account number & IFSC or UPI ID. After authentication, partner bank debits the foreign bank's corresponding account held in INR and transaction is forwarded to NPCI for credit to beneficiary. NPCI routes the transaction to respective beneficiary bank, and beneficiary bank credits the beneficiary account

Payment Instruments
Bank Account

Access Channels

Branch

- Roadmap:** Cross-border transactions with countries such as Singapore, UAE, etc. are in the roadmap. A pilot was also held for performing BHIM UPI QR transactions in Singapore. Another use case, i.e., recurring payments in UPI is also in the roadmap

Source: NPCI | RBI | News Articles Note: Channels listed above are not exhaustive

3. User Adoption



Source: NPCI | Deloitte Analysis | Primary Interviews

Chapter Summary:

- Both IMPS and UPI have **co-existed with high user adoption and have established their own customer base**. IMPS has gained more traction amongst migrants from rural/semi-urban areas for remittances because of the multiplicity of online to offline (including assisted) channels it supports. It is also a more popular system amongst corporates as it provides higher flexibility for corporate use in terms of limit setting, access through internet banking, etc.
- On the other hand, UPI has gained more adoption for small ticket size transactions amongst merchants and digital savvy customers, mainly because of the mobile-only interface
- While there were challenges in the initial years of IMPS owing to customer experience issues, adoption has been encouraging over the years. On the other hand, UPI's adoption has consistently shown over 100% YoY growth since launch. A learning from the experiences of IMPS and UPI has been that if the **requirements of the customers (i.e., external ecosystem in terms of digital penetration and acceptance of the channels) at that point of time are in line with the solution** being offered along with the existing customer challenges being overcome, the growth tends to be faster
- Moreover, **alignment of the government, regulator and operator** also play a vital role in ensuring that the overall policy decisions are in line to encourage users for adopting the system
- **Ease of access** of the system and its channels for both the digitally included and excluded customers has also been key for the success of IMPS and UPI
- Another important aspect that has led to higher adoption, especially for UPI, has been the ease of use or **seamless customer experience**. Customer experience in terms of various aspects such as ease of use of interface, multiplicity of services/use cases offered, and interoperability have played a vital role
- Moreover, **external factors** such as low cost of data and smartphones have also contributed to the growth of overall digital payments, which has also positively affected the growth of IMPS and UPI payments
- **Low transaction charges and incentivization scheme** have also provided an impetus to IMPS and UPI payments
- Apart from the above factors, there has been **increased awareness** amongst users through promotional campaigns

3. User Adoption



Both IMPS and UPI have co-existed with high user adoption and have established their own customer base. While there were challenges in the initial years of IMPS owing to customer experience issues, adoption has been encouraging over the years. On the other hand, UPI’s adoption has consistently shown over 100% YoY growth since launch. 75% of UPI transactions are below INR 1000. Average value is INR 2732

While some of the customers migrated from IMPS to UPI, both the systems have established their own customer segments and niches


IMPS
IMMEDIATE PAYMENT SERVICE



High traction amongst migrants for remittances and businesses for vendor payments, refunds, dividend payouts, etc.

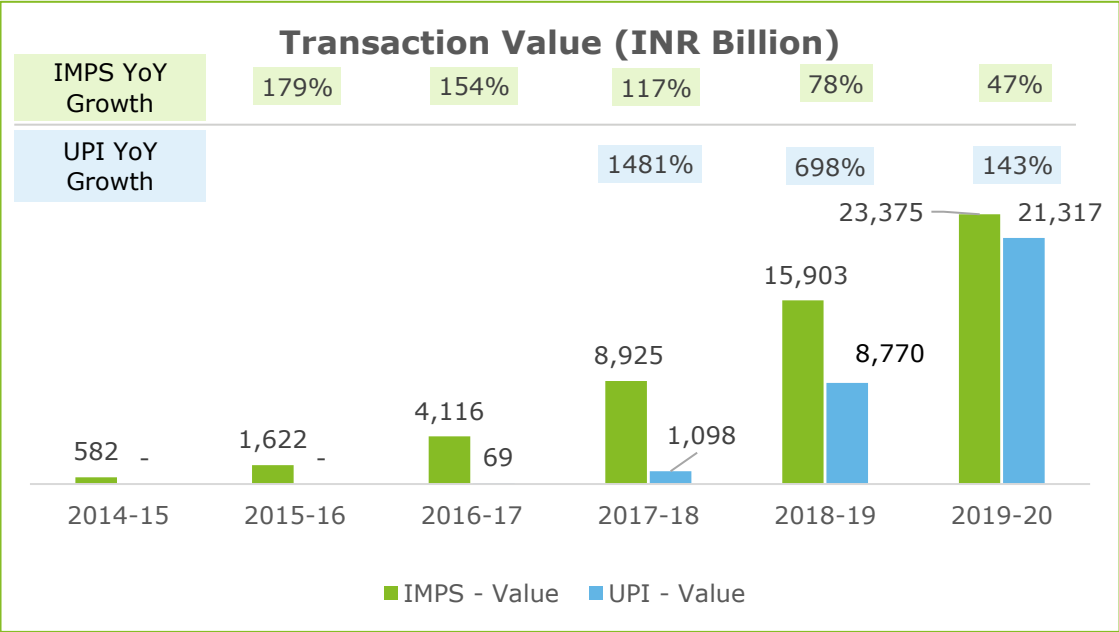
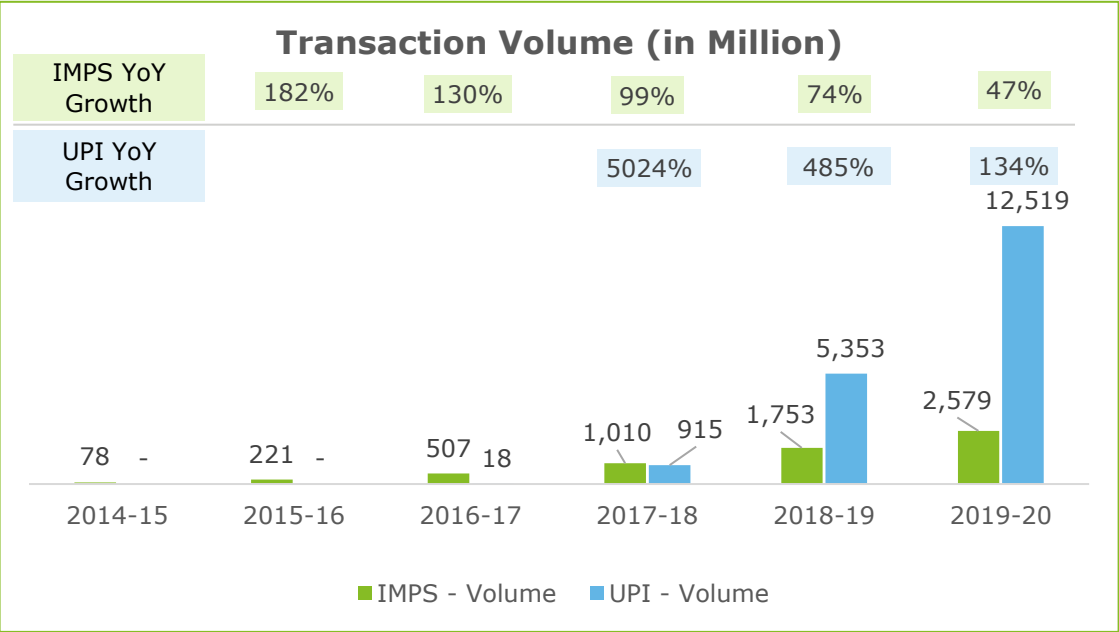



UPI
UNITED PAYMENTS INTERFACE



High traction for low-value transactions, esp. amongst merchants and digital savvy customers





 **There were 10,999 million non-financial balance enquiry transactions through UPI in 2019-20 (135% Y-o-Y growth)**

3. User Adoption



IMPS created an impact through multiple access channels over a wider customer base. UPI benefited through convenient aliases and touchpoints with interoperability for the mobile banking customer. Further push was provided by government / policy decisions and incentivisation programs clubbed with low cost of peripheral infrastructure such as smartphones and data

Key Factors for high user adoption

1 Government and Policy Decisions

- **Demonetization** in November 2016 gave a huge impetus to electronic payments
- Government and RBI has also encouraged electronic payments through programs such as Digital India campaigns and other incentivisation schemes

3 Ease of Use

- **Interoperability** between channels, participants and payment instruments
- **Multiplicity of services** offered, increasing customer engagement
- **Simple UPI registration process and aliases**
- **Innovation at payment leg** (immediate debit, mandate with one-time block, scanning QR, sending payment request) led to deeper P2M penetration

