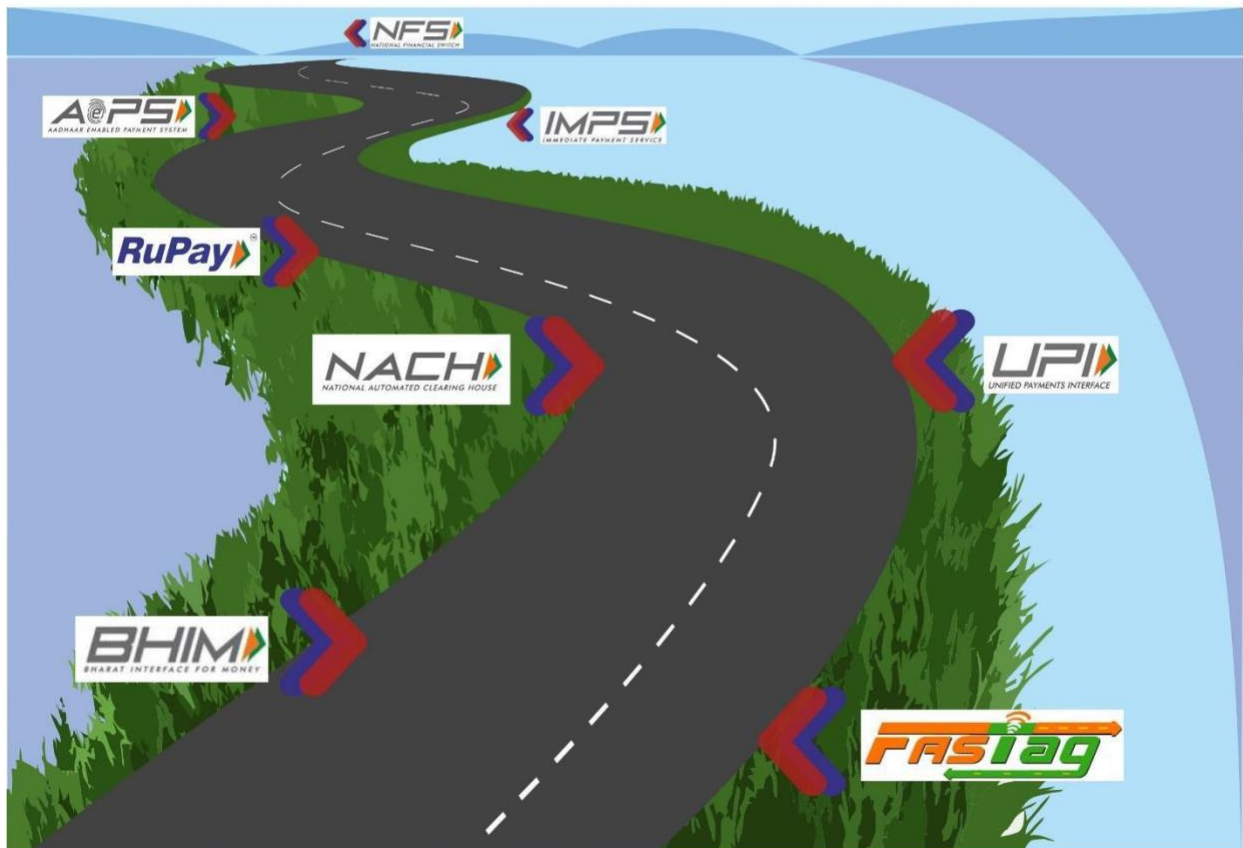भारतीय प्रबंध संस्थान बेंगलूर
INDIAN INSTITUTE OF MANAGEMENT BANGALORE

NPCI: Chartering a Payment Freeway
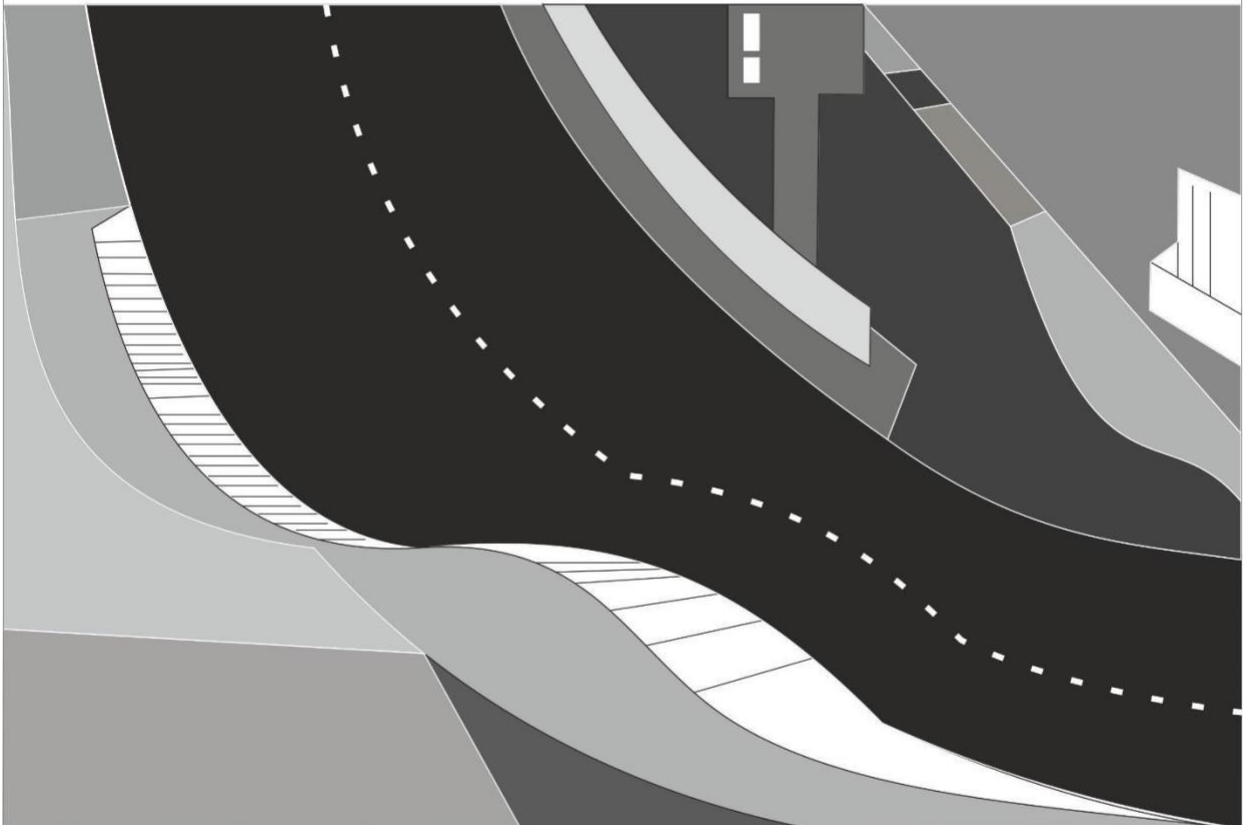
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NPCI: Chartering a Payment Freeway

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ACKNOWLEDGMENT

Contents

1. Background of NPCI

On August 24, 2019, The Prime Minister's Office of India proudly announced the arrival of the RuPay card in the UAE with a Tweet that said, "The RuPay card comes to UAE". The launch of the electronic payment card marked the culmination of a decade of diligent effort by the National Payments Corporation of India (NPCI).

NPCI was incorporated in 2008 as a joint initiative of the Reserve Bank of India (RBI) and the Indian Banks' Association (IBA) with an ambitious vision of becoming the "best payments network globally" and a mission to touch "every Indian with one or other payment services". The government envisioned NPCI as the pivot of the payment-and-settlement infrastructure in India, particularly to address the need for a robust 'backbone' to digitize the economy. This was best served by an entity promoted by the stakeholders themselves.

NCPI started off in 2008 by taking over the National Financial Switch (NFS) from the Institute of Development and Research in Banking Technology (IDRBT), and began formal operations in 2010. Since then, it has made rapid progress as the vanguard of the fintech revolution in India over the last decade. It came up with a range of services and products: IMPS, CTS, NACH, UPI, RuPay, BHIM and AePS to name a few, all of which have helped the banking sector its much acclaimed achieve national penetration. It has gone on to become the backbone to ATM operations and has emerged as the prime vehicle of the Government's ambitious direct benefit transfers. Across departments, 'we surprised ourselves' is a refrain we often hear. In just one decade, NPCI has grown 10 times—from handling 2 mn transactions per day to 22 mn transactions per day — and is well on its way to its target to process 100 mn transactions per day. As Praveena Rai, Chief Operating Officer (COO), says, NPCI's vision is to serve one billion citizens with one digital payment system. According to her their employees are excited by this challenge and the learning they will be exposed to.

Although NCPI is incorporated as a "not for profit" company and in governance and operations subject to similar conditions of transparency, audit and regulations of PSUs, it is closer to private sector in management style. Its promoters include banks from both the public and private sector, which makes it truly representative. As a Sec 25 company incorporated as per the provisions of the Companies Act 1956 (now Section 8 of Companies Act 2013), NPCI cannot distribute dividend, but can book profits, which it has been. As a Sec 8 company, NPCI is also restrained in pricing, and by design, avoids exploiting its market strength in certain areas of payment technology. It has been a socially responsible corporate, operating for public good, making normal profits but not seeking extra-normal profits like a regular free-market company. It is commendable that NPCI has achieved its level of scale, penetration, and corporate vibrancy within the framework of being a quasi-public sector in a highly dynamic, competitive fintech world.

The bigger story, however, is about where exactly it stands out in this competitive market, and how it maintains its innovative and technological edge. Dilip Asbe, after taking over as MD & CEO from A.P.Hota, who was MD & CEO in 2017, started building on the foundation laid by his predecessor. The questions concerning NPCI at the time were manifold: What would the market, industry structure, and technology look like in the future? Will the pricing model, of charging nominal price and with the threat of zero MDR, pose a threat to the sustainability while keeping pace with the market? What would be the competitive advantage of NPCI in market-driven products? How would NPCI remain a preferred employer? Will the present organizational design need reconfiguring to deliver growth and innovation? To reflect on these questions, NPCI undertook a visioning exercise in 2016 and started the Transformation Programme, which Asbe refers to as the 'Run, Grow and Transform Programme'.

2. Genesis

NPCI was set up under the Payment and Settlement Systems Act 2007 as a 'not-for-profit' organization conceived on the recommendation of the Payment and Banking Systems Board set up by RBI in 2005. The Vision document of the Board envisaged creation of a central institution to enable electronic exchange and retail payment systems of the nation. The original objectives were to consolidate and integrate multiple retail payment systems with varying standards into uniform nation-wide system and standard business process. The establishment of NPCI marked the culmination of two decades of automation of payment settlements through Magnetic Ink Character Reading (MICR) introduced in 1986, and the Electronic Clearing System (ECS) in the mid-nineties, which were under the management of The Institute for Development and Research in Banking Technology (IDRBT), a fintech research and technology lab, an arm of the RBI. NPCI began operations once it took over the National Financial Switch (NFS) from IDRBT in 2009, a that time when NFS was already stretched to its limits. The birth of NPCI was well-timed, and coincided the eve of the fintech revolution in India. NPCI brought together ten promoter banks; namely State Bank of India, Canara Bank, Punjab National Bank, ICICI Bank, Bank of Baroda, Bank of India, HDFC Bank, HSBC Bank, Union Bank of India and Citibank N.A, with a combined contribution of ₹100 crores. By 2016, post a second round of funding to the tune of ₹119 crores from 46 banks, the shares were widely held, by 56 member banks representing entities across the banking spectrum. As of March 2020, NPCI's equity has grown to ₹1664 crores.

At inception, NPCI set itself the goal of transforming India into a 'less-cash' society by touching every Indian with one or other payment services. Since then, it has been consistently moving towards its fulfilling its vision to "*be the best payments network globally*". It seeks to be driven by the values of passion for excellence, integrity, customer-centricity, respect, and collaboration. The

stated vision of NPCI is to be able to provide citizens 'anytime, anywhere' payment services that are simple, easy to use, safe, secure, fast, and cost-effective.

NPCI is being fully leveraged by the present government through the ambitious Pradhan Mantri Jan Dhan Yojana (PMJDY), AePS, and RuPay, an indigenously developed Payment System. It has also launched a portfolio of products such as the Immediate Payment Service (IMPS), Unified Payments Interface (UPI), Bharat Bill Payment System (BBPS) and the National Electronic Toll Collection (NETC) to fulfil various niche requirements. These products were created with an aim to enable every Indian to access at least one of the payment services (www.npci.org.in). The evolution of these products and services can be seen in Annexure 1 on milestones. NPCI has managed to achieve high volumes at economical cost structures and nominal charges by following asset-light technology and operational strategy across all the product and service lines. The summary of the performance on various physical indicators can be seen in the Table 1.

