

## **Expansion of Unified Payment Interface**

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*Abstract* -- This research paper examines the Unified Payment Interface (UPI), a modern payment system introduced in India by the National Payment Corporation of India (NPCI). Since 2016, with strong pressure from the Government of India, much emphasis has been placed on these payment systems for smartphones which have now become a major trend with more than two billion transactions per month. There is very little safety and security testing over this sensitive technology that transfers money from user to user. This paper studies the introduction of digital payments in India and examines in detail the technology based on the Unified Payment Interface which focuses on its building and security systems through a review of dynamic and theoretical books. UPI is a huge improvement compared to the existing payment system in terms of cost, easy consumer use, duration and security and saw good user acquisition. Its automated API-based design will enable the development of new solutions for consumers and businesses. UPI is at its highest level and the development of vendor UPI solutions will greatly improve user acceptance. UPI can help bring a large portion of the population into the digital economy and can be a great investment tool for India.

**Keywords** -- **Keywords UPI Payments, Real Time Payments, Unified Payment Interface, Digital Payments**

### I. INTRODUCTION

India is the seventh largest economy in the world with GDP of 8.7 trillion of India's largest economy is India's largest economy. The total amount of money distributed in India since August 28, is 25.83 trillion. Excessive reliance on paper money brings a set of critical problems to the production, storage and financial management of currency notes, the use of counterfeit money and most importantly the lack of transaction leads to tax evasion. These difficulties will only increase as the economy grows. The Reserve Bank of India (RBI) has taken formal steps to promote digital payments in India and established the National Payment Corporation of India (NPCI) as an umbrella organization to promote low-cost payment methods. In August 2016, NPCI introduced Unified Payment Interface (UPI), the next mobile-based payment system that makes real-time bank payments. In a recent interview between Mark Zuckerberg and Mukesh Ambani it led to the fact that the main reason for the rapid development of the Indian economy is directly related to the success of UPI payments. Mukesh Ambani directly linked his quick success with UPI. UPI uses high power telephony in India to make mobile phones a major payment device for consumers and retailers and to make digital payments nationwide. The purpose of this paper is to research in detail the technology behind the UPI and the addition of the value offered by the UPI in relation to existing digital payment systems. UPI has seen rapid growth that could be attributed to a growing ecosystem promoted by banks and increasing consumer engagement but the main use of these early recipients was to make payments from individuals. In order for UPI to reach its full potential, it is important to develop UPI payment solutions for vendors.

This paper helps in determining technological constructs, transaction processes and UPI security systems that can help create new business solutions. India currently has a fairly accepted cash flow infrastructure for traders as well as commercial UPI solutions that have the potential to fill this vacancy in an effective fundraising way. UPI could be a case study for both developing and

developed countries to enable a low-cost, low-cost digital payment system.

## II.BACKGROUND

The Reserve Bank of India is a regulatory body with the Payments and Settlements Systems Act (2007) which is the main law governing payment systems in India. Making India “less money” depends on and encourage digital payments to be the focus of the RBI since the last decade. The five-year RBI Vision Documents set out the tone and vision of achieving key objectives in the ecosystem financial system summarize the RBI's priorities to transform the payment system in India. "Actively promote electronic payment systems for India's low-income community and ensure that payment and payment systems in the country are safe, efficient, co-operative, authorized, accessible, inclusive and compliant with international standards." The 2016-17 season has been a landmark period of payment in India, the country has seen a dramatic change in the payment environment with drastic policy decisions, the introduction of new payment plans and rapid changes in user behavior. Demon possession was introduced at a time when 86% of monetary notes were made overnight. At the time of the demonstration papers money was scarce and one could see the online queue banks and ATMs to withdraw the little money that was available. Commerce and commerce are on the verge of collapse and GDP growth is slowing down despite the rapid introduction of new currency notes and the use of digital payment methods. The previous year of demon making saw the emergence of digital-based money storage that saw rapid adoption by a large smartphone using people. The advent of digital wallets for smartphones has been largely driven by new independent technology companies. At the same time with the explicit mandate from the Reserve Bank of India to conduct advanced online payments, the National Payments Corporation of India (NPCI) has begun developing an advanced payment system called the Unified Payment Interface (UPI). The Unified Payment Interface (UPI) was officially launched by the RBI Manager on 11 April 2016 and was launched for public use on 25 August 2016.