5 Low cost of Usage

- Low cost of **smartphones**
- Decrease in **data prices**
- Nil to very less **customer charges**

Ease of Access

- Prior to UPI, wallets & mobile banking apps had popularized mobile payments. UPI increased the **scope of mobile based touchpoints** (such as 3rd party apps, etc.)
- Also, payments through **agent networks** on IMPS resonated well with less digital savvy customers in rural areas and migrants
- Moreover, IMPS and UPI **catered to both the internet and non-internet users**
- Increased bank accounts was a key enabler of UPI with unique **15.96 crore users**

Increased Awareness

- Higher **acceptability and digital penetration** over the years led to higher awareness amongst customers
- Multiple **promotional campaigns** launched by all ecosystem participants including NPCI

Select Incentivisation Schemes by Government of India for UPI

Referral Bonus Scheme for Individuals*

- To incentivize an existing user of BHIM UPI app to onboard new users
- Bonus paid to both referrer and referee
- Referral considered successful on completion of minimum 3 unique successful financial transactions totaling to Rs. 50 performed by the referee

Cashback Scheme for Merchants:

- To incentivize merchants for receiving payments on BHIM UPI app or *99# from their customers
- Merchant cashback on completion of minimum 50 credit transactions, of which at least 20 transactions from valid unique UPI users

'UPI Chalega' - A
UPI awareness
campaign by NPCI in
association with the
participants



4. Technical Details and Payment Process

Chapter sections:

- 4.1. Technical Details | Messaging Format and QR Codes
- 4.2. Technical Details | APIs, Customer Authentication and Tokenization
- 4.3. Payment Process (Customer Registration, Transaction Fulfilment, Liquidity Management and Settlement)



Source: NPCI | Deloitte Analysis | Primary Interviews





Chapter Summary:

- While IMPS and UPI are **very different systems** from a technical standpoint in terms of architecture, adoption of standards, etc., NPCI is **aiming to build synergy** such that the IMPS code base could be made as similar to UPI as feasible. This is in order to increase convenience and reduce the number of changes required at NPCI and participant's end
- ISO 8583 was adopted in IMPS** because support for this standard was available with many banks at that point of time. **XML was selected for UPI** primarily because of the flexibility, ease of reading and scalability offered by it. IMPS is also being transitioned to XML format
- UPI supports two QR specifications i.e., **UPI QR and Bharat QR** and both are interoperable. Both QR code specifications were launched at different points in time and hence they co-exist because of legacy issue. **Customized specifications** were developed for both the QRs
- IMPS supports limited APIs** which are developed and extended by participants. **UPI offers extensive APIs**, and they are extended by PSP banks / NPCI for either connecting to PSPs/UPI for transactions or for other value-added services such as checking transaction status, fetching transaction details, etc.
- Both IMPS and UPI have implemented **two-factor authentication** in line with RBI guidelines. UPI supports 1-click, 2-factor authentication by enabling device fingerprint through **device binding** as one of the factor
- IMPS faced challenges in its initial years owing to complexity in registration and MMID generation process and subsequently an 'IMPS Simplification' process was undertaken for catering to this issue. Learnings from IMPS were incorporated in UPI to **enable seamless and automated UPI ID** and mobile banking registration process through mobile devices
- Clearing of all transactions takes place through NPCI. Multiple options are provided to participants to connect to IMPS and UPI switches, either through an aggregator or their own switch
- Settlement takes place using **a hub based deferred net model** for direct members. This model was followed because of reduction in liquidity requirements under this approach. Settlement for sub-members takes place in the books of sponsor bank

4.1. Technical Details | Messaging Format and QR Code



- **ISO 8583** was adopted in IMPS whereas **XML format** was selected for UPI
- UPI supports two QR specifications i.e., **UPI QR and Bharat QR** and both are interoperable. **Customized specifications** were developed for both the QRs

Messaging Format		QR Code					
	ISO 8583		Not supported				
<ul style="list-style-type: none">• ISO 8583 was adopted because support for this standard was available with many banks at that point of time and going to market was the priority. IMPS utilized a standardised ISO 8583 messaging format for ensuring interoperability and adoption• Transition of messaging format from ISO 8583 to XML (similar to UPI) is in progress			Two QR specifications supported – UPI QR and Bharat QR				
	XML	<table><tr><th>UPI QR</th><th>Bharat QR</th></tr><tr><td><ul style="list-style-type: none">• Supports static merchant presented, and dynamic merchant & consumer-presented QRs• Consumer-presented QR transactions are very less compared to merchant-presented• Customized QR specifications were developed by NPCI (extension of an existing specification)</td><td><ul style="list-style-type: none">• Supports static and dynamic merchant-presented QRs. Consumer-presented QRs not supported• Specification includes requirements of card schemes and UPI• This solution was launched by NPCI, Visa and MasterCard</td></tr></table>		UPI QR	Bharat QR	<ul style="list-style-type: none">• Supports static merchant presented, and dynamic merchant & consumer-presented QRs• Consumer-presented QR transactions are very less compared to merchant-presented• Customized QR specifications were developed by NPCI (extension of an existing specification)	<ul style="list-style-type: none">• Supports static and dynamic merchant-presented QRs. Consumer-presented QRs not supported• Specification includes requirements of card schemes and UPI• This solution was launched by NPCI, Visa and MasterCard
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<ul style="list-style-type: none">• XML based messaging format was designed considering the global standards and to enable future growth• XML was selected primarily because of the flexibility, ease of reading and scalability offered by it. It was observed that the flexibility provided by ISO was limited, e.g., additional data elements, tag length, etc. could not be custom defined as per requirement. Hence, the view was that changes would be lesser and quicker by adopting XML format		<ul style="list-style-type: none">• Both QR code specifications were launched at different points in time and hence they co-exist because of legacy issue• Compatibility has been established in UPI for both QRs• New use cases such as linking GST information in dynamic QRs, and cross-border QR payments interoperability are being considered• In order to reduce issues related to QR tampering and non-verified entities, signed QR functionality has been introduced wherein the entity / merchant is verified based on the public key (pertaining to the signed QR) stored by UPI• 20 Million QR codes in circulation: 18 million UPI QR; 2 million Bharat QR					

Source: NPCI | Primary Interviews

Source: NPCI | Primary Interviews

4.1. Technical Details | APIs and Customer Authentication



- IMPS supports limited APIs which are developed and extended by participants. UPI offers extensive APIs, and they are extended by PSP banks / NPCI for either connecting to PSPs/UPI for transactions or for other value-added services such as checking transaction status, fetching transaction details, etc.
- Both IMPS and UPI have implemented two-factor authentication in line with RBI guidelines



APIs



Limited APIs developed by participants

- NPCI does not provide APIs as of now. Once the messaging format is transitioned from ISO 8583 to XML, APIs such as name validation, transaction status check, etc. would be launched
- However, participants have developed APIs especially for bulk payments such as salaries, corporate refunds, etc. which they offer to their clients



APIs provided by NPCI and participants

- UPI provides flexibility to support extensive APIs because of XML messaging format and adoption of APIs has been encouraging by participants and TPAPs
- APIs are extended by PSP banks or NPCI for either connecting to PSPs/UPI for transactions or for other value-added services such as checking transaction status, fetching transaction details, etc.



Customer Authentication



- Two factor authentication, factors being
 - Mobile number & MPIN for mobile transactions
 - Card and ATM PIN for ATM channel
 - User ID + Internet Banking Password / Transaction Password for Internet banking channel