Table 1: Summary Factsheet

Product	Achievement		Product	Achievement	
NFS	Direct Member Banks	113	IMPS	Member Banks	498
	Sub – Member & Others	1,038		PPIs	26
RuPay	Enabled PoS Terminals	27,40,671	*99#	Live Banks	86
APBS	Live Banks	967	NACH	Unique Banks	1,320
	Aadhaar Numbers in NPCI Mapper	64,73,49,491		ACH Credit	1,311
AePS	Live Entities	145		ACH Debit	983
	EKYC Live Entities	125		Active Physical Mandate Count	6,59,29,035
	BHIM Aadhar	87		E-Sign Active Mandate Count	7,86,370
UPI	Live Banks	155			

Source: NPCI Website in May 2020, https://www.npci.org.in and NPCI Corporate Presentation

3. Trend and Trajectory

NPCI has been both driving and being driven by the fintech revolution that India has been witnessing in the recent years. It received great impetus from the government, which viewed NPCI as a platform for driving its goal of inclusive banking through digital technology. It also got a tremendous thrust from Demonetization in 2016, as a result of which people from various walks

of life, especially those at the bottom of the pyramid, started using electronic payments actively. Demonetization helped break the general public's fear of technology by inducting them into fintech and retail banking products. NPCI rose to the occasion by rapidly ramping up its products, technology, and scale of operations. The stabilization of existing businesses and operations, ensured sustainability and continuity, but the thrust was to become 'omnipresent', which Asbe described as the drive to become the payment platform of the world, and to go global while at it. NPCI has already achieved global benchmarks in service and delivery, and is now preparing itself for the next scale of activities. The annual growth in volume and value of transactions for various payments instruments of credit cards, debit cards, mobile banking, ATMs and POS are given in Tables 6,7,8,9,10 and 11.

As seen in Table 6 and Table 7, NPCI handled a total transaction volume of 2,668 million and ₹14,123 million in values during the period of 2019 – 2020. In contrast, it was just 3,709 in volume and ₹76,111 million in value in 2014 – 15. Similarly, the growth in volume of non-financial transactions and the related value is provided in Table 11. The value per transaction of various modes of payments like cards and prepaid instruments are given in Table 8. The status of ATMs and POS machines are given in Table 9. The monthly statistics of the volume of transactions under various modes are given in Table 6, and the corresponding value in Table 7. It can be seen that both the volume and value have been growing exponentially since 2016. One of the historical markers is Nov 2016, which was a major contribution to the digital payments system. There was a marked spurt, followed by a period of slack, and growth further forward. What emerges from this is that demonetization helped in breaking the barrier, and once the new adopters got used to it, the practice found acceptance with force across the country.

4. Indian Payment Industry

India is cash - dependent economy with approximately 18% of its GDP circulating as cash. RBI and other commercial banks spend approximately ₹2100 crores annually on currency operations. Cash payment signifies that a large section of the informal sector remains outside the banking sector. The Government sees payment technology as an instrument to handle both these issues. Ideally speaking, rapid progress in communication technology, smart phone penetration, varied choice of digital payment methods, and the wide availability of secured and hassle-free payment systems should reduce dependency on cash. The payment industry comprises of various channels like cards, mobile wallets, internet banking, POS and MPOS (Mobile Point of Sale), and payment gateways. A key instrument is debit card transactions, the volumes of which are growing at an annual rate of 16%,while credit cards grow at 25% as of 2016 (Axis Capital Ltd., 2016). There are also pureplay tech players offering mobile wallets, and MPOS operated by new players like Ezetap, Mswipe, and iKaaz (Ken Research, 2015).

The main catalyst that ignited a revolution in the payments industry is the JAM (Jan Dhan - Aadhar - Mobile) initiative. In 2014, Prime Minister Narendra Modi launched the ambitious financial inclusion project known as Pradhan Mantri Jan Dhan Yojana (PMJDY).Around 270 million bank accounts, with a net deposit of US $10 billion, were opened by February 2017 (Desai et al., 2017). A few important trends helped the penetration of these projects. The Aadhaar scheme, a unique identity system introduced by the Government, which combined biometric and demographic data, helped speed the penetration of bank account opening. Around the same time, smartphone penetration exploded in the country to about 300 million users, and more than a billion phone subscribers. These phones were linked with Aadhaar numbers to comply with eKYC regulation.

India has 2,43,008 ATMs and 1.3 million Point of Sale (POS) devices with a 23% growth rate as of March 2020. However, these numbers are low, given the large geographical spread of the country and the size of its population. In comparison, USA, a developed country with a smaller population, has 5.5 million POS stations, and BRIC countries like China and Brazil have 15 million and 7 million POS stations, respectively. Mobile-based payments have been another driver of growth in the segment. India has about 600 million registered mobile accounts and 250 million smartphones in use, and NPCI has been proactive in making its products mobile-enabled. IMPS was the first attempt at mobile-based banking systems, followed by the Unified Payment Interface (UPI), which enabled micropayments. Micropayment services facilitate routine online payments possible without any hassle. Periodic payments like utility and mobile bills, tolls, cabs, etc are also facilitated through micropayment technology. Recent efforts are towards 'Tap and Go' payments, as an extension of current payment technologies and services.

5. Growth Drivers

NPCI has been at the center of the payment technology moment in India, both driving it as well as being driven by it. This has been facilitated by certain growth drivers, which it leveraged to its distinct advantage. NPCI's story is one of a combination of policies, technology, and time. When asked about the key drivers of the rapid scaling at NPCI, Asbe mentioned five factors which contributed to it. These were: The vision of NPCI as set forth in the Vision Document of Committee by the RBI, the support extended by the promoters and user banks, the top-tier management team that has helped to keep pace with the developments and challenges in the field, the overall ecosystem of technology, innovations in payment systems, industry users and consumers, and finally, the strategic push by the government through its various schemes and policy measures. The RBI has been proactive and supportive of the digital payment system, and it has always facilitated its pace with an enabling regulatory environment (Annexure 1).

This sentiment is also echoed by Cook and Raman (2019), who attribute the following factors for the "role played by NPCI in transforming the way India manages financial transactions", and for the success of NPCI:

- "An industry-led approach to ownership and governance, with strong regulator backing
- Competitive economics through a utility model, mixed with smart growth and a startup culture
- A strategy of incremental, open- source product development
- A government/regulator that uses carrots, not only sticks
- A government/regulator that balances caution with progress"

Leading aggregators and the start-up ecosystem responded with alacrity, developing new products and services that customers and beneficiaries have adopted rapidly. NFS helped it position itself centrally. Thanks to being promoted by member banks and being fully supported by the Government and regulator, NPCI has come a long way in fulfilling its mission and to serve its goal of technology-driven financial inclusiveness in India.

Access is a key aspect of financial inclusiveness. In terms of physical branches, India has 1,30,000 bank branches with an equal number of business correspondents (BCs). Banks have mobilized more than a billion accounts, with the number of active bank accounts being close to 500-600 million. The RBI introduced another category of banks called payment banks, along with small-finance banks and 36 prepaid service providers to address the requirements of this new category. NPCI has been instrumental in ensuring the inter-operability of transactions among these prepaid services and banks.

The 'triad of strength' of NPCI is Technology, Marketing, and Human relationship Management. NPCI has managed to be competitive while retaining its edge in technology, human resources, and infrastructure consistently. It has managed to move beyond its mandated product portfolio and has make a mark in the fintech product markets, while remaining a lean organization.

Several prestigious awards bear testimony to their achievements in various spheres:
- Financial Express India's Best Banks Awards - Fintech 2017-18
- The Hindu Business Line Change Maker Awards - Changemaker of the Year 2018
- TiE Mumbai Hall of Fame 2020 - Outstanding Value Creating Institution

Award for Outstanding Value Creating Institution

6. Governance and Stakeholder Partnership

6a. Governance

NPCI started as an SPV promoted by a group of banks from the public and private sectors, widely held, and representative. Since inception, it was clear that NPCI would follow the governance framework of the private sector, which was one of the purposes of setting it up as an autonomous corporation. It adheres to corporate governance structures, with an independent board and management by board-level committees. Its CEO is appointed by the board, with approval from RBI. NPCI is subject to audit by C & AG and is bound by applicable public procurement regulations and transparency norms but remains outside the purview of the Central Vigilance Commission. The Board is headed by a Non-executive Chairman and consists of the CEO, one Nominee Director of RBI, five Independent Directors, and six nominee Directors representing shareholder banks. It has a professional board, with representation from banks from the public and private sectors, academicians and management consultants. It is also balanced with representation from policy-makers, regulators, public and private banks, and outside experts. The list of Board Members presented in Annexure 2.

An important aspect of NPCI's board governance is role of committees, which enables them to address issues with a drill-down approach. The Board is supported by various committees like the Nomination and Remuneration Committee, Audit Committee, Risk Management Committee, HR committee Technology and Project Management Committee, Business Strategy Committee, Committee of Independent Directors, and a Corporate Social Responsibility Committee. There is also an advisory committee, headed by Nandan Nilekani, who served as the chairman of the

Unique Identification Authority of India (UIDAI). This committee oversees innovations and public policy. In addition to these, NPCI has an Innovation Committee, Technical Advisory Committee, and a Risk Advisory Council, along with Steering Committees and Working Groups (www.npci.org.in). The organization follows structured and systematic processes with stated policies for audit, whistleblower, code of conduct, CSR, etc. wherever necessary. NPCI partners with specialists to address specific issues in governance.

The first Managing Director and CEO of NPCI was Hota, he was appointed in 2010 after his stint in the Department of Payment and Digital Systems of the RBI, where he helped draft the Payment and Settlement Systems Act of 2007. Hota steered NPCI during the early stages of institution-building, and laid a strong foundation for its future. He was instrumental in rolling out several products which were scaled up eventually. N.R Narayana Murthy was the first Interim Chairman, appointed on 1st August 2009.

In the beginning, industry players were not enthusiastic about NPCI. Banks, especially the private ones used to the sophisticated and technology-savvy global credit card players were lukewarm to NPCI. However, Hota's push and perseverance in the initial years helped NPCI spread its network and build trust in the market. As a person with regulatory experience, he was able to ensure that strong governance practices were put in place. Post his retirement in August 2017, Asbe took over, who was serving as COO before taking over the mantle of CEO. He had been involved in the launches of all NPCI products, making for a seamless transition. Since then, he has been engaged with efforts aimed at scaling up the organization and building on its strong foundation. The current non-executive Chairman is Biswamohan Mahapatra.

6b. Stakeholders Partnership and Engagement

The shareholding pattern of NPCI is widespread, with 56 banks participating. It includes representation from both public and private players in the banking sector, setting the stage for wider acceptance. The banks were represented in the Board as well.

NPCI enjoyed several advantages thanks to being promoted by banks. Its first product, NFS, was acquired from IDRBT, which helped NPCI open its window to all banks. However, NPCI did not rest there and was quick to launch several products which went on to become the backbone of financial services in India. NPCI has not shied away from launching products which are market driven either, but has always followed a strategy aimed at winning over its client base with nominal pricing and good service, than by just leveraging its unique pivotal position in the market. They maintain strong relationships with banks, many of which are often co-opted to be part of NPCI's steering committees. The member banks are consulted right at the design stage of products and services development, and pilots with select banks are carried out before any scaling-up is

undertaken. Banks, over the years, have become more open to NPCI's innovations, a visibly positive move from their reluctance to move to the NPCI platform in its initial years. At an operational level too they maintain close relationships at various levels with client banks. Continuous vigil on transactions helps them alert banks whenever any breach is detected. Periodic reports on their performance on various products and services are also made available to stakeholders.

7. Product Portfolio

Over the years, NPCI has evolved into a full-service provider of fintech solutions, and has proven to be a solid backbone to the payment infrastructure of India. It started with mandated settlement services like NFS, IMPS, CTS, from where it moved on to dominate market-driven products like UPI, RuPay, etc. Settlement services progressed from covering ATM-type transactions to cheque truncation and settlement services, and from a whole range of instant services to bulk services. Each service evolved in response to emerging market requirements, from ensuring that instantaneous settlements at par with global standards, to enabling bulk transfers such as direct benefit transfers. NPCI's settlement services are now very comprehensive, and covers all possible market requirements. A cluster of NPCI's portfolio of products and services, along with timelines are presented in Fig 1 below.

NPCI has also kept pace with the fast-growing fintech world, launching multiple products simultaneously in the B2B and B2C segments of the market. It launched UPI the interoperable platform services, which enabled multiple payments systems as well as multiple players to come on board, while simultaneously launching products like RuPay, which serve the final customer. The market is pyramidical in structure, and this segment can be viewed as the baseline bottom layer that covers the non-mobile segment. The middle layer covers a vast segment with feature mobiles, and the top layer comprises smartphone users, which has become the main attraction to every player building on previous layers. NPCI's portfolio of services and products which meets the niche requirements of this hierarchical market-structure is provided in Fig.2.

Another approach to segmenting is based on the interface of Customer, Beneficiaries, Public, Business, and Government. Each segment presents its own unique complexities and special needs, and NPCI plays the role of a robust backbone as well as a frontal entity in these segments, as shown in Fig 3 below.