A surprising step for NPCI was to allow the instant payment system (IMPS) to measure the interactive NFS coverage. Prior to IMPS online trading systems for sets were Real time Gross Settlement System (RTGS) and National Electronics Funds Transfer System (NEFT). RTGS and NEFT do not qualify for small ticket sales due to limitations of the features of these systems such as high business limits, late payment for frequent and unstable operating hours. NPCI is therefore familiar with IMPS, a real-time refund service with rotund clock availability. IMPS is standalone station and can be accessed via smart phone, internet, ATM and (USSD) on smart phones. IMPS provides mobile-based feed transfer services consisting of various shareholders such as banks, merchants, and mobile service providers. IMPS deals with payment as soon as the payment occurs at a professional transaction level with guaranteed quick transactions for both senders and recipients.

## III.FUNDAMENTALS OFUPI

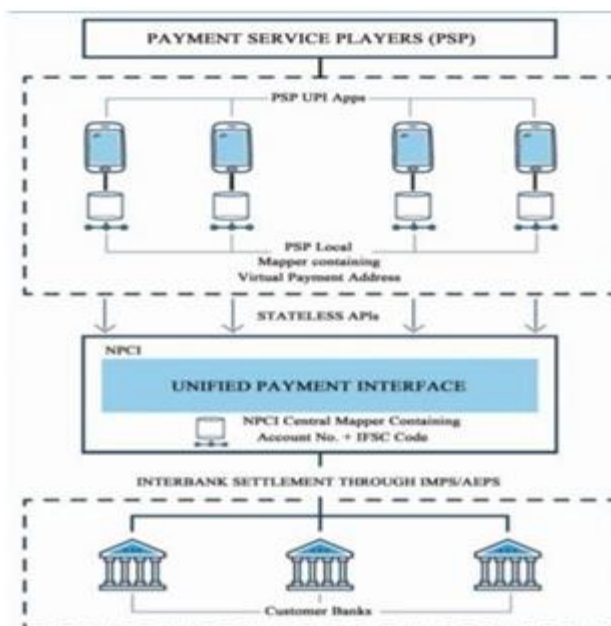
Industrial NPCI Unified Payment Interface (UPI) as a shared interface connector or platform for all digital refund programs in India. NPCI is the site owner, network operator, service provider, and UPI Network manager. Unified Payment Interface allows the style and set of standard Application Programming Interface to reduce digital payments using a smart phone. UPI contributes to the high prevalence of smart phones and the increasing availability of Smartphones, data and the internet to allow for a high-cost India-based system. UPI allows users to send or request instant payments to their bank accounts using a smart phone, making the mobile phone a people's main payment device. UPI uses IMPS as a switch to enable faster payment and

settlement between different financial institutions. With UPI everyone with a bank account in India can create their own visible payment address (VPA or UPI ID) and start making an agreement using a mobile phone. This is a visible payment address e.g. abc @ xyzbank becomes a unique personal payment ID and explains the need to share bank details during transactions. UPI simplifies digital payments, instead of giving out cards to more expensive and time-consuming people. UPI empowers the mobile phone to be a great tool for authorizing and making payments. And a mobile phone with a unique payment ID makes it a low-cost payment acceptance device that makes digital payments universal, convenient and low-cost.

### III- A. IMPROVEMENTS OVER EXISTING SYSTEM

- 1) **Mobile-based Debit Transactions:** The current digital payment systems that include cards and online payments are corporate-based transactions that are transactions initiated by the customer. There is no way for a retailer to initiate a payment request (withdraw) that a customer can accept and pay. UPI enables real-time drag-and-drop operation using a mobile device.
- 2) **Interoperable User Interfaces:** UPI allows payments to all connectors, which means that payments can be requested on a single interface and transactions can be authorized on a different interface. Eg. Merchant can request payment on the website where the user can verify and pay using mobile phone.
- 3) **Disclosure of Banking Information:** There is no need to share sensitive bank details such as account number etc to make a transaction. Users can create their own unique payment address acting as their unique identity to make or receive payments. This is for secure payment because the user does not have to share any sensitive data on third-party interfaces. **Safety with One Click-2 Factor Authentication:** UPI enables one-click transactions - when the customer only needs to enter the mobile MPIN to make the transaction. This is not the same as payment systems available where you have to enter card details, usernames, passwords, OTPs etc. On third parties or websites to make transactions. In the UPI the user's personal cell phone acts as a single device to authorize and verify payment.
- 4) **Mobile first approach:** UPI is designed to adopt a smartphone using Indians to enable low cost and global digital payments. With UPI there is no need to build separate consumer infrastructure (cards etc.) to enable digital payments. In India, nearly every adult has a bank account and a cell phone. UPI is using this ubiquitous partnership to empower digital payments in India.
- 5) **Some mobile payment systems such as e-wallets work on their silos i.e. the payer and the payee need to be on the same platform as the transact.** For UPI, only the recipient's payment address is required and the amount is credited to the bank account. Also, to create e-wallets, users need to first deposit money into the wallet accounts which means that their money stays attached to the wallet account until it is refunded to the bank accounts. While in the UPI there is no need to reload any wallet, the money is deducted directly from the payer's bank account and deposited into the payer's bank account.