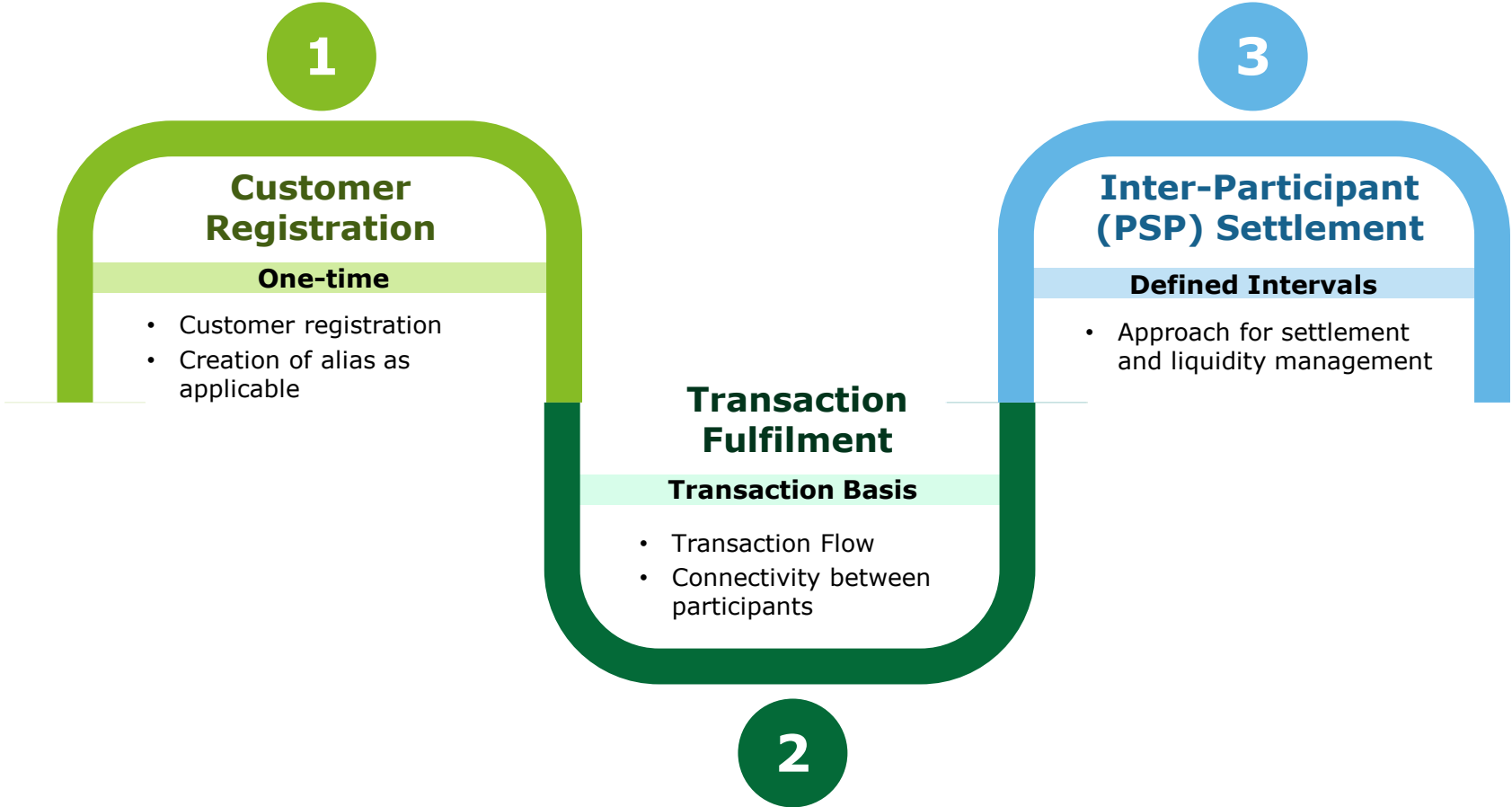


- 1-click, 2-factor authentication supported, using mobile (first factor) and UPI PIN (second factor). Mobile number is used for authenticating the first transaction and device fingerprint through device binding for subsequent transactions. While biometric (Aadhaar) as second factor is supported by the system, it has not been implemented yet
- Risk is reduced further by dividing authentication requirements between PSP and issuer bank. First factor is validated by the PSP and the second factor is validated by the remitter bank

4.2. Payment Process



Various steps in the payment process include **one-time customer registration, payer-payee transaction fulfilment and inter-participant settlement** (which takes place on non-real-time basis). Subsequently, various aspects related to these areas are covered



4.2. Payment Process | Customer Registration

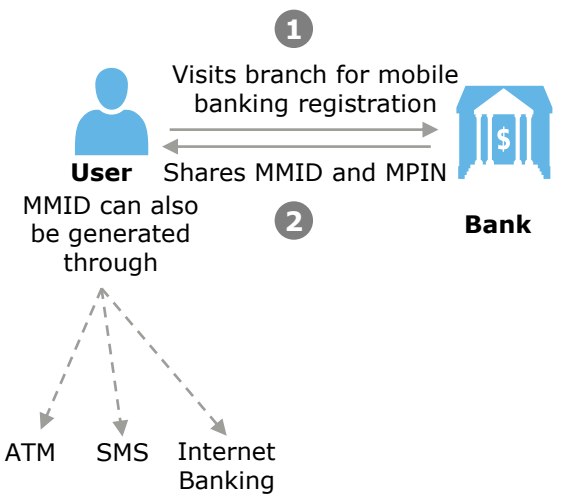


- IMPS faced challenges in its initial years owing to complexity in registration and MMID generation process which posed issues in user adoption
- Subsequently, an 'IMPS Simplification' process was undertaken for catering to this issue
- Although the process is simplified, the learnings from IMPS were incorporated in UPI to enable seamless registration and UPI ID creation process through mobile device

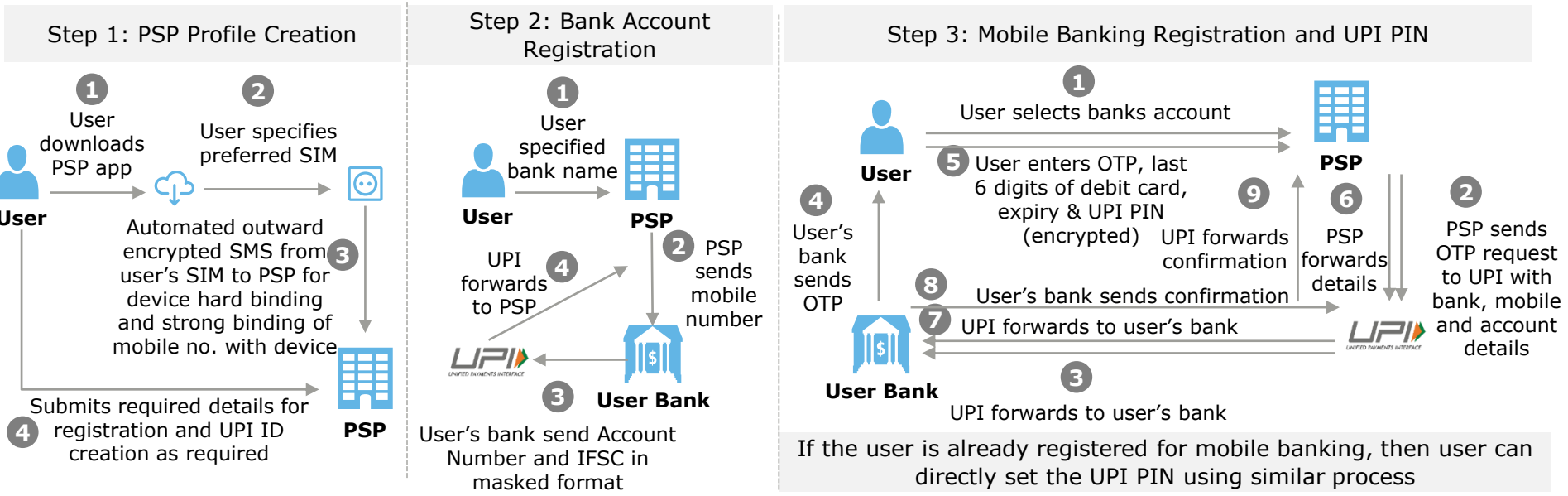


- ✓ Mobile banking registration mandatory for transaction through mobile channels
- ✓ For beneficiary, mobile banking registration is mandatory while receiving payment using the mobile number and MMID

Registration for Mobile Banking and MMID



Simplified and automated process for Mobile Banking Registration and UPI ID generation



4.2. Payment Process | Transaction Fulfilment | IMPS



Typical transaction fulfilment process which is followed for IMPS transactions involving both remitter and beneficiary sub-members has been described below. Intra-Bank transfer are not supported by IMPS



a Connectivity options between sub-member and sponsor:

- Connectivity to NPCI-IMPS through sponsor bank's Application Service Provider (ASP) switch (more prevalent option largely because ASPs have required technology and PPIs sometimes do not prefer integrating with sponsor bank)
- Integration with sponsor bank
- PPIs can also connect to NPCI-IMPS directly

Connectivity options between sponsor bank/direct members and NPCI:

- Member's switch connected through Bharat switch (more prevalent option)
- Via an aggregator / application service provider called Mobile Payment Solution Provider (approach typically used by smaller banks such as regional rural banks who may not have technical capability or banks who do not wish to make required investment)

Connectivity options between sub-member and sponsor: Same as 'a'

1. Customer initiates transaction through sub-member application. Application could be provided in-house, by sponsor or by ASP
2. Sub-member authenticates customer, debits customer account and forwards transaction to remitter sponsor bank
3. Remitter sponsor bank validates the request (from security perspective), creates ISO 8583 request and forwards to NPCI-IMPS
4. NPCI-IMPS forward transaction to beneficiary sponsor bank switch
5. Beneficiary sponsor bank sends transaction to beneficiary sub-member
6. Sub-member credits funds into beneficiary account and sends response. It also sends SMS to beneficiary
7. Beneficiary sponsor bank sends response to NPCI-IMPS
8. NPCI-IMPS forwards response to remitter sponsor bank
9. Remitter sponsor bank sends response to remitter sub-member bank. Remitter sub-member bank sends SMS to customer