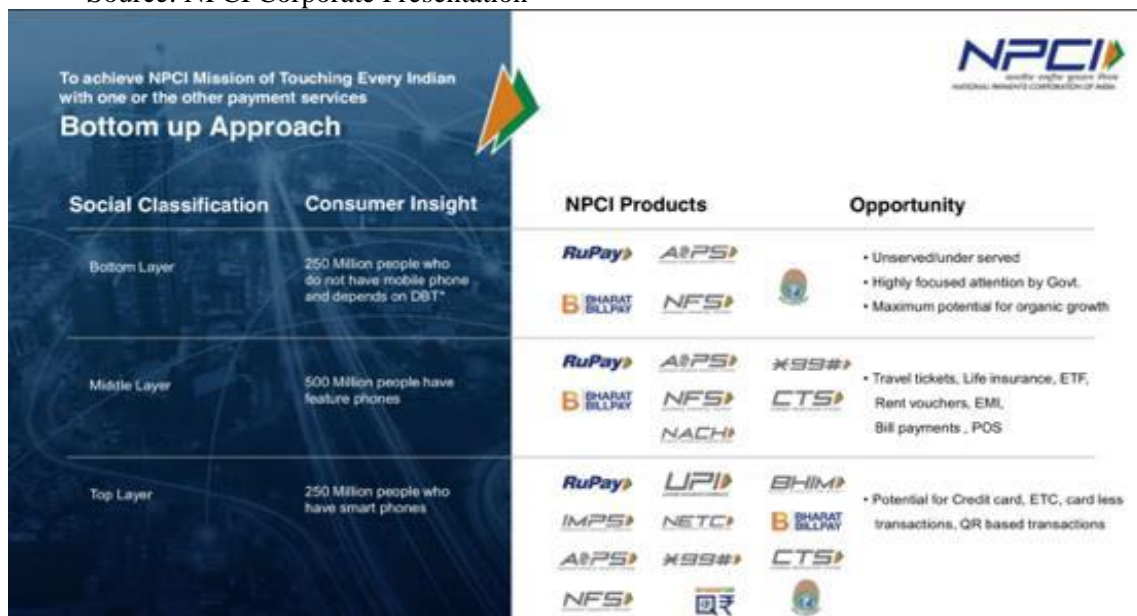**Figure 1: Timelines of Various Payment Services**

Source: NPCI Corporate Presentation

While UPI powers the C2B, B2B, and P2P segments, NACH serves the B2C, P2G, and G2P segments. BHIM, on its part, powers transactions in the C2B, B2B, P2P, and P2G segments.

Figure 2: Portfolio of Products and Services of NPCI

Source: NPCI Corporate Presentation

The market-driven products of NPCI are developed keeping in mind the 'access' customers have, to technology and banking services, and their usage of these. There are crores of users who lack even feature-phones, and crores of customers wanting to transact in low-volume and high-frequency. NPCI made it possible to cater to even the lowest market segment thanks its ability to keep the cost structure of financial products low in India. NPCI has developed several products keeping the interest of the Government in mind, Bharat Bill Pay, or FASTag being the flag bearers. All its products have been consistently successful, and are being scaled rapidly to serve the intended market segment. Even in market driven products like RuPay, NPCI operates like they are public goods than a private good. The product wise per minute transaction in volume of various products is presented in Table 2.

Table 2
Product wise per minute transactions in volume (as of May, 2020)

Product	Volume
RuPay	6505
BHIM	317
UPI	28576
AePS	10097
NETC	1277
BHARAT BILLPAY	383
NACH	4976
CTS	709
NFS	7245

Source: NPCI Corporate Presentation (May, 2020)

The features and evolution of the product portfolio are presented below, to highlight the journey the products have gone through. The descriptions are largely taken from the website of NPCI, corporate presentations, and from the discussions we have had with their officials.

Figures 3: Products Business Type-wise

Source: NPCI Corporate Presentation

7.1 National Financial Switch (NFS)

NPCI started with the NFS, which was transferred to it from IBDRT. The migration from paper-based cheque-processing to electronic payment-processing took time, but made rapid progress subsequently. As of May 2020, NFS supports 1,151 members including 113 direct participants and 981 sub-members, 50 RRBs, 7 WLAOs (white-label ATM operators) linked to more than 2,48,000 lakhs ATMs, including recyclers. Its subscription model enabled even smaller regional banks, including cooperative banks, to participate. It follows global standards, and maintains an uptime of more than 99.5%. It has developed a reliable Dispute Management System (DMS) with high operational effectiveness. It is also linked to Discover Financial Service (DFS), Japan Credit Bureau (JCB), and China UnionPay International (CUPI), which enables its cardholders to use NFS-connected ATMs in India. The Asia Pacific region is a fast-growing market for ATMs, and India is one of the fastest growing regions.

7.2 Immediate Payment Service (IMPS)

Immediate Payment Services (IMPS) was launched in November 2010. Until then, there was no provision for transfer of funds 24x7x365 in real-time interbank operations in India. The country joined the Real Time Gross Settlement (RTGS) in 2004. However, funds could be transferred only through NEFT and RTGS during banking hours. NPCI tested a pilot in August 2010 with major banks like SBI, UBI, BOI and ICICI participating on the mobile payment system. The product was formally launched in November 2010. IMPS was created to provide interbanking facilities 24x7,

through various channels like mobile, internet, ATM, SMS, Branch and USSD (*99#), all of which are supported by NFS.

The main participants of the IMPS are the Remitter (Sender), the Beneficiary (Receiver), banks, and NFS. A Remitter will have to register with the mobile banking service of any bank to avail this service. They will be provided with a Mobile Money Identifier (MMID) (a 7-digit code) and an MPIN from the bank. The remitter can then either download the software application for mobile banking or use the SMS facility (if the bank provides IMPS through SMS) to carry out transactions. The beneficiary is required to link their respective mobile number with the bank and have to obtain a Mobile Money Identifier (MMID). The remitter can then send money by logging in to the application and entering the beneficiary's mobile number, followed by the MMID and MPIN. Once the funds are transferred, a confirmation SMS is sent and a transaction number is provided for reference. An appropriate two-factor authentication method is used for security. The service comes with a cap on the amount that can be transferred through this method. The IMPS enables customers to use mobile devices to access bank accounts and perform transactions like funds transfer, making payment mechanisms simpler. IMPS laid the foundation for a range of mobile banking services that followed.

IMPS was recognized as one of the premier global payment technologies by Fidelity National Information Services (FIS), out of 40 active real-time payment programs worldwide. FIS mentions this in its fifth annual 'Flavors of Fast' report (FIS, 2019). IMPS was also awarded the 'greatest innovation' in fintech, beating payment facilities from the United States and China. It is recognized as the world's fastest growing instant payments system, with a daily volume of transactions rising from about 216.82 million a day (₹11.27 million in transaction value) in 2016 - 17 to around 2.58 million a day and ₹23.37 million during 2019 - 20 (Table 10). According to the FIS study, the elevated rating of IMPS was based on the tested standards of the system, published API (application program interface) and the demonstrated involvement from third party suppliers.

7.3 Cheque Truncation System (CTS)

The Cheque Truncation System (CTS) was launched in April 2011 to provide for faster clearance of instruments. Since MICR and image data travel together in this system, reconciliation amounts are not required; cheques are not lost, tampered or pilfered; and the risk of data manipulation during transit is mitigated. All these features provides enhanced security and automation. This process also eliminates paper movement and provides for fraud management. Furthermore, data and image manipulation are prevented through the use of digital signatures and encryption.

Despite the obvious benefits, implementation of CTS took time because regulation was a major impediment to cheque truncation in all countries. New Zealand was the first to pass a regulation

that amended its Cheques Act of 1960 in 1990,paving the way for electronic submission of cheques. Other countries followed suit, including the United States, which passed the regulation in 2004. In India, the RBI set up a working group under the chairmanship of its Executive Director R. B. Burman, who submitted a report in July 2003.

Prior to CTS became operational, the MICR system took care of cheque transactions. 66 MICR centres and 1,264 Non MICR centres were handling clearing and settling MICR-based cheques in their geographical area of operation. The cheques moved physically, and it took an inordinate amount of time for final settlements. In the CTS system, the physical instrument is truncated at the presenting bank's end either at the branch level or at the service branch level. The captured images and data are then transported electronically to the drawee bank on the same day for processing. The clearing locations are divided into 3 regional grids, and all clearing houses of a grid are settled together on a T+1 basis. It follows a nominal pricing policy as mandated by the RBI. India is now considered the leader in the implementation of robust cheque instrument features. NPCI ensures 99.99% uptime, while handling an average daily volume of upto 4 million transactions per day. The current system is benchmarked to process instruments upwards of 7 million transactions per day.

7.4 National Automated Clearing House (NACH)

NPCI introduced the National Automated Clearing House (NACH) in December 2012, in response to a huge demand for an automated clearing house for bulk high-volume transfers from financial institutions, government, and corporate houses. The NACH is a web-based platform to facilitate high volume interbank electronic transactions that are repetitive in nature. This channel can be used for bulk transactions to give subsidies, interests, dividends, pensions, salaries etc. and for payment collections for utility services like telephone, electricity and water, as also investments in mutual funds, loans, insurance premiums, etc (www.npci.or.in).It is a consolidated platform for 'pull' transactions that were otherwise processed in a decentralized mode across 81 centres, which led to operational inconveniences, especially to corporates.

As per the directions of the RBI, it is necessary for the customer to provide a mandate to corporates for initiating debit request to his/her bank for collections. In the ECS platform, the mandates were physically exchanged between banks; and this process took up to 30 working days. The introduction of the Mandate Management system (MMS) under the NACH helped reduce the turnaround time to a maximum of 10 working days. Under NACH, banks were required to send the mandate image along with data instead of the physical mandate. NPCI also introduced E-Mandate, to migrate from the paper-based model to an electronic model, through which customers could authorise transactions by themselves. This helped in reducing the turnaround time further. NPCI has prescribed a set of rules for NACH-based operations and business, and has also

defined standards and best industry practices for all the electronic transactions. These are common for all participants, service providers and users alike.

NACH is an important platform that supports the goal of financial inclusion set by the government and enables direct benefit transfer related transactions pursuant to Aadhaar linking. The platform aims to provide a dynamic, robust, secure and scalable platform for transactions and file-based transaction procedures for all participants. It is designed with the best security features and payment performance, with a multi-level validation facility for data that can be accessed by any participant of the platform across the country. The system targets 99.99% uptime, with a processing capacity of 30 million transactions per day, scalable up to 50 million transactions.

7.5 Aadhaar Enabled Payment System (AePS)

AePS delivers the '4As for financial inclusion' to rural India: Authentication of customer, Availability of services, Accessibility through AePS channel, and Affordability of service (it is provided free of cost to customers). The linking of Aadhaar with bank accounts opened many possibilities for Direct Benefit Transfer (DBT) and other financial payments in India. NACH's Aadhaar Payment Bridge (APB) facility, which helps the Government in executing the DBT scheme is a good example of this inclusive system. The RBI constituted two working groups — on Micro ATM standards and Central Infrastructure; and connectivity for Aadhaar-based financial inclusion transactions to further the goal of financial inclusion. The groups recommended that NPCI should develop a Proof of concept (PoC) for the integration of the authentication and encryption standards of the UIDAI, and to check the efficacy of Micro ATM standards and transactions using Aadhaar. The PoC was successfully piloted at various locations. Notably, piloting products before launching these full-scale has been one of NPCI's strategies. AePS was created as a bank-led model that allowed inter-operable financial inclusion transactions at Micro ATMs through Business Correspondents (BCs) using Aadhaar authentication. This system limited types of transactions. As per the system, the only requirements from a customer for conducting a transaction are the IIN (for identifying the bank of the customer), the Aadhaar number, and a fingerprint (captured during enrolment).

The AePS serves the financial inclusion goal of the Government of India and facilitates easy transfer of social benefits like NREGA, pensions, scholarships, etc, according to Denny Thomas, Incharge of NETC and AePS. . It is compatible with any government form (Central or State) that uses the Aadhaar-based authentication system provided by the UIDAI. This has helped bring in transparency, and has helped in plugging several types of leakages in benefit transfers significantly.

7.6 RuPay Cards

The products and services described so far constitute the backbone to payment system, which mandates that financial institutions are compatible, and used heavily by Government agencies. Although the primary goal of the NPCI is to deepen financial inclusion, it also promotes products which are market driven. According to Nalin Bansal product Head, RuPay and NFS was launched to fulfil the RBI's vision to offer a domestic, open-loop, multilateral system that will allow all Indian banks and financial institutions to participate in electronic payments. RuPay was launched by the NPCI in March 2012 as a card payment scheme to achieve the RBI's vision of introducing a domestic card. In fact, the very name "RuPay" was coined to invoke a feeling of nationality among users. The logo has two arrows — in orange and green resembling the national flag — indicating a nation on the move, and service that complements the pace. The blue colour indicates tranquillity. (www.npci.org.in). The RuPay card was first proposed in the 2004 Report of the RBI, and was publicly announced by the Finance Minister later in 2009. It was first launched as debit card, and later as an international card. Programmes like Jandhan contributed greatly to its success.