#### IV. UPI ARCHITECTURE



UPI workings on a mutual layer or a unified interface established and hosted by NPCI. This mutual layer arranges transactions and guarantees settlement across bank accounts using IMPS as well as Aadhaar Enabled Payment System (AEPS). The Banks, monetary organizations and other entities that provide UPI services connect to the NPCI's united interface through normal APIs to enable communications from Virtual Payment Address evading the need to segment account details or authorizations. In UPI solution, compensation authentication and authorization are constantly done using personal smartphone. Since this cover offers a united interface, many-to-many interoperable payments can be consummate using standard set of APIs.<sup>17</sup>

Some of the crucial APIs to allow UPI communications are:

- 1) **Payment API:** This is the chief APIs used for directing the transaction and is used to pledge Pay Request (Push Payment) and Collect Request (Pull Payment). The API comprises of remitter and recipient details.
- 2) **Authorization and Address Translation APIs:** They are used to obtain proper authorization details and interpret the specific Virtual Payment Address to the shared global addresses (Bank Account Number and IFSC Code, Aadhaar number). This permits customers to simply provide such virtual address to others (individuals, entities, etc.) devoid of having to expose actual account details.
- 3) **Keys Grade APIs:** Such APIs permit secure transaction and report of authorizations to legalize dealings by numerous units in the UPI ecosystem. Such of the APIs are used to demand for and cache the account benefactors and other units list of public keys. Reliable and certified NPCI libraries and services are used for credential capture and the PKI public key encryption at capture time.

## V. IMPACT OF UPI ON PAYMENT SYSTEM

UPI has spectator rapid growth since its presentation in August, 2016 in terms of amount of users, capacity and value of dealings. Currently 150 banks are live on UPI platform with additional 100 PSP UPI apps obtainable on app finding platforms. Within 12 months of presentation of UPI, more than 20 million customers have downloaded numerous UPI PSP apps. Entire value of transactions on UPI has grown 182% month on month meanwhile its launch with total managed amount of Rs. 287 billion till September 2017. The regular monthly value of dealings on UPI has now overtaken monthly dealings of all e-wallets put organized in India. The worth of transactions on UPI is presently as less as likened to value of credit and debit card trades which create about Rs. 2700 billion per month but the UPI is rising at a much faster rate. Presently person-to-person money transmissions constitute mainstream of UPI dealings while person-to-merchant dealings are presently very less. Influence on Expenditures in Physical Biosphere: Expenditures in the bodily world include money and debit or credit card dealings. UPI has the possible to transform expenditures in the offline biosphere as it offers a fee effective substitute to both currency and cards transactions. With UPI, dealers do not need expensive POS technologies to gather digital payments through cards, a trading will be capable to display a exclusive UPI QR Code which the client can scan with portable phone and kind the payment with the quantity being credited immediately into merchant's bank account. Business can receive payment approval over their mobile phones. Most cash dealings at trading point happen due to absence of digital acceptance mechanisms with merchants. The clients can also directly payat

seller's UPI ID and dealer will obtain confirmation on the mobile phone. Influence on Online Payments: At present, mainstream of online transactions is allowed by payment doorways with Debit/Credit Cards and Netbanking being the chief modes of payments. Customers are required to input all the delicate details comprising Card Numbers, Card Authentication Value, Net banking user names and passwords etc. This creates online payments susceptible to data leakages and

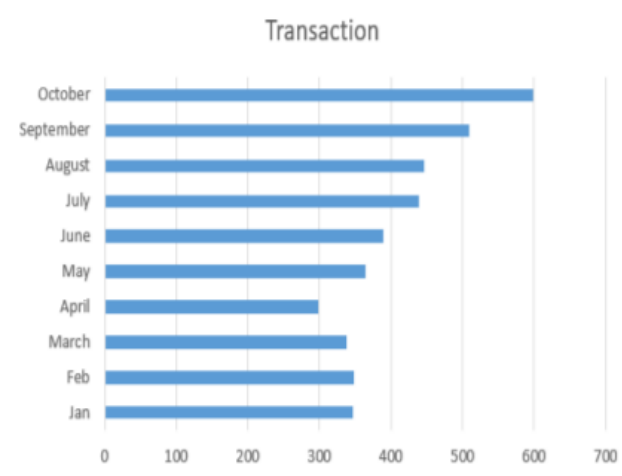


Figure 2

frauds. Also, there are a figure of network trips between card networks, issuer and obtaining bank to allow a business which leads to great disappointment rates of transactions. With UPI consumers need not deliver any info, a customer can basically scan a QR code shown on the website using a smart phone and payment can be done in seconds with a little network hops. This can not single avoid data leakages of any delicate data but also upsurges transaction attainment rates.