Source: NPCI | Primary Interviews

Note: Above is a typical process which is followed involving both remitter and beneficiary sub-members

Note: Intra-Bank transfer are not supported by IMPS

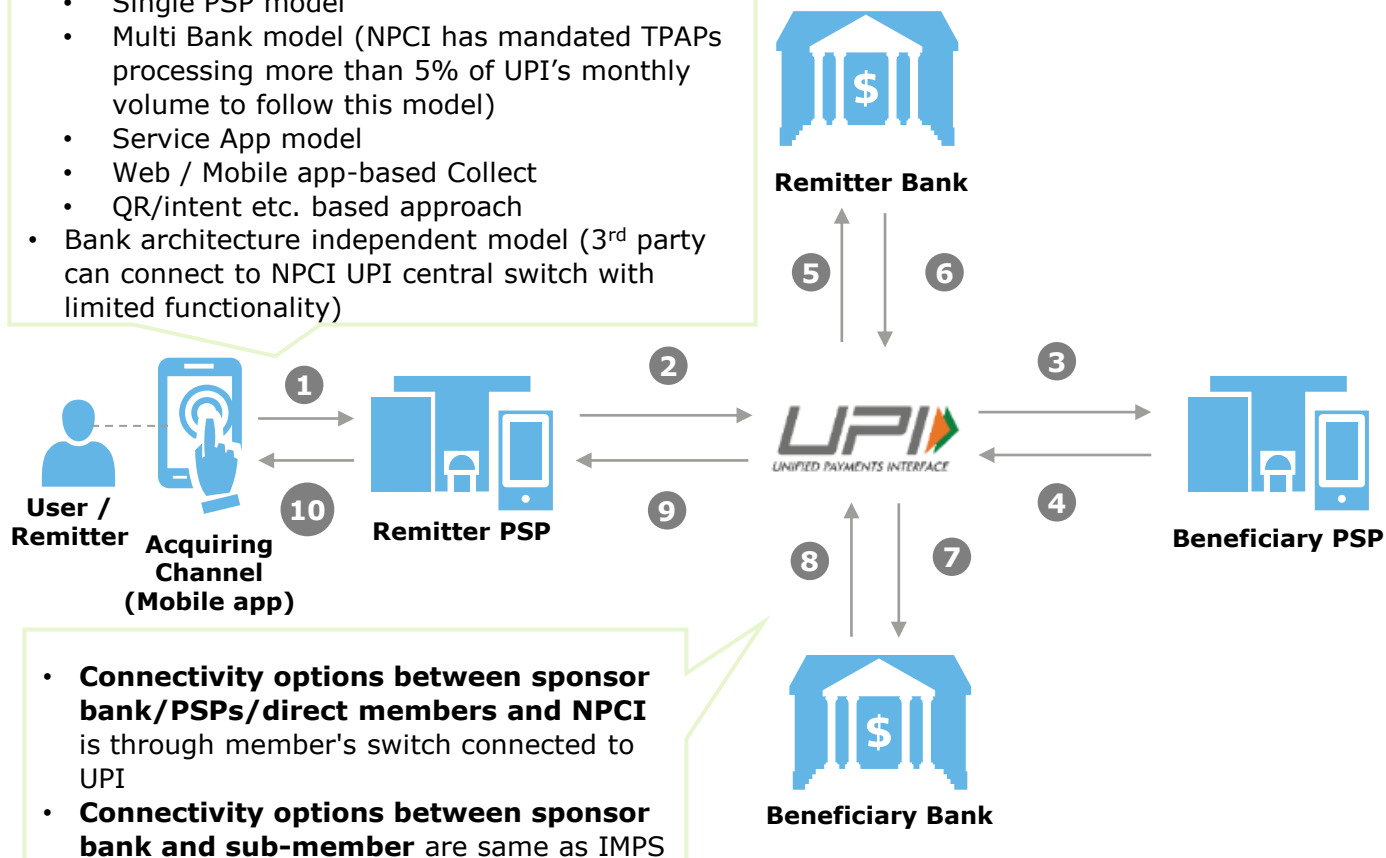
4.2. Payment Process | Transaction Fulfilment | UPI



Typical transaction fulfilment process which is followed for P2P push request when remitter Bank & remitter PSP are separate entities, and beneficiary PSP & beneficiary bank are separate entities. UPI supports both inter and intra-bank transfers

Connectivity for 3rd parties:

- Bank architecture dependent model:
 - Single PSP model
 - Multi Bank model (NPCI has mandated TPAPs processing more than 5% of UPI's monthly volume to follow this model)
 - Service App model
 - Web / Mobile app-based Collect
 - QR/intent etc. based approach
- Bank architecture independent model (3rd party can connect to NPCI UPI central switch with limited functionality)



1. Remitter initiates transaction by entering the UPI ID of the beneficiary
2. Remitter PSP sends the request to NPCI-UPI
3. NPCI-UPI sends the request to the respective beneficiary PSP for address resolution and authorization
4. Beneficiary PSP sends relevant account details of the beneficiary to NPCI-UPI
5. UPI sends the debit request to remitter bank
6. Remitter bank debits the remitter's account and sends confirmation to NPCI-UPI
7. NPCI-UPI sends credit request to beneficiary's bank
8. Beneficiary bank credits the customer's account and confirms the same to NPCI-UPI
9. NPCI-UPI sends the successful confirmation to the remitter PSP
10. Payer PSP sends the confirmation to the customer


Note: UPI supports both inter and intra-bank transfers



4.2. Payment Process | Liquidity Management and Settlement



Settlement takes place using a hub based deferred net model for direct members. This model was followed because of reduction in liquidity requirements under this approach. Settlements are performed in central bank account for easier liquidity management. Settlement for sub-members takes place in the books of sponsor bank

Direct Member Settlement					Indirect Member Settlement
Approach	 Hub	Type Time	Multilateral Deferred Net Settlement	4 Cycles Per Day on RTGS working days	<ul style="list-style-type: none">• The settlement of transactions by sub-members take place in settlement accounts of sponsor banks maintained with RBI. Same process as mentioned for direct member settlement• Under this arrangement, sponsor banks will assume complete responsibility for the settlement of all transactions by sub-members• Settlement takes place through the sub-member's pre-funded account maintained with sponsor bank on gross basis during the same RTGS cycles
<ul style="list-style-type: none">• Settlement service in IMPS and UPI is provided by NPCI (by virtue of its Type D RTGS member) and net settlement position is passed to RBI's RTGS for settlement through accounts maintained by members with RBI. The settlement positions are passed as Multilateral Net Settlement Batches (MNSBs) using Net Settlement Interface• While the approach and process remains similar, IMPS and UPI settlements were separated by NPCI within the first year of UPI's launch because the net obligations had to be arrived at separately for the two systems in line with legal and regulatory requirements and because of banks' request for separate reporting / information• Settlement in IMPS and UPI takes place 4 times a day on RTGS working days. Separate MSNB file is created for RTGS holiday. Post holiday, separate settlement take place for each MSNB such file• Multilateral deferred net settlement has been followed owing to the following benefits:<ul style="list-style-type: none">• Convenience for systems handling substantial volumes and lower liquidity requirements• Netting also benefits the regulators, by virtue of reducing the size of credit and liquidity exposure of participant banks, thereby leading to containment of systemic risk• With the Payment & Settlement Systems Act, 2007 and the framing of Regulations thereunder, legal basis was provided to 'netting' and 'settlement finality'• Central settlement (Hub approach) was followed because it reduces the liquidity burden on banks as they get benefit of excess funds at one clearing center to offset the deficit at another• As per RBI's directions, clearing houses such as NPCI need to publish the time of arriving the net settlement position for members to ensure adequate funds' availability. Also, time between arriving at the net settlement position and posting of the net settlement position should be as minimum as possible					

Source: RBI directive on Settlement and Default Handling Procedures in Multilateral and Deferred Net Settlement Systems under the Payment and Settlement Systems Act, 2007

5. Governance Framework

Chapter sections:

- 5.1. Legal and Regulatory Aspects
- 5.2. Risk Management
- 5.3. Dispute Resolution
- 5.4. Customer Complaints



Source: NPCI | RBI

Chapter Summary:

- **The PSS Act, 2007 is the legal framework** for the payment and settlement systems in India which was conceived by RBI in order to ensure soundness of payment systems with adequate legal backing and monitoring mechanism at a time when electronic payment systems and operators were evolving. The Act designates the RBI as the authority for regulation and supervision of payment systems in India. The Act also covers various aspects such as guidelines related to regulation and supervision of payment systems, authorization of payment systems, settlement of disputes, rights and duties of the system provider/operator, provides legal basis for 'netting', 'settlement finality' and loss allocation among system participants and payment system, etc.
- NPCI was set up in December 2008 **as an umbrella organization** for retail payment systems in India. It has been incorporated as a **'Not for Profit' company**
- IMPS, UPI and all its payment intermediaries/participants are regulated by the RBI. IMPS/UPI steering committee, which comprises of 19 members from various banks and non-banks, has been constituted to discuss and deliberate on business, operational, and technical issues of the systems
- NPCI has designed an **Enterprise Risk Management (ERM) Framework** drawing guidance from regulatory guidelines of RBI, ISO 31000:2009 standard; COSO framework and guidelines from Bank for International Settlements. Risk committees are specifically entrusted to oversight on risk management
- Since the transactions in IMPS and UPI involve debiting the remitter's account as the initiating trigger, the credit risk (owing to crediting the beneficiary account without sufficient funds in remitter's account) is mitigated. Hence, credit risk arises only pertaining to inter-participant settlement which is mitigated by constituting **settlement guarantee mechanisms**
- NPCI has an **Operational Risk Management Framework** under which the key elements include measure, monitor, report, identify, evaluate and control risk
- **Cyber security framework** with Protect, Detect, Respond, Predict and Recover methodology is incorporated at NPCI. Detective and remedial procedures have been put in place to ensure cyber resilience
- With respect to data management, customer payment sensitive data is allowed to be stored only in PSP banks and not by the 3rd party applications
- There have been multiple measures under the legal and regulatory framework to ensure efficient resolution of disputes and complaints. A system for automated dispute resolution mechanism is in place for IMPS and UPI

5.1. Legal, Regulatory and Governance Aspects



The PSS Act, 2007 is the legal framework for the payment and settlement systems in India which was conceived in order to ensure soundness of payment systems with adequate legal backing and monitoring mechanism at a time when electronic payment systems and operators were evolving

Institutional and Governance Framework

Legal Framework:
Payment and Settlement Systems Act, 2007 (PSS Act, 2007)

Regulator and Overseer: RBI
Board for Regulation and Supervision of Payment and Settlement Systems

Owner and Operator:
NPCI
IMPS/UPI Steering Committee

- In order to promote sound payments with adequate **legal backing**, a legal framework was proposed by RBI owing to the following key reasons:
 - Existing legal structure did not explicitly cover 'netting' and 'settlement finality', and most of the payment systems (apart from RTGS) functioned on a net settlement basis
 - Lack of an apposite provision in law for regulation and supervision of the payment system operator reduced the scope of having a monitoring mechanism which leads to safety and security concerns (especially because payments operations were increasingly being shifted away from the central bank)
 - Lack of legal clarity about the products designed using information technology (especially because systems were based on payment instructions which did not fall in the category of instruments in the existing legal structure)
- With the above context, **The Payment and Settlement Systems Act, 2007** (PSS Act, 2007) came into force in 2008, which was further amended in 2015
- The Act covers all categories of payment systems that provide clearing, payment or settlement services or all of them and includes central counterparties, securities settlement systems etc. except for the stock exchange
- Following are the key elements covered in the Act:
 - **Regulation and supervision of payment systems in India** and **designates the RBI (reserve bank) as the authority** for that purpose and all related matters. Key powers to regulate and supervise comprise:
 - Power to determine standards
 - Notice of change in the Payment System to the RBI
 - Power to call for returns, documents, etc. and access to information
 - Power to carry out audit and inspection
 - Power to issue direction
 - Power of to make regulations
 - **Authorization of Payment Systems**
 - **Settlement of Disputes**
 - **Legal basis for 'netting', 'settlement finality' and loss allocation** among system participants and payment system, where the rules provide for this mechanism
 - **Rights and Duties of the system provider/operator**
 - **Offences and penalties**
 - 2015 Amendment: **Settlement and treatment of collateral** in case of insolvency, or dissolution or winding up of a participant

5.1. Legal, Regulatory and Governance Aspects



Being the designated authority under the PSS Act 2007, RBI has issued various regulations and guidelines for payment systems and participants, and has also been performing the oversight function through offsite and onsite inspections

Institutional and Governance Framework

Legal Framework:
Payment and Settlement Systems Act, 2007 (PSS Act, 2007)

Regulator and Overseer: RBI

Board for Regulation and Supervision of Payment and Settlement Systems

Owner and Operator: NPCI

IMPS/UPI Steering Committee

- Under the PSS Act, 2007, **two regulations** were put in place by RBI, namely,
 - **Board for Regulation and Supervision of Payment and Settlement Systems Regulations, 2008:**
 - Details functions and powers of the Board for Regulation and Supervision of Payment and Settlement Systems (BPSS)
 - BPSS is a committee of the Central Board of the RBI constituted for the purposes of exercising the powers, performing functions and discharging duties conferred on the RBI under the PSS Act
 - **Payment and Settlement Systems Regulations, 2008:**
 - Covers matters such as form of application for authorization for commencing/ carrying on a payment system and grant of authorization, determination of standards, furnishing of information, etc.
- RBI constituted a department, Department of Payment and Settlement Systems, in order to assist BPSS in performing its functions
- RBI has also issued guidelines and directives from time to time such as on Mobile Banking, Internet Banking, Dispute Resolution Mechanism, Storage of Payment System Data, and Settlement and Default Handling Procedures in Multilateral and Deferred Net Settlement Systems, etc. which IMPS, UPI and their participants need to comply

Payment System Oversight:

- While the working definition of oversight stresses on safety and efficiency, the scope of oversight, regulation and supervision of payment and settlement systems in India encompasses additional policy objectives, such as, authorization, accessibility, inclusiveness and compliance with international standards
- **'Principle of Financial Market Infrastructure'** (PFMI) implemented in India for regulation and supervision of FMIs
- An Oversight Division in the Department of Payment and Settlement Systems has been formed
- Oversight is performed primarily as a **combination of offsite supervision and onsite inspection**
 - Offsite supervision: This is the primary means for oversight and its is conducted through:
 - Self-assessment: FMIs are required to undertake/conduct regular periodic assessment against the CPSS-IOSCO's PFMIs and submit the assessment report along with the compliance measures to the RBI
 - Call for information
 - System of alerts: FMIs are required to put in place a mechanism for proactively reporting any abnormal events/developments, etc. to RBI at the earliest possible time
 - External and/or internal audits of control measures
 - Assessment of any changes/amendments
 - Onsite inspection
 - Meetings with the Board and the senior management of the FMIs and participants of the FMIs on developments and issues relating to the FMI as and when required
 - Laying down policies for regulations, issue direction to FMIs and participants

5.1. Legal, Regulatory and Governance Aspects



While the regulations are in place, RBI has been continuously reviewing its policies and making necessary amendments in order to ensure 'responsive regulation' with the evolving requirements, which can also be observed in its Vision 2019-21

Institutional and Governance Framework

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Payment and Settlement Systems Act, 2007 (PSS Act, 2007)

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Board for Regulation and Supervision of Payment and Settlement Systems

Owner and Operator:
NPCI
IMPS/UPI Steering Committee

Key measures towards forward-looking regulation supported by a risk-focused supervision in Payment and Settlement Systems Vision 2019-21

- **Governance and oversight:**
 - Constitution of a **self regulatory organization (SRO)** to be considered to cover digital payment system operators for self-regulatory governance framework to foster best practices on aspects such as security, customer protection, pricing, etc. and establish minimum standards, etc. SRO will serve as a two-way communication channel between players and regulator
 - Oversight framework prescribing **the intensity of oversight proportionate to the systemic risks, or system-wide risks** posed by the payment system or operator, or participant being drafted
- **Fostering innovation and collaborative competition:**
 - **Framework for regulatory sandbox** to provide a controlled environment, with certain regulatory exemptions, to allow experimentation of new payment system products by traditional and non-traditional players
 - Review of policies to encourage more players to participate (**including pan-India Umbrella Organization/s**) and promote pan-India payment platforms, to give a fillip to innovation and healthy competition
 - Encourage adoption of new technologies including **DLT for enhancement of digital payment services**
- **Review of policies for non-banks:**
 - Review of policies to provide a level playing field among banks and non-banks
 - **Review of membership of centralized payment systems for access neutrality between banks and non-banks.** RBI has permitted participation of non-banks in certain payment infrastructure; RBI to also initiate discussion on framework for settlement risk management with increased participation of non-banks
- **Security, standard setting and performance assessment:**
 - Framework for **collecting data on frauds** in payment systems
 - Framework for **testing resilience** including business continuity and **infrastructure redundancy preparedness**
 - Consideration for **separate regulatory framework for outsourcing arrangements by non-bank** payment service providers
 - RBI's guidelines for mobile banking indicate the technological and security standards which the banks may comply. **Specific standards for banks providing mobile payment services** to be issued **mandating minimum requirements**
 - **Promote interoperability through standardization** and the use of universally accepted standards to be enhanced
 - Framework for ongoing **assessment of performance of retail payment systems** (such as uptime, technical declines, capacity, etc.) would be designed