As of May 2020, RuPay comprises598 issuance banks, 38 acquiring banks, 11 e commerce acquiring entities, 15 live aggregators, 695 RRBs and cooperative banks on ATMs, 252RRB and cooperative live on e-commerce, 557 RRBs and cooperative banks live on PoS, and 436 RRBs and cooperative banks live on EMVs (Table 3). On the international front, RuPay has partnerships and associations with Discover Financial Services, JCB International Co Ltd, and UnionPay International Co Ltd. Their endeavour for future growth is to deepen merchant acceptance and increase their retail as well as international reach.

Table 3: RuPay Factsheet

Banks issuing RuPay Cards (including Co-op Banks and RRBs)	1100+
Banks issuing Platinum Debit Cards	95+
Banks issuing International Platinum Debit Cards	35+
Total No. of RuPay Cards (Nov 2019)	624 Mn
Banks issuing RuPay Credit Cards	14
Total no. of Credit Cards (Sep 2019)	2.6 Lacs
Total Rupay POS transaction in F.Y. 2019-20	233.05 Mn
RuPay transactions on E-Com in F.Y. 2019-20	458.44 Mn

Source: NPCI Corporate Presentation and npci.org.in, NPCI Corporate Presentation (May 2020)

The RuPay card provides flexibility and enjoys high levels of acceptance in India. RuPay carries out transactions domestically, making it very affordable by keeping the cost of clearing and the settlement very low. India is now the sixth nation globally to have its own gateway for national payments, following USA, Japan, China, Singapore and Brazil. RuPay ensures that customer data and transactions data reside in India, adding a layer of protection for consumers. RuPay targets hitherto untapped rural, thanks to its attractively priced product offering. Banks benefit from usage of RuPay cards by saving at least 25-30% of the switching and cardholding cost compared to its counterparts MasterCard and Visa. The biggest challenge, however, remains to motivate private sector banks and other mainstream banks to convert to RuPay cards (Khan, 2013). The many features and benefits available to RuPay customers include complimentary airport lounge (for domestic and international travellers) access program, 24x7 concierge services, cashback facilities, insurance covers and several exclusive merchant offers (www.npci.org.in). RuPay facilitates the movement of cash in real-time, helps avoid late fees, provides alerts, cashback awards, etc. and enjoy wide acceptance thanks to tie-ups with Visa and Mastercard. Some of RuPay's major live merchants are IRCTC, amazon.in, BookMyShow, Paytm, Airtel and Mobikwik. The global comparison of RuPay as a domestic card can be seen in Table 4.

Table 4: Global Summary of Domestic cards

Sl. No	Country	Domestic Card Networks*	Year	Card Network Share (%) 2017					
				VISA	MASTER CARD	DOMESTIC*	AMEX	DINERS	Others
1	Australia	eftpos	1984	38	29	25	8		
2	Brazil	Elo, ItauUnibanco	2011	39	45	13	1		1
3	Canada	Interac		39	24	35	3		
4	China	Unionpay	2002			99			1
5	Germany	Girocard	2007	14	12	71	2		
6	Hong Kong	EPS, China Unionpay	1985	15	12	62	7		4
7	India	Rupay	2012	48	33	15	4		
8	Italy	Bancomat Poste ItalianeApA		24	27	44 4	1		

9	Japan	JBC J-Debit		39	20	29 8	3		
10	Russia	MIR, Golden Crown	2017,1994	45	37	14			3
11	Singapore	NETS	1985	32	24	37	5	1	

Source: CPMI 2016

In the case of international cards, banks are required to pay entry fees to become part of their network. This is not the case with the RuPay card, which does not charge participating banks a membership fee. RuPay card is not widely recognized internationally yet when compared to Visa or MasterCard, both of which have been on the market for many years, and have been adopted for most internet and offline operations by companies like Amazon, eBay, Walmart and others. NPCI is working towards wider global acceptance of RuPay through strategic partnerships with Discover Financial Services (DFS) and Japan Credit Bureau (JCB). A huge opportunity in the untapped business areas like the unorganized corporate gifting market, NPCI introduced the RuPay Prepaid card in 2014 as an extension to the RuPay Debit card.

7.7 RuPay Contactless

'RuPay Contactless' refers to an open-loop chip-based payment cards product launched by NPCI. This card can be useful for all kinds of payments such as transport, toll collection, shopping etc. For payments lower than ₹2,000 in value, customers can simply tap their card to process transactions. The card does not require a second factor authorization through a PIN, it uses RFID (Radio Frequency Identification) or NFC (Near Field Communication) technology for data transmission, making it more convenient. It is compatible with devices like mobile phones, smart watches, key fobs; even accessories like rings and pendants. Comparable contactless payment cards include Samsung Pay, Apple Pay, Google Pay, Fitbit Pay, Merpay, etc.

Contactless smart cards such as the Oyster card or Rio Card that function as stored-value cards are becoming popular for use as transit system fare cards. RuPay Contactless specifications are open-standard, interoperable and scalable, and can be adopted by all card schemes. RuPay Contactless has implemented high security features, is vendor agnostic, and is specifically designed for low-value payments.

The Government has been promoting RuPay cards actively, with instructions to Government Departments, Local Bodies and State Government Undertakings to issue RuPay debit/credit/ATM cards to employees and various beneficiaries like students(for scholarships) or farmers(for

farming-related and other schemes tied to their bank accounts). The RuPay card was launched in Bhutan, UAE and Bahrain by the Prime Minister, Mr. Narendra Modi

7.8 *99# Service

In November 2012, NPCI launched another product, *99#, based on the Unstructured Supplementary Service Data (USSD) service for mobile banking. This service, however, has a limited reach, with only two TSPs, MTNL and BSNL, offering it to customers. Keeping in mind the importance of mobile banking, various regulatory and trading bodies came together to bring all TSPs on the *99# service (USSD 1.0) platform. The service was dedicated to the nation by Prime Minister Narendra Modi on 28th August 2014 as part of the Pradhan Mantri Jan Dhan Yojana (PMJDY).

The main objective of the *99# is to make banking services available to the common man without the need for smartphones. A common number can be used across all TSPs (*99#), and users can transact with the help of an interactive interface displayed on their mobile screens. Services offered through the *99# services are: interbank transfer of funds (sending and receiving), balance enquiry, UPI/PIN reset, etc. This service is currently hosted by 86 member banks and all GSM mobile service providers, with the option of communicating in 13 different languages. The service also provides an additional channel for the BHIM app. Additionally, it provides value added services like Aadhar linking status, PMJDY OD status, etc.

7.9 Unified Payments Interface (UPI)

The launch of the Unified Payments Interface (UPI) in August 2016 marked an important milestone in the progress of the electronic payment system. UPI is now NPCI's flagship service. It allows account holders of any bank to transact money using a unique ID called the UPI ID or the payment address generated by the system. Users can also transfer money using their financial address (Account number + IFSC code) or through their Aadhaar numbers. Initially, UPI was meant for mobile phones with internet facility. However, it is now available for non-internet based mobile devices as well, using the *99# (USSD 2.0) protocol that was launched along with BHIM in December 2016.

NPCI conducted a pilot launch of UPI in April 2016 with 21 member banks participating. These banks published their UPI-enabled apps on the Google Play store in August 2016. Currently, 144 banks and payment banks are live on UPI, with 21 banks acting as Steering Committee members. According to NPCI, UPI was introduced because the "ecosystem wanted the product". Although it was not conceived as a platform for the payment highway, it has evolved into a successful one. According to Arif Khan, Chief Digital Officer (CDO), UPI is truly a "four-party model" when it

comes to financial transactions, globally speaking. The presence of banks in the system lends credibility and security to the system.

UPI combines multiple bank accounts, made accessible from a single mobile application of any participating bank, enabling seamless routing of funds and merchant payments under a single head. It also provides an on-demand 'Peer to Peer' facility through which any request can be scheduled and paid when required. UPI is unique in that it provides immediate transfer of funds using mobile technology, on a 24x7 basis throughout the year. UPI makes it possible to access different bank accounts through a single mobile application. The main stakeholders of this interface are payer PSP, payee PSP, remitter bank, beneficiary bank, NPCI, bank account holders and merchants. The interface uses a single-click 2 factor authentication protocol. According to Krupal Parchure, the Head of UPI Product and Strategy, use of XML language helped a lot in its success, in comparison to other services that use ISO 8583. According to him, "simplicity and seamlessness" have ensured stickiness.

All these contributing factors helped merchant on boarding easily. Incremental security is provided through the virtual address of the customer (for Push and Pull).The customer does not need to enter the card number, account number, IFSC etc. The platform enables 'bill sharing' between friends, and is quite popular with merchants and users alike. It also includes utility bill payments, over-the-counter payments and barcode-based (scan and pay) payments, along with a simplified facility for donations, collections and disbursements. On the customer service side, it is notable that complaints can be raised directly from the app.

UPI services include pay requests, where the initiating customer can push funds to the intended beneficiary. Payment addresses include mobile number & MMID, account number & IFSC, and Virtual IDs. The platform also incorporates collect requests, through which the customer is able to pull funds from the intended remitter by using a Virtual ID. The platform also supports a range of non-financial transaction services like generation of OTP, change of PIN, transaction status queries, etc. UPI-enabled platforms can transfer up to ₹2 lakhs at a transaction cost of less than ₹0.45. As of May 2020, there are 155 banks live on UPI, with a monthly volume of 1234.50 million transactions for a value of ₹2.183trillion (US$28 billion). In Table 5 we give below a global comparison of comparable products of UPI, but should be remembered UPI offers far greater services.

Table 5: Global Comparison of UPI

Country	System	Year of implementation	Online	Mobile	Physical channels	Other	Inter-PSP settlement Model
Australia	New Payments Platform (NPP)	2017					Real Time
Brazil	Nil						
China	Internet Banking Payment Systems (IBPS)	2010	Y	Y	Y		Deferred Net
Hong Kong	Faster Payment System (FPS)	2018	Y	Y			Real time
India	Immediate Payment Services (IMPS)	2010	Y	Y	Y	IVR	Deferred Net
India	Unified Payment Interface (UPI)	2016		Y			Deferred Net
Japan	Zengin Data Telecommunication System	2018					Deferred Net
Mexico	SPEI	2015	Y	Y	Y		Real Time
Russia	Nil						
Singapore	Fast and Secure Transfers (FAST)	2014	Y	Y	Y		Deferred Net
South Africa	Real Time Clearing (RTC)	2006					Deferred Gross
United Kingdom	Fast Payment Services (FPS)	2008	Y	Y	Y	Phone	Deferred Net
United States	Nil						

Source: CPMI 2016

Since its launch, UPI volumes and corresponding transaction values have increased manifold with 1246 mn transactions being recorded in March 2020, which translates to ₹2,18,891 crores in value. Thanks to organic growth and higher focus, merchant-based transactions are currently growing at 25% and P2P at 75%.The recently-launched UPI 2.0 has enhanced features like Invoice in the Inbox, Signed Intent/QR, UPI mandate with blocking of funds, UPI for overdraft account etc.

Other version launches include usage of QR code for proximity merchant payment, DTH payment and so on. They can also facilitate dynamic QR for specific clients. SEBI has recently approved UPI for IPO related transactions as well. Their strategy with start-ups is to sandbox technology, and offer the platform for the development of applications.

Apart from BHIM, there are currently 48 other UPI apps available, including SBI Pay, Axis Pay, and those from DCB Bank and HDFC. Some of the major merchants on the platform are LIC, Max Life, Reliance Energy, Oyo, Uber, Amnesty International, and HelpAge India. The global comparison of UPI can be seen in Table 4.

7.10 Bharat BillPay System

The concept of Bharat Bill Payment System was recommended by the RBI in 2013, by a Committee headed by G Padmanabhan. The recommendation came as the result of a study on the feasibility of a Giro-based payment system. RBI entrusted the responsibility to the Bharat Bill Payment Central Unit (BBPCU). NPCI was entrusted with designing business standards and protocols for all the technical and business requirements of participating agents. It developed new standards for bill processing, which could be used by all the participants. BBPS has successfully integrated a four-party model seamlessly. It currently follows batch processing and is looking to target real-time processing. Australia has implemented a similar system called B Pay, but BBPS is ahead of it in coverage and features. According to A R Ramesh, Chief of BBPS, "Bharat Bill Payment System has brought about a revolution in India's bill payment market by enabling every citizen to pay different bills under the same window. BBPS unified the ecosystem bringing banks and non-banks under one roof as the official authorized platform for bill collections".

BBPS was developed and launched by the NPCI in Aug 2016. It provides a single platform for the payment of all utility and other bills, and is accessible at all times from anywhere, with inter-operability features, enabling reliable and safe transactions, in line with the tagline 'The one stop destination for Bill Payment'. It scores high on inter-operability, accessibility through various channels, cost effectiveness, assured clearing settlement, and standardized processes, among other parameters. Only authorized Bharat Bill Payment Operating Unit (BBPOU) centres handle payments. The platform also accommodates agent institutions who offer bill payments and collection. The agents can be service points, branches, BCs or collection points. According to the Ramesh, "Consumers can pay their bills via any of the Bharat BillPay enabled channels — digitally via internet banking, mobile banking, wallet, website or BHIM app, or through physical channels like Business Correspondent, Bank Branch & Retail Agents". The platform provides instant confirmation through SMS or receipt.