## VI.IMPACT OF UPI ONBUSINESS

Separately from being the maximum cost effective, fast and unified payment method UPI aids digital payments for an entire range of businesses equally for brick and mortar and digital merchants. For a physical business, each worker can be allowed to gather digital payments subsequently there is no need of any POS mechanism, each operative can be provided an exclusive UPI ID and QR Code which the staffs can extant to the client to collect payments. Apart from adjacent payments where the customers is bodily present at the promoting counters, UPI unlocks unique chances for businesses to gather payments where clients are not actually present For example. Insurance premium assembly, university fee and electricity bill expenditures etc. where payment demand can be sent to the consumer and client can pay remotely using smartphones. Another significant use case for industries can be to permit payment at the time of transfer. In India there is a large occurrence of cash delivery, nearly 60% of E-commerce deals proceed with cash payment being complete at the time of delivery. Such compensation at the time of delivery can be improved into digital imbursement at the time of delivery using UPI whereby a purchaser can easily recompense through UPI at the time of delivery.

## VII.EXPANSION OFUPI

NPCI have understood a radical rise in the quantity of relationship that banks and other monetary institute provide stage has doubled its rate from previous year and have anticipated to grow at the same rate. In a recent discussion Google vouched for India's UPI system and agrees to

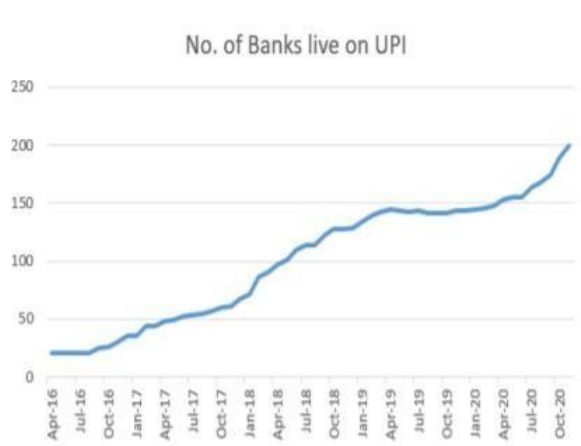


Figure 3

implement its functionality all over the world by the end of 2023.

## VIII. UPI 2.0 AND INTERNATIONAL EXPANSION

UPI has seen rapid growth that can be credited to the growing ecosystem encouraged by banks and added payment service players and cumulative adoption by the users. Safety, ease of use and expansion of business solutions are supreme to make UPI a payment arrangement of choice both for users and businesses. In this direction NPCI is coming out with an advanced version of UPI called UPI 2.0 with improvements in security, ease of use for clients and which open new use cases for industries and expand the UPI ecology. The noticeable features of UPI 2.0 are anticipated to include: Transaction verification using Biometrics: Currently users can confirm their payments using 4 - 6 digits MPIN. This MPIN can be created by the user on the PSP UPI App with the