5.1. Legal, Regulatory and Governance Aspects



NPCI was authorized by RBI for setting up and operating IMPS and UPI; The systems and all related intermediaries/participants are regulated by RBI along with IMPS/UPI steering committees

Institutional and Governance Framework

Legal Framework:
Payment and Settlement Systems Act, 2007 (PSS Act, 2007)

Regulator and Overseer: RBI
Board for Regulation and Supervision of Payment and Settlement Systems

Owner and Operator:
NPCI
IMPS/UPI Steering Committee

NPCI Governance and Authorisation:

- NPCI, a 'Not for Profit' company, was set up in December 2008 as an umbrella organization for retail payment systems in India with the guidance and support of the RBI and the Indian Banks' Association (IBA)
- The broad objective of forming a separate entity was to bring greater efficiency by way of uniformity and standardization in retail payments and expanding the reach of both existing and innovative payment products for greater customer convenience. It was also in line with the best practices observed by RBI in many other countries wherein regulators are not the service providers unless the payment system is systemically important
- NPCI is regulated by RBI and governed by the board comprising of representatives from member banks. With initial shareholding of ten promoter banks, the ownership has since been diversified to 56 banks. RBI approves the appointment of the Chairman, and the Managing Director and Chief Executive Officer (MD & CEO) of NPCI; it has also appointed a nominee director on NPCI's Board
- Considering the public sector characteristic of NPCI and the requirements of the PSS Act, 2007, the shareholding comprises at least 51% stake by the public sector banks
- Authorization:
 - NPCI is an authorized Payment System Operator by the RBI to set up and operate in India under the PSS Act, 2007. The year of issuance of authorization for IMPS and UPI was 2010 and 2016 respectively
 - NPCI has been granted Type D membership of RTGS and acts as a settlement agency that arranges the necessary interbank settlement of credits and debits to the banks' respective current accounts with RBI
 - Over the years, NPCI has developed and operated various retail payment products, including handling operations of the National Financial Switch (NFS)
- NPCI was tasked for the launch of IMPS and UPI because it aligned to its existing services (under the umbrella of retail payments) and the clients (banks) had existing relationship/membership with other products of NPCI

Enforcement of guidelines across IMPS and UPI:

- IMPS, UPI and all its payment intermediaries/participants are regulated by the RBI. The IMPS/UPI steering committee comprises of 19 members from various banks and non-banks. The committee has been constituted to discuss and deliberate on business, operational, and technical issues of the systems
- The Audit & Compliance teams at NPCI ensure enforcement of compliances
- The regulator audits NPCI at scheduled calendar and provides oversight
- The participants are guided by the Procedural guideline & Operating circulars issued by RBI and NPCI from time to time
- NPCI ensures compliance by participants through the process of audit at the time of onboarding as well as regular submission of audit reports

5.2. Risk Management



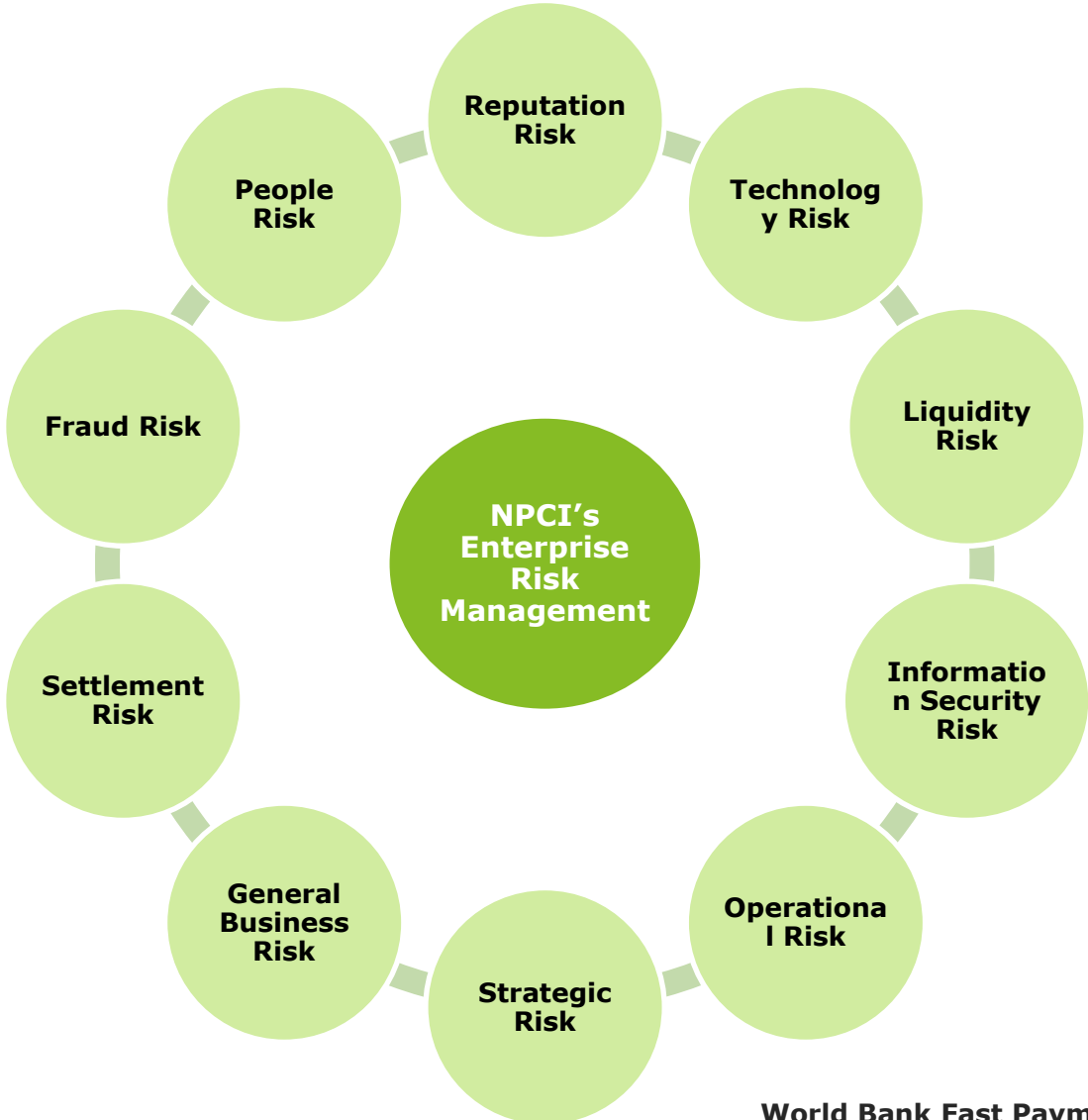
NPCI has designed an Enterprise Risk Management (ERM) Framework drawing guidance from regulatory guidelines of RBI, ISO 31000:2009 standard; COSO framework and guidelines from Bank for International Settlements. Risk committees are specifically entrusted to oversight on risk management

Risk Management Framework:

- NPCI has designed an Enterprise Risk Management (ERM) Framework drawing **guidance from regulatory guidelines of RBI, ISO 31000:2009 standard; COSO framework and guidelines from Bank for International Settlements**
- Additionally, basis regulatory requirement, NPCI is aligned with **PFMI guidelines** of applicable principles. This ensures that NPCI has effective systems and controls in place to identify, measure, monitor, manage and report risks arising in and across NPCI's operations, business and business enabling functions
- NPCI has issued Procedural Guidelines for both IMPS and UPI. It also releases periodical circulars on both payment systems

Governance:

- Board Committees are specifically entrusted to oversight on risk management
- Committees that form part of Governance, Risk & Compliance include **Risk Management Committee (RMC)** of the Board and **Internal Risk Management Committee** for efficient governance



5.2.1. Credit and Liquidity Risk Management



Since the transactions in IMPS and UPI involve debiting the remitter's account as the initiating trigger, the credit risk (owing to crediting the beneficiary account without sufficient funds in remitter's account) is mitigated. Hence, credit risk arises only pertaining to inter-participant settlement

Legal and Regulatory Basis

- In order to manage the above-mentioned risk, legal basis is provided to '**settlement finality**' and the operator (NPCI) has obligation of "Settlements" under the PSS Act, 2007
- RBI has also issued a directive pertaining to 'Settlement and Default Handling Procedures in Multilateral and Deferred Net Settlement Systems' under the Payment and Settlement Systems Act, 2007