BBPS is used for bill payments for utilities such as electricity, telecom, DTH, gas and water. In future, the service is intended to include insurance premium, mutual funds, school fees, institution fees, credit cards, local taxes and invoice payments. Transactions can be carried out through multiple channels like the internet, internet banking, UPI, Aadhar based payments, mobile-banking, PoS terminals, mobile wallets, MPOS (Mobile Point of Sale), kiosks, ATMs, bank branches, and through agents and business correspondents. The technology is API-driven. Transactions are carried out in real-time with a very quick turnaround time.

The total estimated bill payment size is Rs.5.85 trillion. The value of transaction that passed through BBPCU is Rs, 2178.72 cr. The break up of billers is presented in Table 6.

Table 6 : Payment Services Digitally Through Online Channels (200+) And Physical Outlets (4 Mn)

Electricity	72	**Covered Billers (216)**	Gas (Pipeline)	21
DTH	05		Gas Cylinder	03
Mobile Post-paid	10		Water	29
Landline Post-paid	09		Insurance	10
Broadband Post-paid	22		Loan EMI	28
NETC FASTag	05		Cable Tv	01
Education Fee	01		Toal	216

An interesting feature of BBPS is that under the process of 'fetch', a customer can see the invoice of the biller in real-time. Whenever an agent conducts a transaction, the payee gets an instant SMS conformation of the payment from NPCI, which provides a reliable assurance. This apart from the saving in cost for people in rural areas, the significant opportunity cost of effort in terms of travel and time for them is also directly addressed by the platform. The platform keeps tab on all complaints, while also monitoring social media. While individuals tend to use Bharat BillPay for multiple reasons, technology has opened the door for challenges from several rivals who provide cheaper services, quicker transactions, and increased safety.

The involvement of NPCI in the national bill payment system has helped to keep the transaction cost low. A private or foreign player would have significantly raised the tariffs. NPCI does not prescribe how much an acquirer can charge the end customer, but it has prescribed transaction rates for intermediates. It retains only a small fraction of the fee charged per transaction. For the Financial Year 2019-20, 14.57 crore transactions have been made through the Bharat Bill Payment Central Unit (i.e., Off-us transactions) for a value of ₹21,677Cr. Its clientele includes bank-BBPOUs as well as non-bank BBPOUs. Going forward, BBPS will include all recurring payments

in the education sector, recurring deposits, credit card, mutual funds, municipality services, subscription fees etc.

7.11 BHIM

BHIM is an app(available on the Google Play Store) launched by the NPCI in December 2016 that enables customers to make quick payments in a simple manner by using the Unified Payments Interface (UPI). Bank-to-bank payments can be done instantly by using only a mobile number or Virtual Address (UPI ID). Money can be sent through BHIM by just entering a Virtual Address (UPI ID), or an account number with a QR code scan. Money can be collected by entering the Virtual Address (UPI ID). BHIM provides payments easy through a 'Scan and Pay' facility. The BHIM app allows the user to view their transaction history and pending UPI collect requests. Complaints can be raised for declined transactions through the 'Report' option. Each customer is provided a static QR code and permanent address, which is linked to a BHIM account. Downloadable QR codes can be shared through different social platforms like WhatsApp and email. Customers can switch between different bank accounts via the BHIM app, which also provides options for changing PIN and checking balances. The app is currently available in many languages.

For additional security, users who send or collect requests from unknown sources can be blocked or reported for spam. Users can also schedule payments according to their convenience through the app. The BHIM Aadhaar Pay enables merchants to perform digital payments with customers over the counter using Aadhaar-based authentication. The only requirement is that the merchant must have a smartphone and a standard biometric scanner linked to the smart phone via USB, and both merchant and customer must have their Aadhaar numbers linked to their respective bank accounts.

7 .12 FASTag: National Electronic Toll Collection

NETC is a nationwide toll payment solution that enables customers to use their FASTag as payment mode on any toll plaza. It provides an interoperable, secure framework capable of use across the country by deploying Radio Frequency Identification (RFID) technology for toll payments while the vehicle is in motion, thereby saving time and fuel. It is operational at over 650 toll plazas across India. FASTag scan be issued by all member banks; and has become a fast-growing product line for them. The NETC programme has the potential to cover all future use cases for making vehicle-linked payments like parking, e-challans, fuel-payments, etc. It reduces cash handling and enables centralized audit control. Customers can recharge their FASTags through various payment mechanisms without having to stop at the toll plaza.

8. Marketing Management

The entrepreneurial characteristic of NPCI comes out strongly in their approach towards markets and marketing, which is very unlike an undertaking that operates in the public system. This becomes very evident when Asbe speaks about Transformational Strategies at NPCI, and Kunal Kalawatia, Chief of Marketing discusses Design Thinking; typical of organizations which have huge appetite for '*market space for strategies*', useful ideas and actionable frameworks. According to Asbe, NPCI follows a dual path of 'Run and Grow', by which it simultaneously takes care of existing products and new product innovation. It also services mandated products while scaling up its existing products, while also multiplying new product launches. The thrust of Run strategy is to focus on delivery, operational and cost efficiency, and reliability according to Rai. The thrust on Grow is on product development, attaining product maturity, eco system management, and ensuring behavioural development. The run strategy further refined it as building human resources, eco system management, scoping for best practices and ideas from participants for financial and non -financial sectors.

To deliver these objectives, the marketing department at NPCI adopted Design Thinking and Design Lab. It applies Design Thinking in product design, product launch, branding, promotion cycles, and internal structuring. Their commitment towards continuous innovation is obvious from the evolution of UPI 1.0 into UPI 2.0. UPI 1.0 by itself was a huge success in operational scale, as well as in the range of partners and products. All their products follow the criteria of sustained innovation, sustainable business models, a cost-plus pricing model, and fee-based services. According to the Kalawatia, once NPCI is set on a course, "it is difficult to repurpose". As reflected in RBI Reports, there is clarity among stakeholders, as also board guidance and top management strategies. IMPS is the inflexion point upon which the path breaking UPI platform was built.

Khan refers to UPI and Rupay as the payment rail on which start-up sand innovators run easily. According to Kalawatia who joined the team from a product company in a competitive market, NPCI undertakes all the necessary marketing functions: market promotion, advertisement, branding, and market research through systematic processes. An underlying principle that is often highlighted in discussions is that NPCI does not make a distinction between captive mandated services like NFS or CTS or NACH, and market driven products like UPI, RuPay and BHIM, which are in competition with products and services from other fintech players. According to Kalawatia, in services like NFS or NACH, they provide several value-added services to their partners in terms of support, performance reporting and security, among other things. They levy nominal changes based on a cost-plus model, and they manage this by constantly controlling costs. Market driven products are promoted through partners and channels. They have a separate market

development team that continuously identifies new partners to work with. Once a partner joins them, they codevelop the product and help them with several things, including providing standardized promotional kits developed by the design innovation team. This strategy of working closely with partners and channels has helped NPCI achieve scale with limited budget for marketing and promotion. UPI is a classic example of this. Several services have been floated on the UPI platform by the Government and partnering institutions, but UPI has remained an invisible technology behind payment systems in India. The NPCI keeps its focus on upgrading UPI, its features, scalability leaving its promotion to its partners. This is how it has been able to achieve its reach and scale so far.

NPCI never exploited its unique position of being pivotal to the banking sector or the fact that it has been promoted by banks themselves. It sells itself on the strength of cost competitiveness and service. This approach has made it decidedly market driven, and on the constant lookout for innovations and new products. From being a strong player in b2b market, it has extended itself to b2c markets through partners and other channels with UPI, RuPay and Bharat Bill, which operate in the highly competitive markets facing global majors like Master, Visa and strong national majors like Paytm. Its services can be characterized or categorized as:

- b2b and b2c
- mandated and market driven products
- public good and market driven products
- platform services, products and value-added services
- vanilla products for bottom of the pyramid and value-added services catering to premium segment
- products for the youth as well as an inclusive segment
- domestic and global competence

NPCI goes through a systematic process for product conceptualization and launch, regardless of whether the original idea came from inside the organization or the market, or sometimes the regulator or government. It has designed and delivered products like RuPay, Bharat Bill, etc by taking them through its own rigorous process of conceptualization of the product and technology, indigenization, piloting, and launching. It does all these collectively with member banks in a collegial way. It has over a thousand corporates in its fold and offers many value-added services. NPCI has always followed conservative practices in marketing, first piloting a product and later concentrating on early adopters. It has managed to position itself strongly in the competitive market with strong partnerships and highly effective channels. According to Kalawatia, its inclusivity is evident from the fact that it holds 50% of the cards but only 20% of the volume of business, at 30% of total value. All this has happened despite the fact that product launches in the fintech world are highly complex in general and goes through arduous regulatory approval by RBI.

The growth pattern of ATMs and POS is shown in Table 7 below. Trends of Transaction of cards and digital payments are presented in Figures 4 to 7.

Table 7: Transaction Trends of ATMs and POS.

ATM	Volume(mn)	Value(INR bn)	Ticket Size (INR)	Share - Volume	Share - Value
Credit Cards	9.77	45.33	4639.19	0.10%	0.14%
Debit Cards	9859.61	33107.89	3357.93	99.90%	99.86%
PoS& online	**Volume(mn)**	**Value(INR bn)**	**Ticket Size (INR)**	**Share - Volume**	**Share - Value**
Credit Cards	1762.59	6033.48	3423.08	28.54%	50.41%
Debit Cards	4414.28	5934.75	1344.44	71.46%	49.59%

Source: Department of Payments and Settlements, RBI 2019

In product designing and promotion, NPCI follows the design thinking aspects of Educate, Enable, and Activate. When it comes to new product development, their design teams follow a process of design, customer resolution, and co-education. In designing, the teams operate as internal start-ups. In enabling, they learn from the market and from partnership banks so that they can 'learn and develop'. They also conduct hackathons on new product development among students, and exercise that has consistently thrown up several interesting ideas and possibilities that have been taken up by the organisation. The loyalty programmes are examples some of these innovative ideas. NPCI works with clients to promote their services. According to Kalawatia, the success of their internal and external strategies with UPI 1.0 gave them the confidence to proceed with UPI 2.0.

The biggest threat from competition is the dwindling fee structure, the so-called 'race to the bottom'. The decision of the government to waive Merchant Discount Rate (MDR) is of great concern to NPCI in this regard.

Figure 4: Transaction Trends 2016-2019 (Volumes in Millions)
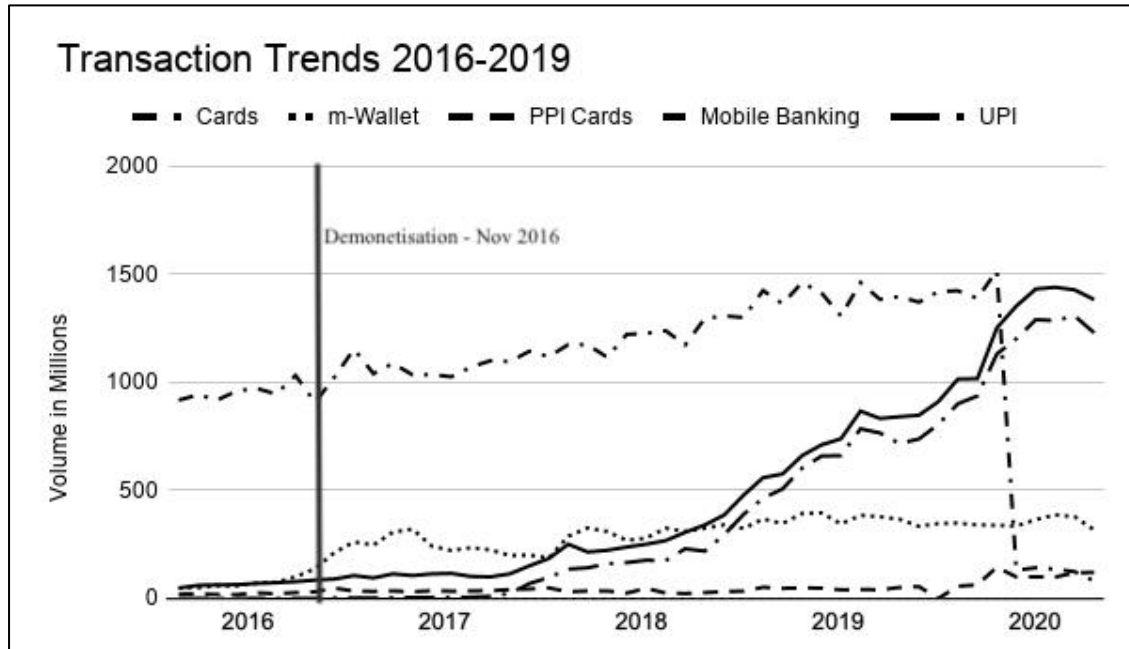
Source: RBI Bulletin Archives - Payment System Indicators