capability to reset the MPIN as and when vital. This MPIN is saved by secure NPCI app and verified by the Issuer Bank. However, this use of MPIN has its own boundaries with consumers forgetting the MPIN and entering incorrect MPINs leading to non-successful transactions. Another apparent risk is fear of fake transactions in case of damage or robbery of mobile phone. To overcome these problems, UPI 2.0 will comprise transaction verification using biometrics of customer like fingerprint or iris (eye) prints. User will have the choice to validate the transactions using his/her biometrics. In order to allow biometric authentication UPI has been combined with Unique Identification Authority of India (UIDAI) which delivers online verification services including biometrics and OTP verification. UIDAI is the chief repository of biometric statistics of more than 1.26 billion or about 87% Indian population who have recorded for country's unique identity service through Aadhaar. Also, Aadhaar Number of the customer is now mandatorily associated to the bank account of the user. and iris prints of users. Such strategies will be required to be certified and registered with smartphone. Manufacturers are coming up with smartphone which can detect fingerprints and iris prints of users. Such smartphones will be required to be verified and registered with UIDAI to enable them to safely store the biometrics of the user. Once the customer agrees to authenticate the deal using biometrics, finger print or iris print stored on the mobile phone and communicated to NPCI in cryptographic form which then raises the UIDAI verification API on behalf of Issuer to validate the biometrics. *UPI Payment Mandate:* One of the major use cases for customers and insurance premium and debts EMI payments. To enable the business to receive scheduled payments and seamless experience for consumers, UPI 2.0 will have functionality where consumer can give one-time authentication for repeating payments to various merchants. While the command creation is a one-time activity, it permits user's account to be debited as per the mutual terms and condition, without the necessity for user to validate the transaction every time. UPI will bid the mandate service that will allow both remitter and recipient to create mandates or standing orders through their individual banks. This mandate shall be recorded immediately post the one-time verification by the remitter. To twitch with UPI 2.0 is expected to provision only revocable mandates and mandates can be created on Virtual Payment Discourse only. With UPI 2.0 all the loopholes existing in UPI 1.0 like numerous occurrences of identity theft have been resolved. An example of transactions initiated using the BHIM UPI executed in Singapore on 13<sup>th</sup> November, making it the first time that the technology has been used for making payments globally, according to a PTI report. The development is anticipated to launch by February 2020. It is together developed by (NPCI) and Network for Electronic Transfers (NETS) of Singapore. After the project is executed, anybody with a BHIM UPI will be able to make transactions at a NETS endpoints by scanning the Singapore Quick Response Code (SGQR), and the sample would be live till November 15, the report said. At this instant, we don't know if additional UPI app, such as Google Pay and PhonePe would also role in Singapore. Prime Minister Narendra Modi had propelled the BHIM app in Singapore previous year along with RuPay and UPI allowed transmittal app by State Bank of India.

Succeeding the launch, RuPay consumers could make payments at all NETS recognition points across Singapore. The expansion of UPI to Singapore and UAE originates afterward the Nandan Nilekani led committee on digital payments had suggested that NCPI should enlarge payment facilities like UPI, RuPay and BHIM to other republics as well. The fund transfer system could quickly be used in the United Arab Emirates and Singapore. These 2 countries have by now opened to India's RuPay cards and discussions are on to inductee the UPI imbursement services too. Both have a ample population of Indian emigrants. The summary of the UPI payment system could also be a large boost for Indians travelling to such countries.

NPCI has been totalling more functionalities to the UPI framework. In August 2018, it tossed UPI 2.0, which lets clients link over-draft accounts to the edge. It added functionalities for merchants such as provision for invoicing. Shortly, UPI apps will get features such as standing orders, which permit the possibility of recurrent payments such as SIPs in mutual funds, and monthly payment. Reports said that Indians travelling to Singapore and the UAE would be permitted to pay via UPI for products and services there in a few months. Maximum banks have reserved UPI transactions free of cost. UPI's noteworthy feature, which even a Google executive emphasized, is its real-time deal. Transfers are immediate from one bank account to another curved the clock. The consumer does not need to stake credentials such as bank account details or the bank codes. A distinct user can use many bank accounts on a single application. For the 1<sup>st</sup> time in India, a receiver can request for money through the application, the requestor does not requisite to part authorizations such as bank account details or bank codes making it easier for merchants to use it. Its two-factor authentication makes it secure.

## IX. CONCLUSION

UPI has allowed smart phone to be used as a major payment device for sending and receiving payments. UPI influences high teledensity in India to allow every bank account holder to make online transactions using a mobile phone. India, which has a bad merchant payment recognition infrastructure UPI, allows even the smallest merchant to start accepting online payments without the need for any external machine. UPI has completed the need to distinguish the complicated payment details of the transacting parties, which makes expenditure easy and unified for transacting parties.

Associated to all other payment systems it would not be inappropriate to say that UPI is the most progressive payment system in the world. With its normal set of APIs, UPI has permitted different banks to interconnect with each other and has allowed interoperability between dissimilar bank payment systems. In UPI there are no mediators like in card networks, which permits for low transaction costs and immediate settlement. While all other online modes of payments like card setc. take times to ample the transaction and settlement procedure, UPI permits payment to be completed in seconds. UPI works on a safe, secure and healthy platform with ample safety features to make it more secure than any existing payment systems. Introduction of biometric verification in UPI will not only make payments more protected but will also take a massive leap towards integrating advanced generation technology with existing payments system. UPI can be a great technology for financial institutions in India and enable a huge set of population to be a contributor of digital economy.

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