Net Debit Cap (NDC) and Intra-Day Cycles

- NDC **limits are allotted to participants** in IMPS as per the Settlement Guarantee Mechanism (SGM) policy. For UPI transactions, a specific percentage of existing IMPS NDC limits as prescribed and as approved by the respective governance bodies is assigned to each participant
- The net debit position is **calculated after each transaction** in order to minimize risk and transactions are declined once the NDC limit is 100% utilized
- NPCI has institutionalized **multiple intra-day settlement cycles**, in order to minimize the liquidity risks

Guarantee and Loss Sharing Mechanism

- NPCI has constituted **Settlement Guarantee Fund (SGF)** comprising of pledged cash collaterals and pooling of funds by way of committed line of credit for payment systems to address any adverse impact of liquidity/credit risk arising due to settlement default by the participants
- Constitution of SGF corpus is through the **arrangement of line of credit (90% of SGF) and remitter member(s) contribution (10% of SGF)** is based on their **transaction throughput**
- In the event of a participant failing to meet its settlement obligations on the settlement date and thereafter, loss sharing mechanism is invoked
 - Loss is equivalent to the net debit obligation of the defaulting participant(s) and charges as applicable
 - Keeping in view the PFMI guidelines the loss is shared by all the surviving participant(s) (all the remaining participants in the system)
 - Share of loss shall be related to the risk exposure (transaction limit) set for the participant(s)
 - Contribution would be same for the participants in a particular exposure group

Sub-Member Credit and Liquidity Risk

- Minimum NDC limit defined for sub-members for IMPS and UPI. Limit is maintained separately within the overall limit of the sponsor bank (parent-child relationship maintained)
 - Operational issues and delays (TAT of ~3-5 days) were observed since it was a manual process wherein sub-members had to approach sponsor bank which in turn had to notify NPCI to update the limit. Hence, NPCI launched a Liquidity Manager Member Portal (LMMP) for sponsor banks to manage limits of sub-members as and when required

5.2.2. Operational and Fraud Risk Management



NPCI has an operational risk management framework under which the key elements include measure, monitor, report, identify, evaluate and control risk. One of the learnings from IMPS and UPI pertaining to fraud risk management has been the need for a centralized data on frauds. A comprehensive framework for collection of data on frauds in payment systems is being drawn by RBI in consultation with the industry

Defined guidelines and framework

- NPCI has an operational risk management framework under which the key elements include measure, monitor, report, identify, evaluate and control risk. NPCI also performs operational risk assessment procedures when new systems, activities and processes are introduced or undertaken
- Procedural Guidelines are published for the participating members which also contain various risk guidelines. It also defines roles & responsibilities of each participant in the ecosystem (sponsor, sub-member, PSP, etc.)
- Further, risk guidelines/circulars/advisories are issued for member banks on time-to-time basis

Fraud Risk Monitoring and Management Solution

- NPCI has designed and implemented a Real-time Fraud Risk Monitoring and Management solution (FRM) for fraud detection and prevention. This solution is intended to be implemented for all the on-line systems offered by NPCI. Solution is used for monitoring UPI as of now
- System has the capability to process transactions in real-time and near real-time mode. Member banks monitor the alerts through web-based access
- IMPS has a separate Fraud Risk Management module which is not real-time

KYC / AML

- Members need to comply with KYC, AML, Combating of Financing of Terrorism (CFT), PEP check, Terrorist List check, Customer Due Diligence (CDD) and Enhanced Due Diligence (EDD) checks as stipulated by the RBI for activities of members before registering a customer. Members have to submit to NPCI, a duly signed declaration in this respect
- As part of AML Monitoring, transactions are monitored based on certain Red Flag Indicators. Such transaction trail is assessed on various parameters such as location, volume, frequency, number of parties involved etc. and if suspicious, a Suspicious Transaction Report is filed with the relevant authority

Centralized Data on Frauds

- There were challenges around no central solution to manage fraudsters that could be leveraged across the ecosystem
- Hence, a comprehensive framework for collection of data on frauds in payment systems is being drawn in consultation with the industry
- RBI has expressed need to share fraud related data for payment systems. Such data can be used analytically for differentiating fraudulent and legitimate transactions; oversight and supervision, and also for providing guidelines to entities for minimizing risks of similar frauds

5.2.2. Operational and Fraud Risk Management



The Reserve Bank of India has issued guidelines with respect to customer awareness for fraud prevention. RBI has also issued guidelines for fraud reporting mechanism

Fraud Reporting and Awareness

Customer Awareness

- As per RBI's guidelines, customers must be advised to notify their bank of any unauthorised electronic banking transaction at the earliest after the occurrence of such transaction, and informed that the longer the time taken to notify the bank, the higher will be the risk of loss to the bank/ customer
- Also, as per guidelines, alert SMS must be sent to remitting customer with details of sender and beneficiary
- In order to reduce frauds in UPI, the concept of verified merchants has been introduced and all such merchants are indicated at the time of transaction
- RBI is also considering the following initiatives with respect to customer awareness pertaining to payment systems:
 - An industry level initiative for building awareness through generic advertisements and systematically planned customer orientation programs
 - Creation of a Universal Icon / Symbol Set for basic use cases / operations in the area of retail electronic payments

Reporting Frauds

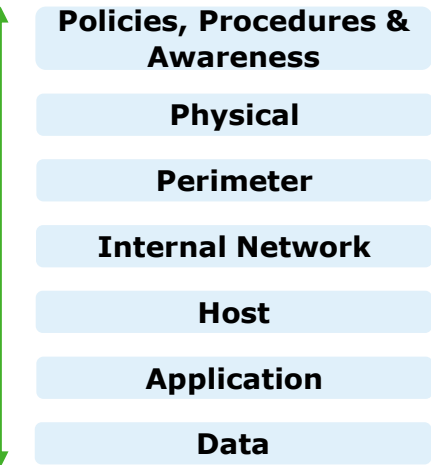
- As per RBI's guidelines, banks must provide customers with 24x7 access through multiple channels (at a minimum, via website, phone banking, SMS, e-mail, IVR, a dedicated toll-free helpline, reporting to home branch, etc.) for reporting unauthorized transactions that have taken place. Banks shall also enable customers to instantly respond by "Reply" to the SMS and e-mail alerts and the customers should not be required to search for a web page or an e-mail address to notify the objection, if any
- Further, a direct link for lodging the complaints, with specific option to report unauthorised electronic transactions shall be provided by banks on home page of their website. The loss/ fraud reporting system shall also ensure that immediate response (including auto response) is sent to the customers acknowledging the complaint along with the registered complaint number
- The communication systems used by banks to send alerts and receive their responses thereto must record the time and date of delivery of the message and receipt of customer's response, if any, to them. This shall be important in determining the extent of a customer's liability
- On receipt of report of an unauthorised transaction from the customer, banks must take immediate steps to prevent further unauthorised transactions in the account

5.2.3. Cyber Resilience and Data Management



Security framework with Protect, Detect, Respond, Predict and Recover methodology is incorporated at NPCI. For payment system data storage, RBI has issued guidelines. Special considerations were considered while allowing TRAP access in UPI. Customer payment sensitive data is allowed to be stored only in PSP banks and not by the 3rd party applications

Defence in Depth Approach of Cyber Security



NPCI has deployed various technologies to upgrade its security posture leveraging a multi-layered defence approach to combat evolving cyber threats

- NPCI is compliant under PCI DSS v3.2, ISO 27001:2013 and ISO 22301:2012 and has defined Business Continuity Management framework
- Security framework with Protect, Detect, Respond, Predict and Recover methodology is incorporated at NPCI
- Policies adopting the above frameworks and the CSITE framework of RBI have been framed including Information Security Management System (ISMS), Business Continuity Management System (BCMS), Cyber Security and Data Security Policies
- Below are few technologies and controls that are deployed at NPCI which have mitigated some real time cyber-attacks at NPCI:
 - Perimeter security controls including firewall, web application firewall, micro-segmentation of network, routing controls, secured switch configurations, proxy server, Anti-Distributed Denial of Service Solution, Anti-Advanced Persistent Threat etc.
 - Detective controls including 24x7x365 Security Operations Centre (SOC) to monitor and restrict attacks
 - Privileged identity & access management solutions
 - Security assessment tools for vulnerability assessment, penetration testing and other application security assessment
- NPCI also issues guidelines pertaining to security and infra requirements, and disaster recovery for members joining IMPS and UPI
- Following measures have been put in place by RBI to ensure quick remedial in case of a security breach:
 - Internal Security Incident Response Team
 - Defined Playbooks for each type of alert
 - Escalation Matrix for Internal Stake holders and Governing Bodies
 - Standby External Security Incident Response Team
 - Defined Media Statement