Figure 5: Transaction Trends 2016-2019 (Values in Billions)
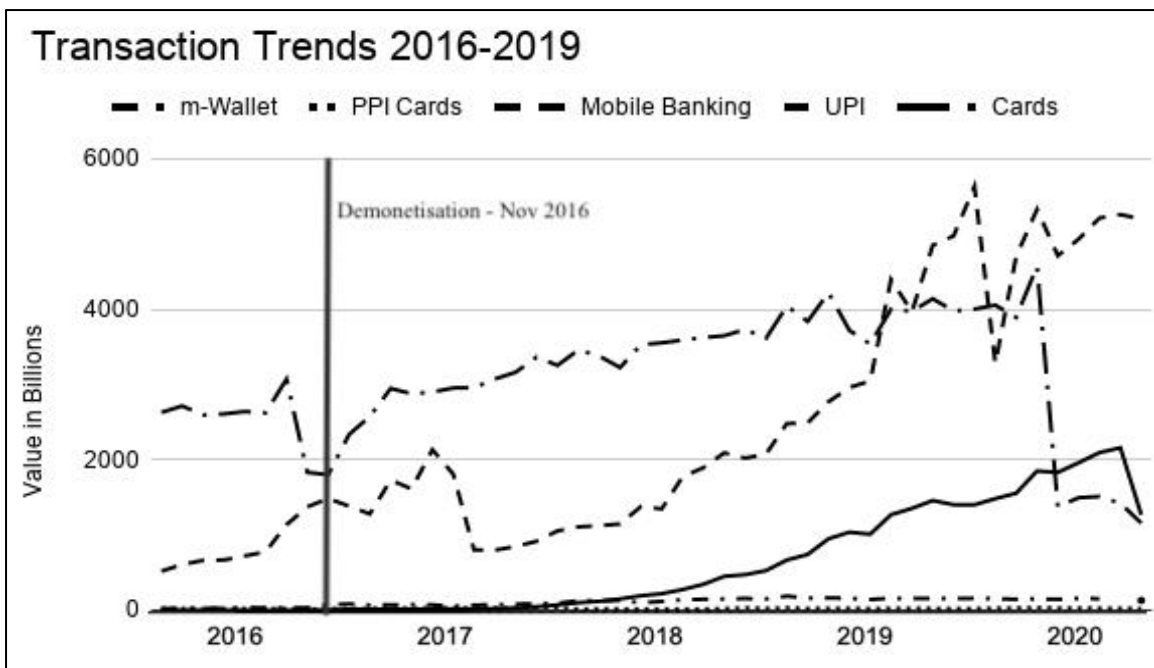
Figure 6: POS Machine Trends 2016 - 2019

Source: RBI Bulletin Archives - Payment System Indicators

Figure 7: Value per Transaction Trends for Various Payment Systems

Source: RBI Bulletin Archives - Payment System Indicators

9. Technology Architecture

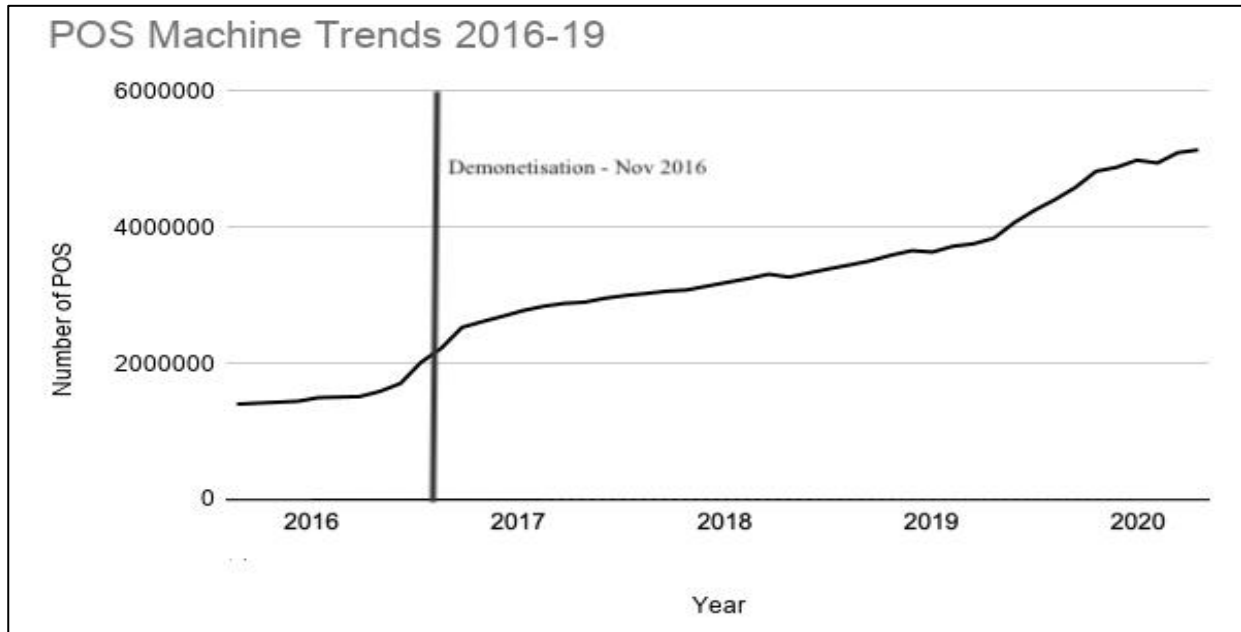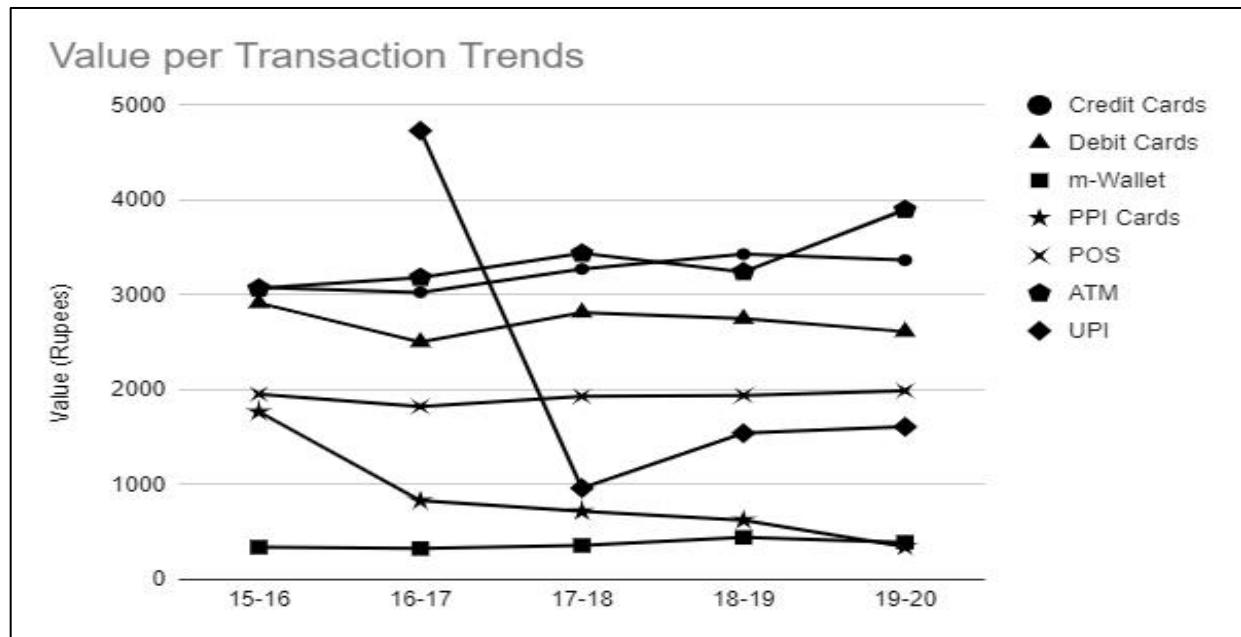D' Silva. et al (2019) drawing lessons from digital financial infrastructure design mentions that the key to the success of digitalization was the development of the full-fledged India Stack model. They characterize the India Stack infrastructure as comprising of Identify Rail, Payment Rail, and Data – Sharing Rail. NPCI has strong footprints in Payment and Identify Rails. Identify Rail as an Aadhaar-based authentication system that can accommodate eSign, and DigiLocker. UPI is characteristic of a Payment Rail player, as "a single interoperable interface to bank accounts, effectively granting mobile access to the payment system allowing financial transactions to take place instantly, on demand, and in fiat money inside the formal financial system" (D'Silva et al, 2019). IMPS, RuPay, UPI, AEPS, APBS, and Jan Dhan are examples of this. Data-Sharing Rail is "where data privacy is ensured and customer data facilitate financial transactions, while moving efficiently and securely based on customer consent" (D'Silva, et.al, 2019) (Figure 8). If Aadhar provided the unique digital identity which paved way for eKYC, UPI provided interoperable Payment Rail (Fig 8). According to the authors, "India Stack is an example of how a unified, multi-layered set of digital platforms, provided by the public sector, gives businesses, start-ups and developers significantly improved access to financial services" (D'Silva, et al, 2019).

NPCI is primarily a technology firm with an organizational structure that allows it to focus on all aspects of technology, including digital and risk management. While the technology relating to operations is looked after by the COO, the futuristic technology acquisitions are looked after by the CDO. Every function has a technology component as well. These functions are divided as Operations and Run technology, Online Product and Operations technology, Tech Infrastructure Upgrade and Upscale, Offline Operations technology, Information Security, etc. The CTO looks after special projects. Cloud computing and Data Center, IT Procurement and DC build all have separate heads. The structure thus comprehensively addresses each aspect of technology that come into play in each of the products and services. According to Khan the present focus is on building futuristic technology, driving digital marketing, and customer centricism. All product from the conceptualization stage to launch stage go through rigorous testing and NPCI and goes through a strategy of undertaking pilots of all of its innovation. Product development involves partnering with other financial institutions, with whom the products are first piloted.

Figure 8: India Payment Stack Rails
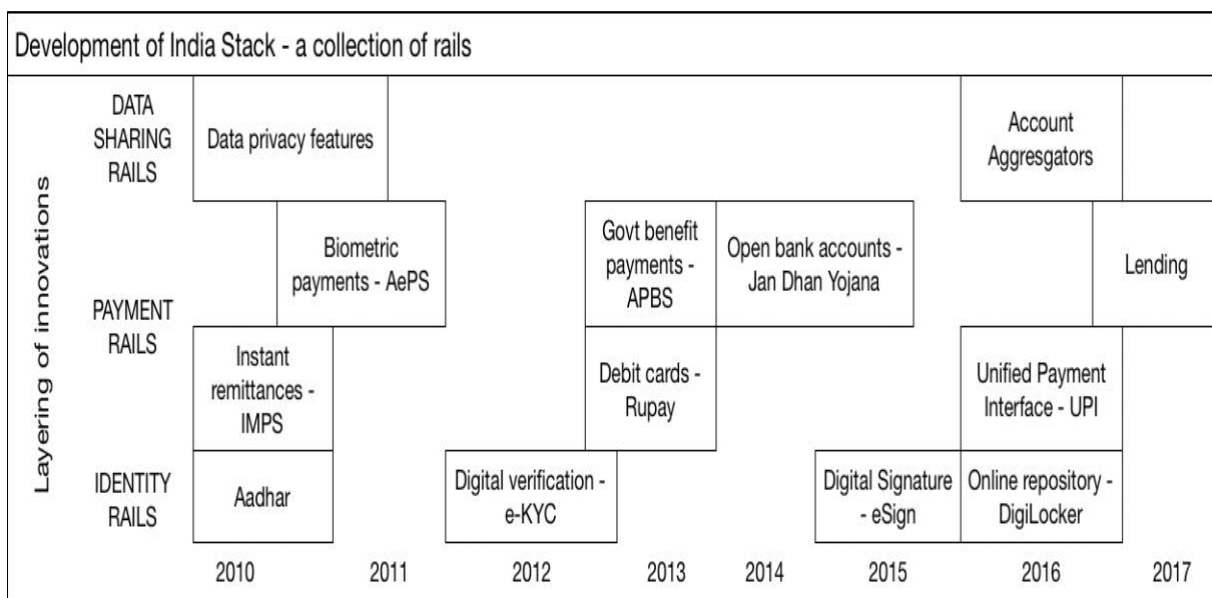
Source: D'Silva, BIS, 2019

NPCI has a strong risk management policy (which is described later) and a healthy risk management culture. It mostly develops on open source, and its products are platform independent. This ensures better interoperability overall. One of its goals is to develop standards for the payment industry. NPCI builds scalable technology that is secured from cyber threats, especially because many partnering financial institutions are involved in the system. Most of the required software is developed in house. Whenever required, NPCI also partners with various software firms that come under their supervision and project management. Their teams are constantly challenged with scoping for new applications and technology, a practice that helps it to excite their professionals. NPCI prefers to work with their partners and codevelop products and applications that always follow open source principle, are flexible, platform independent, and compatible with all database forms. It takes them through architecting, developing protocols, business rules, and reports and works within the private cloud of NPCI. It also identifies start-ups with potential and seeks to encourage and develop them through various programmes. Throughout the organisation, NPCI manages to keep its entrepreneurial and technology starts up culture going.