Per RBI’s vision document, a framework would be drafted for testing resilience (ability to continue to operate even if a system has failed completely by switching activity to a separate system or process or a combination of both) of the payment systems. The framework shall also include business continuity and infrastructure redundancy preparedness

Data Management

- RBI has issued guidelines on storage of payment system data. There were no incremental guidelines for IMPS and UPI
- NPCI has the right to issue guidelines for the system operated by it. NPCI has issued data guidelines - no PII in mobile app; PII at PSP have to encrypt data@rest; PII data@move needs to be encrypted as well
- Customer sensitive data is allowed to be stored only in PSP banks and not by the 3rd party applications and is saved in encrypted form
- NPCI has incorporated data security policy which is in line to most of the global accepted standards around data privacy and security
- NPCI also has Backup Infrastructure to safeguard its data

5.3. Dispute Resolution



There have been multiple measures under the legal and regulatory framework to ensure efficient resolution of inter bank disputes. A system for automated dispute resolution mechanism is in place for both IMPS and UPI

Inter-Bank Dispute and Adjustment Resolution

- NPCI has a dedicated disputes redressal system i.e., Bharat Clearing & Settlement System (BCS-IMPS) for resolution of IMPS disputes. In BCS-IMPS, all the disputes are settled in every settlement cycle. Similarly, Unified Real time Clearing & Settlement (URCS), a back-office system is in place for UPI. This portal validates and processes the disputes raised by members. The adjustments are performed along with previous business day approved transactions
- Member banks must deploy separate resources for performing reconciliation on daily basis and raise adjustments, if needed. Member banks are also advised to handle the recon operations on all days irrespective of Sundays and other public holidays and to have a round-the-clock help desk team
- Where the adjustment/decline by the beneficiary bank is not acceptable to the remitting bank, they can refer the issue for arbitration by manual process to NPCI's Panel for Resolution of Disputes. NPCI has set up a Panel for Resolution of Disputes (PRD) comprising four members and the President to look into unresolved interbank settlement disputes as per the directives of the DPSS of the RBI and PSS Act 2007
- In case the participant is not satisfied with the decision of the panel of the system provider, the dispute shall be referred to the RBI

Various Inter-Bank Dispute and Adjustment Scenarios

1. **Beneficiary Timed Out transaction** - Applicable for P2P and P2A
 - Customer account is credited but response got timed out (Beneficiary to NPCI)
 - Customer account is not credited, and response got timed out (Beneficiary to NPCI)
 - Customer account is not credited, and response got timed out (Beneficiary to NPCI) - Post reconciliation it is found that customer account cannot be credited because of closed account, no such a/c, etc.
2. **Chargeback** - In case of wrong or incorrect beneficiary a/c
3. **Chargeback Acceptance / Representment** - Chargeback acceptance is only confirmation, there will not be any fund movement between Beneficiary and Remitter
4. **Pre-arbitration, Pre-arbitration Acceptance and Pre-arbitration Rejection**
7. **Arbitration**
8. **Transaction Credit Confirmation (TCC)** - This option is provided only to make remitter bank understand that customer a/c has been credited either online or by initiating manual credit by beneficiary. This will avoid raising chargeback by remitter bank
9. **Returns (RET)** - Beneficiary bank can return the funds to the remitting bank where beneficiary bank is not able to credit their customer's a/c due to wrong a/c no, a/c closed, etc.

Source: NPCI | RBI

5.3. Customer Complaints



Similarly, the customer complaints need to be resolved bilaterally between the participants within the timelines stipulated by RBI and NPCI. Moreover, it is mandatory to provide an option on the PSP app to raise complaints in case of UPI

Customer complaints

- **IMPS**
 - Any complaint about credit not being given to a beneficiary should be dealt with conclusively and bilaterally by the remitting and beneficiary banks within 3 days from the date of the complaint
 - Members are required to have a separate operations team to handle inter member/customer’s complaints
- **UPI**
 - In case of any complaints related to UPI transactions, the first point of contact for customer is the customer’s PSP. Customer’s PSP has to mandatorily provide option in their app to raise dispute/complaint by providing transaction reference/ID number. However, if customer decides to approach his/her remitter/beneficiary bank instead, the respective bank requires to entertain all such requests and help to resolve the complaint to the customer’s satisfaction
 - Customer can raise a dispute/complaint through the PSP app by selecting transactions from history and/or by entering any other unique reference such as transaction id no.
 - Complaints regarding non-refund for failed transactions and/or non-credit for successful transactions shall be dealt by the PSP/Bank. Any complaint about credit not being given to a beneficiary should be dealt with conclusively and bilaterally by the remitting and beneficiary banks as per the guidelines circulated by NPCI from time to time
 - For P2M complaints, it is mandatory for acquiring banks to take up the matter with merchant and check the status of the transaction

Recent Regulatory Initiatives

Ombudsman Scheme for Digital Transactions

- It is an expeditious and cost-free apex level mechanism for resolution of complaints regarding digital transactions undertaken by customers of the system participants for deficiency in certain services covered under the grounds of complaint specified under the scheme
- Complainant must first approach the system participant concerned. If the System Participant does not reply within a period of one month after receipt of the complaint, or rejects the complaint, or if the complainant is not satisfied with the reply given, the complainant can file the complaint with the Ombudsman for Digital Transactions within whose jurisdiction the branch or office of the System Participant complained against, is located

Harmonization of Turn Around Time (TAT) and customer compensation for failed transactions using authorized Payment Systems

- RBI has put in place a framework on TAT for resolution of customer complaints and compensation framework across authorized payment systems

Best Practices as per NPCI guidelines for reducing customer complaints:

- Both credit and debit SMS/App notifications irrespective of the transaction ticket size should be sent to customer
- Separate SMS should be sent for all successful debit & credit reversals
- After resolution of the complaints raised on the PSP applications, notifications describing the status of the complaints should be sent for the same
- Complaints should be uploaded in RGCS and responded on same day to further enhance the customer experience

Source: NPCI | RBI

6. Annexure























Chapter sections:

6.2. Key Features


6.3. Operational and Fraud Risk Management


6.1. Key Features


Key Highlights		Transaction Type & Use Cases		
	Operating hours	<div><div></div><div></div><div></div></div>		
	Payment speed	<div>IndividualBusinessGovernment</div>		
	Transaction limit*			
	Alias	<div><div></div>Merchant (UPI)<div></div>Bulk / Batch Payment</div>		
	Channel	<div><div></div>Cross-border payments<div></div>Request to Pay (UPI)</div>		
	User charges**	<div><div></div>Schedule future payments (UPI)<div></div>Bill payments</div>		
	Infrastructure setup	<div><div></div>Direct Debits (UPI)</div>		
	Messaging format			
	Use of Open APIs			
	Authentication			

Approach

Type | Time

Hub

RTGS

Distributed clearing

Deferred Net Settlement

4 Cycles Per Day on RTGS working days

6.2. Operational and Fraud Risk Management



Below are the key fraud risk mitigation measures in UPI. Apart from these measures, various other checks such as velocity checks, transaction limit cap, validation on permissible remitter account type for a particular beneficiary, etc. are also prescribed by NPCI

Key Fraud Risk Mitigation Measures in UPI

	Secure Customer Registration	<ul style="list-style-type: none">• Customer is sent an SMS by the PSP while registering the customer to ascertain the veracity of the customer• The PSP also does the device fingerprinting through an automated outward encrypted SMS (Mobile number to PSP system) which hard binds the mobile number with the device. This ensures that the transactions originating from the Hard bound device are secured at the first step itself. This outward SMS sent is encrypted and does not involve any customer intervention
	Application security	<ul style="list-style-type: none">• The PSP application is certified by NPCI and the NPCI Utility / Libraries embedded in the application for entering sensitive data such as Biometric credentials, PIN and One Time Password (OTP)
	Transaction Level Security	<ul style="list-style-type: none">• Authorization is split between the PSP and the Issuing Bank<ul style="list-style-type: none">• The device fingerprinting of the mobile device serves as the 1st factor• UPI PIN or the Bio-metrics is the 2nd factor of authentication
	Security while handling the PIN	<ul style="list-style-type: none">• PIN is always entered by the customer on the NPCI Library (which is embedded into the Parent PSP App while certification) which is invoked while entering the PIN for an interoperable transaction• The PIN traverses over the secure channel from UPI to the Issuing Bank basis the PKI encryption where PIN is encrypted using the Public key at the UPI and the Issuing bank decrypts at its end using its Private key
	Unsolicited Pull requests	<ul style="list-style-type: none">• Customer is in control of transaction and has to enter authentication details to initiate a debit to his/her bank account

Apart from the above, various other checks such as velocity checks, transaction limit cap, validation on permissible remitter account type for a particular beneficiary, etc. are also prescribed by NPCI for IMPS and UPI