10. Risk Management

The success of NPCI's growth depends vitally on the management of risk, as it involves the financial system of the entire country. According to Mathan Babu Kasilingam, Chief Information Security Officer, the risk management culture runs throughout the entire organization. COSO, ISO 31001, ERM and PFMI have been implemented for clearing house and the 13 risk-management principles prescribed for clearing house are followed meticulously. Strict guidelines are followed

for on boarding members and tight legal compliance is maintained. As for risk management, they pay attention to both enterprise risk and ecosystem risk concurrently. When it comes to partnerships, they track adherence to payment reliability, finality of transaction, ICBS and SWIFT management by partners, correspondent bankers and the overall tripartite relationship. Settlement and payment are governed by well-defined policies, and immediate steps are taken upon the detection of any divergence. Continuous monitoring for frauds, money laundering, etc is strictly followed as it can directly impact the reputation of the partnering institutions, not to mention themselves. Risk audits are carried out by external auditors. The various aspects of risk management in terms of enterprise risk, operations, fraud, settlement, business continuity and cyber are discussed in Annexure 3.

11. Procurement Management

NPCI follows a transparent and effective procurement process. It has a Board-approved procurement policy which states the delegation of financial powers and process. It is guided and overseen by the Technical Advisory Committee and Technical Project Management Committee. The technical advisory committee decides the procurement recruitments. It also has a Management Committee comprising all the heads of departments. The various Committees engaged with procurement are below:
- Tender Opening Committee (TOC-Internal)
- Eligibility Evaluation Committee (EEC-Internal)
- Technical Evaluation Committee (TEC-Internal)
- Commercial Evaluation Committee (CEC-Internal)
- Price Discussion Committee (PDC- Internal as well as external)

The In-Charges of the respective departments are empowered to undertake procurements that are part of the plan. At each level, committees have been defined to take the decisions. In exceptional cases, they may report to higher-ups but decisions are taken within departments in regular course. They follow multiple approaches in tendering. The simplest model they follow is deciding by an L1-based tender processing and bidding. They also follow the Reverse Auction method if they think they need better price discovery. For proprietary products, mostly single OEMs, they directly negotiate with the vendor. They also follow a process of inviting two bids – technical and financial, and open the financial bid. Limited RFPs are also invited in select cases. The respective procurement committees have the power to decide the mode of tender depending on service requirements and the availability of technology. According Prasad P Joshi, Head of Strategic IT Procurement, they follow tight time frames that can take a maximum of 60 days to finalize a procurement. The efficiency of their practices ensures that it usually takes lesser time than that.

If procurement is not considered 'high value', designated individuals have been vested with the power to decide on it. According to Joshi, their thrust is on effective procurement while ensuring adherence to the manual and effective price discovery at the same time. Procurement rarely comes in the way of timely implementation of projects at NPCI. There are also qualitative differences from the public sector. NPCI comes under the C&AG audit but not CVC. However, they are compliant with government procurement policies. Although they follow similar guidelines, ensure transparency and due process of law, the thrust is on outcome and effectiveness, as also timeliness of decisions. As they deal in an area of technology that is intangible, price discovery is a big challenge.

12. Financial Model

NPCI has been managing with equity and the internal generation of funds since inception. It has had two rounds of equity mobilization, in the year 2009 – 10, and then in 2015 – 16. In the first round it raised ₹100 crores from 10 promoters. The next round saw 46 members contributing ₹119 crores. NPCI's equity has grown to ₹1664 crores as of 31st March 2020. It is not driven by compulsions of valuations, so the second time they raised equity, valuation was done on the basis of book value being a Section 8 company. Analysts would agree that its valuation commands a multiple, but preferred book value. The company's turnover in 2018 – 19 was ₹980 crores, and surplus before tax was ₹477 crores. Its expenditure on employees was ₹148.62 crores, and ₹30 crores was spent on administration. It has been economical and has been steadily earning profit over the years. The Balance Sheet and P & L statement can be seen Table 12. According to Ashish Pai, Incharge of Finance and Accounting, NPCI follows the principle of cost-plus pricing as mentioned earlier, but it keeps cost under control for efficiency and global competence. Its charges are quite nominal compared to the market rates, and this enables financial inclusion and penetration across the country. Furthermore, NPCI is not driven by considerations of valuation and going public like private corporates are.

NPCI understands that it is operating in the field of public good. Its client base includes its promoters, but all parties are treated alike. NPCI has so far been self-sustaining and has been able to fund its growth as well as future commitments such as retirement benefits. Its pricing policy for products has been very nominal, and has helped greatly in market penetration. This, however, leaves a very thin margin for the bankers and channels. NPCI's business model takes this into account and depends on volume rather than margin. It follows the principle of 'each bucket on its own' to ensure that each product should have a positive contribution in margin.

Moreover, NPCI offers a range of services that has no comparable national or global players competing, especially ones that can provide the same services. Even for comparison each of NPCI's services must be compared with respective individual competitors. Pai also points out that

no product launch, technology up gradation or expansion has suffered from lack of funds. The biggest threat they face, however, is the policy of 'Zero MDR' that may push them into a dive towards thinner margins. The Financial Statement of NPCI is presented in Table 12.

13. Organizational Transformation and Human Relations

The human relationship management of NPCI must be understood in the context of its organizational transformational strategy. As a Section 8 undertaking operating in the highly competitive fintech market, NPCI faces immense challenges in attracting and retaining talent. It has an employee strength of 800 plus and operates out of Mumbai and Hyderabad. It has two categories of officers: senior professionals who joined at lateral levels, and young professionals who are recruited from college campuses across the country. Over time, it has recruited professionals from the market for its marketing, technology and risk workforce, from amongst whom it has built the top management and a second layer of professionals. NPCI manages to maintain a young professional team that is highly motivated and driven. With respect to human resources, NPCI management operates like a technology firm, constantly taking multiple measures to keep employees motivated. It conducts several events and organizes different programmes to keep its employees connected with the organization.

After a successful initial run, NPCI started introspecting in 2016, revisiting its structure and design according to Nishith Chaturvedi, Chief of HR and Administration. They also embarked on an Organizational and Technology Transformation Programme to make it future-ready, through which they categorized their activities into Run, Grow and Transformation categories. NPCI studied industry trends to help it become more agile and innovative, while ensuring overall ecosystem security. It assessed as many possible challenges as possible, and decided to relook at the overall internal architecture in terms of organizational structure, policies and processes. This exercise enabled the initiation of the transformation journey they are known for. They partnered with the global consultant on the subject way back in 2017, as a result of which they came up with a revamp programme on the basis of the organization's projected growth for next 5 to 7 years.

Their analysis lead to the identification of the following futuristic trends to which implications for NPCI were mapped (Fig 9 and 10).

Figure 9 : Futuristic Trends in FinTech

Trends	Implications for NPCI
Move towards cashless payment	• Payment solutions should be able to mirror consumer shifts • Systems should be scalable to manage large transaction volumes with no outage • Ideate and develop new products to stay competitive in the market
Innovation in digital payment platforms	• Ensuring a broad and robust backend platforms for the products • Agility to develop new solutions in line with front end innovations
Government push	• Leverage government initiatives optimally • Advise governmental bodies to achieve their objectives through NPCIs payment solutions
Focus on data analytics	• Leverage analytics to drive penetration and enable retention by channel partners
Rise in cross-border transactions	• Tie-ups with payment solutions of other countries
Rising cyber fraud	• Payments system architecture to move to advanced security measures, such as EMV • Improved cyber security, to prevent data frauds in the ecosystem.

From the organizational structure point of view, they identified these issues.

Figure 10: Structural Organizational Issues

Issues	Structural Issues
Diffused accountability	• Accountability for product innovation is spread across COO and Chief Project Advisor • Front-end product sales accountability is spread across multiple verticals • No SPOC for Project Management accountability
High span of control	• Integration of diverse and disparate accountabilities under COO • CTO is integrating the accountabilities of 'run' and 'transform'
Low span of control	• Some of the existing n-3 resources have no/few team members under them
Duplication of resources	• An overlap of activities has been observed under some of the functions

NPCI systematically went about redesigning the organizational structure keeping in context all the future trends and organizational requirements they visualised according to Chaturvedi. They went through the exercise to take it full-circle, upto the aspects of role-identification and evaluation framework, way beyond current practices in PSUs. Structurally, Run and Grow are looked after by the COO and Transformation by the CDO, making for a big thrust on technology and digital adoption. The digital thrust was to make the organization AI, Big Data, and Analytics enabled according to Khan. They identified roles that are functions rather than designation based, so that they are not tied to a hierarchy. They looked at roles from the perspective of Accountability and Knowledge, and everything from selection, training, manpower-planning was incorporated into these roles. They also identified and culled out new roles wherever required. They go by a flexible structure of 'in-charge' rather than hard coded designations. They do not adhere to a hierarchy and ensure that nobody reports internally, which is an interesting concept. The only hierarchy they implemented was three levels in the workforce: Junior, Middle and In-Charge. Operations and decisions are handled within departments. They keep the span of control minimal, and avoid vertical processing and duplication of work, which can prove to be a drag on the efficiency of the workforce.

Performance evaluation is tightly linked to the roles and the Balanced Score Card they have implemented is in turn linked to these roles. They follow Hay's framework for this and have engaged Hay's-Certified professionals to carry it out. The evaluation encompasses both technical and behavioural aspects, with structured frameworks assigned for each role. Based on this framework, technical and behavioural competency mapping was carried out for each officer.

Their Evaluation Methodology Framework looks at all roles from the three perspectives:
1. Know-How
2. Problem-Solving
3. Accountability

Each of these are further divided into sub-factors and incorporate a quantified grading scale. Every role is evaluated (on the basis of the Job Description) on these 3 parameters and an overall score is ascertained. Through this scientific approach, all roles at NPCI have been evaluated, and the organization structure realigned to minimize redundancies. Along with the revised structure, internal grading (banding) has also been revised, and critical HR processes such as hiring, promotion, internal job posting have been aligned to each other. At the base lies 'role availability'. NPCI has now moved to a role-based organizational structure.

Each role has been described in the form of a Success Profile that summarizes the requirements of that particular role, including hierarchy, dimensions, accountability, qualifications, behavioural &technical competencies, along with the desired proficiency levels as explained by Chaturvedi.

The same template is followed whether it is for internal posting or for recruitment from the market. They look for talent from the talent pool once a role is identified. If talent is not available from within the pool, they source form the open market. This framework helps NPCI make effective succession plans.

Officers are asked to identify two roles each, one from their own job pool and another from outside it. They evaluate eligible resources and build them up. They also ask for possible aspirational roles for which they tries to find a fit. They help them develop the required technical skills. Similarly, they follow a very structured approach for training. For each role, they map an Individual development plan (IDP), identify skill gaps, and then decode the IDP in consultation with their bosses. The mapping is carried out by certified professionals. The responsibility for training and upgrading in turn lies with the In-Charge in order to encourage ownership for such initiatives. They also have a Mentorship programme through which 50 certified people undergo 4 days of training. The mentors are volunteers from within the organization, which serves well to enthuse participants. At the time of on boarding, the recruits are assigned a project for 6 months. A diary is maintained, which helps them prepare for cross-functional roles. According to the HR Head, in the ultimate analysis, the employees are driven by pride and the feeling that NPCI is a great place to work.

According to Chaturvedi, NPCI has introduced an interesting HR practice. Over the years, they observed that some individuals are highly productive and can be significant individual contributors. These individuals are identified and posted as specialists with the necessary up skills. This posting is done after an assessment of the individual's interest in specialist roles, and some commitments are agreed upon beforehand. At present they have 25 to 30 specialists in different roles. In recent times, they have also had to suffer attrition because of organisational transformation, but they expect it to come down once the results of the transformation stabilize. They follow the Bell Curve and compensation is structured based on CTC rather than salary, with attendant benefits like DAs, unlike PSUs. They benchmark favourably against leading technology firms in the private sector such as Accenture, PayPal, Paytm, Reliance Jio, Google Pay etc. (Interestingly, they do not benchmark against NSE, SBI, etc.)As a progressive organisation, they seek to be in the 50th percentile when it comes to the compensation curve. NPCI looks to benchmark themselves in five categories, viz. technical, payment tech, consulting, banking, and business development. They also lay strong emphasis on the recruitment process and select people who would fit the NPCI culture overall.

NPCI hosts an initiative called "Campus Connect" to promote financial literacy among students in the country. Over 3000 students from 35 management institutes in cities like Mumbai, Pune, Chennai, Hyderabad and Bengaluru were hosted for these sessions. The main theme of these sessions was to make students financially aware about revolutionary products like UPI and BHIM.

The objective of holding such an event was also to explain the significance of a cashless society, and identify young, talented minds who can bring about innovation in the payment industry by making students participate in "NPCI Ideathon", a brainstorming session to make suggestions for the improvement of BHIM and UPI applications. NPCI has hosted several such events to promote financial literacy.

14. Crisis Response to Covid

Covid-19 posed a real challenge to the crisis management systems of NPCI. Unlike other crises and disasters, the Covid pandemic required harsh lockdowns resulting in shutting down of offices across the country, posing a threat to not only NPCI but also to all its clientele like banks, NPFCs, etc. They had to somehow keep the systems running, especially because of being in mission-critical Essential Services. NPCI not only successfully overcame the crisis but also used it to further the cause of digitalization. According to Rai, they quickly implemented its business continuity plan across all its payment systems and also coordinated with its clientele to ensure that the payment systems were kept running. In the first week the emphasis was on ensuring full functionality to the partners and market participants. They coordinated with banks and other partners, and ensured their people are in place to keep the systems going. They went into planning manpower quickly and drew up back up Team B, and C for every team. The situation is tested all crisis managed plans and they managed it successfully along with the user financial institutions. They then went into enabling outlets and vendors with no touch payment system and the market adopted to it quickly. The crisis helped speed up changes very quickly.

Next, it started addressing the problems faced by vendors and merchants as a result of the social distancing norms enforced in public places, according to Rai. NPCI quickly on boarded UPI and UPI – QR to make the process totally contactless and completely online. Asbe mentions that this ensured that vendors can carry on without compromising on self-isolation guidelines. NPCI has currently enabled more that 15 million QRs in the market. Soon after the lockdown was announced, NPCI facilitated cash withdrawals services through UPI to payment service. It allowed transactions upto ₹1000 per day in Tier1 and Tier 2 centres, and ₹2000 per day in Tier 3 to Tier 6 centres. Service providers were also allowed to charge customers a nominal fee for availing this service.

NPCI also launched a massive campaign to scale up digitalization. Rai, in an interview, summed up the efforts by saying that in the current environment of social distancing, NPCI initiated #IndiaPaySafe through their ongoing 'UPI Chalega' campaign to create awareness about financial safety through digital payments. They took a step further to spread awareness around digital payments with a campaign to drive a broader message across the public in terms of using UPI as an easy, safe and instant way for digital payments. NPCI used celebrities to push the cause among the public and created the UPIChalega.com micro site where all useful information on how to use

UPI safely can be found(Financial Express, April 2020).Vendors and users alike adapted to digital payments in a big way, with more activity in the retail segment and with small amounts, indicating its penetration and inclusiveness.

15. The Next Phase

NPCI so far has kept pace with technology and the market, and is gearing itself for the next level of operations. Towards this, they reflected on their journey and building blocks, and arrived at a transformation programme, which has now been put into action. Over the years, it has built strong building blocks in human competency, technology competency, and operational competency while managing to keep itself lean and cost-effective. It has also consistently managed to maintain a scaled-up start-up culture. It rode on technology breakthroughs and some support from regulatory and government initiatives. However, it did not rest on these achievements and continued onwards to make a mark in the highly competitive technology-intensive fintech world. At their inception, if NPCI were asked where they would be a decade hence, they might not have predicted the range of product portfolio and scale. But, as they say, they surprised themselves and at this juncture, it will be interesting to reflect on where it will be in five to ten years.

Table 6: Payment Systems Volume Indicators –2019 - 2020

	2019-2020											
	Apr.	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mar.**
Cards	1384	1397	1371	1420	1424	1389	1517	131	142	136	124	80.4
Credit Cards	167	174	164	179	180	180	203	176	203	201	188	163
Usage at ATMs	0.86	0.89	0.81	0.86	0.85	0.81	0.82	0.79	0.89	0.85	0.79	0.75
Usage at POS	166.9	173	163	178	179	179	202	103	118	116	115	81
Debit Cards	1216	1223	1207	1236	1243	1208	1314	429	457	463	438	371
Usage at ATMs	808	815	800	816	814	794	859	626	648	653	618	544
Usage at POS	408	407	407	420	429	414	455	248	263	258	245	192
Prepaid Payment Instruments (PPIs)	419	418	389	407	407	403	484	467	507	523	502	398
m-Wallet	378	367	334	347	349	340	339	335	365	387	378	317
PPI Cards	40	51	55	0	57	63	145	100	100	99	119	121
Paper Vouchers	0	0	0	60	0	0	0	0	0	0	0	0
Mobile Banking	833	841	848	911	1015	1017	1252	1353	1432	1440	1428	1383
Cards Outstanding	932	873	886	890	877	888	896	885	860	872	880	886
Credit Card	48	48	49	50	51	52	53	54	55	56	57	57
Debit Card	884	824	836	840	826	835	843	830	805	816	823	828
Number of ATMs (in actuals)	227164	227227	226839	227629	228170	227886	229374	232000	232000	233000	234000	234000
Number of POS (in actuals)	3757621	3840490	4068954	4252804	4409250	4589727	4825074	4883000	4988000	4947000	5099000	5139000
UPI	766	717	738	806	901	937	1131	1202	1290	1286	1307	1229

Source: RBI Bulletin Archives - Payment System Indicators
https://www.rbi.org.in/scripts/BS_ViewBulletin.aspx

Table 7: Payment Systems Indicators – 2019 -2020

	2019-2020											
	Apr.	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mar.**
Cards	3974	4140	3977	4002	4055	3893	4570	1377	1496	1511	1422	1158
Credit Cards	580	617	573	600	600	598	715	601	657	665	621	505
Usage at ATMs	4.02	4.1	3.8	4	4.1	3.9	4.1	3.8	4.2	3.9	3.7	3.6
Usage at POS	576	612	569	596	596	594	711	317	351	351	334	266
Debit Cards	3393	3523	3404	3402	3455	3295	3855	775	839	845	801	653
Usage at ATMs	2843	2946	2834	2821	2874	2737	3154	2840	2917	2971	2851	2499
Usage at POS	549	576	570	581	580	557	701	370	397	389	362	272
Prepaid Payment Instruments (PPIs)	181	182	177	184	183	178	186	178	189	182	172	153
m-Wallet	155	157	154	159	154	146	151	146	158	154	144`	131
PPI Cards	25.79	25	22	24	28	31	35	31	30	28	28	22
Paper Vouchers	-	-	-	–	–	–	–	–	–	–	–	–
Mobile Banking	3966	4850	4975	5631	3280	4701	5327	4712	4933	5213	5258	5201
Cards Outstanding	–	–	–	–	–	–	–	–	–	–	–	–
Credit Card	–	–	–	–	–	–	–	–	–	–	–	–
Debit Card	–	–	–	–	–	–	–	–	–	–	–	–
Number of ATMs	–	–	–	–	–	–	–	–	–	–	–	–
Number of POS	–	–	–	–	–	–	–	–	–	–	–	–
UPI	1354	1458	1403	1402	1483	1555	1850	1833	1961	2096	2159	1270

Source: RBI Bulletin Archives - Payment System Indicators https://www.rbi.org.in/scripts/BS_ViewBulletin.aspx

Table 8: Value per Transaction of Instruments

	15-16	16-17	17-18	18-19	19-20
1 Cards	2928	2552	2864	2825	3383
1.1 Credit Cards	3078	3028	3274	3430	3366
1.1.1 Usage at ATMs	5068	4482	4698	4642	4736
1.1.2 Usage at POS	3063	3020	3266	3423	3311
1.2 Debit Cards	2916	2504	2816	2749	2614
1.2.1 Usage at ATMs	3143	2811	3371	3358	3898
1.2.2 Usage at POS	1354	1368	1377	1368	1424
2 Prepaid Payment Instruments (PPIs)	652	426	409	462	403
2.1 m-Wallet	341	327	359	444	393
2.2 PPI Cards	1769	831	718	627	347
2.3 Paper Vouchers	49946	50607	43614	14667	0
3 Mobile Banking	10375	13031	7696	4778	4221
POS	1954	1824	1931	1942	1989
ATM	3070	3183	3438	3243	3899
UPI	-	4732	963	1543	1610

Source: RBI Bulletin Archives - Payment System Indicators https://www.rbi.org.in/scripts/BS_ViewBulletin.aspx

Table 9: ATM & Card Statistics

Year		Mar'14	Mar'15	Mar'16	Mar'17	Mar'18	Mar'19	Mar'20	CAGR (Mar'14 - Mar'19)	CAGR (Mar'14 - Mar'20)
Number of Banks		54	55	56	56	49	66	64	3.4	2.46
ATM (Millions)		0.16	0.18	0.2	0.21	0.21	0.2	0.21	3.97	3.96
POS (Millions)		1.07	1.13	1.39	2.53	3.08	3.72	5.13	23.17	25.10
No. of outstanding cards as at the end of the month (Millions)	Credit Cards	19	21	25	30	37	47	57	16.15	16.99
	Debit Cards	394	553	662	772	861	906	828	14.86	11.19
No. of Transactions (Actuals) (Millions)	ATM	572	625	732	711	776	892	556	7.7	-0.40
	POS	103	133	185	379	446	570	527	32.98	26.26
Amount of transactions (₹ Billions)	ATM	1798	1990	2249	2262	2667	2894	2680	8.26	5.87
	POS	231	287	362	691	862	1107	983	29.82	22.98

Source: RBI Bulletin Archives - Payment System Indicators https://www.rbi.org.in/scripts/BS_ViewBulletin.aspx

Table 10: Retail Payment Statistics – Financial Transactions

NPCI Operated Systems	F.Y.2014-15		F.Y.2015-16		F.Y.2016-17		F.Y.2017-18		F.Y.2018-19		F.Y.2019-20	
Financial Txns:	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
NFS Inter Bank ATM Cash Withdrawal *	2,374	8,312	2,837	9,993	3,170	10,818	3,503	13,357	4,017	15,126	4,312	16,151
NACH- National Automated Clearing House	325	1,197	1,393	3,715	1,968	7,208	2,375	9,753	2,861	13,384	3,402	17,630
APBS Credit (Disbursement based on UIDAI No.)	168	61	717	186	949	287	1,298	560	1,495	862	1,675	991
ACH Debit	3	58	24	504	88	1,480	211	2,789	421	4,795	611	6,253
ACH Credit	81	52	508	879	731	3,844	703	5,210	883	7,297	1,115	10,380
NACH Credit	72	1,025	115	1,998	1	27	-	-	-	-	0	1
NACH Debit	-	-	28	148	198	1,570	163	1,194	62	430	1	5
CTS Cheque Clearing (Processed Volume)	926	66,010	920	69,889	1,112	74,035	1,138	79,451	1,112	81,536	1,036	79,175
IMPS	78	582	221	1,622	507	4,116	1,010	8,925	1,753	15,903	2,579	23,375
RuPay Card usage at (POS)	5	11	25	45	195	290	460	488	695	808	823	1,147
RuPay Card usage at (eCom)	1	1	10	6	88	59	208	166	432	367	658	610
AEPS (Inter Bank) Txn over Micro ATM (withdrawal/ Deposit)			0	1	16	23	106	269	254	678	437	1,189
BBPS (Bill Payment passing through BBPCU)					0	0	11	11	74	91	146	217
UPI - Unified Payments Interface					18	69	915	1,098	5,353	8,770	12,519	21,317
BHIM					6	18	88	300	187	796	201	753
USSD 2.0					1	1	2	4	2	3	1	2
UPI excluding BHIM & USSD					10	48	825	795	5,165	7,971	12,317	20,563
USSD 1.0					41	0	5	0	-	-	-	-
NETC					24	7	127	33	254	57	583	113
Total Financial Txn (A)	3,709	76,111	5,406	85,271	7,138	96,626	9,858	113,553	16,806	136,719	26,493	160,924

* NFS Cashwithdrawal amount does not include Card to Card Transfer, Volumes in Million, Values in Billion

Source: NPCI Website https://www.npci.org.in

Table 11: Retail Payment Statistics – Non-Financials

Non Financial:												
NPCI Operated Systems	**F.Y-2014-15**		**F.Y-2015-16**		**F.Y-2016-17**		**F.Y-2017-18**		**F.Y-2018-19**		**F.Y-2019-20**	
	Volume	**Value**	**Volume**	**Value**	**Volume**	**Value**	**Volume**	**Value**	**Volume**	**Value**	**Volume**	**Value**
NFS Inter Bank Txn over ATM (e.g. Balance inquiery/ Mobile No. registration etc.)	694	-	863	-	1102	-	1273	-	1247	-	1117	-
AEPS (Inter Bank) Txn over Micro ATM (e.g. Balance inquiry/ Mini statement etc.)	-	-	0	-	10	-	95	-	270	-	387	-
AEPS (Intra Bank) UIDAI Authentication over Micro ATM	-	-	94	-	319	-	781	-	1170	-	1505	-
eKYC Verification (Successful Txn)	-	-	13	-	48	-	156	-	153	-	90	-
Demographic Queries(Authenticated UID)	-	-	13	-	32	-	639	-	136	-	34	-
AEPS Tokenization	-	-	-	-	-	-	-	-	-	-	1253	-
Archieval Query on CTS (Print+Retrieve request) (NAS)	-	-	1	-	2	-	2	-	2	-	3	-
BBPS (Bill Fetch)					0		15		264	-	778	-
UPI (Balance Enquiry)	25	-	29	-	31	-	824	-	4688	-	10999	-
Total Non FinancialTxn (B)	719	-	1013	-	1543	-	3786	-	7929	-	16167	-
Total Financial + Non Financial (A+B)	4429	76111	6419	85271	8681	96626	13643	113553	24736	136719	42660	160924
Volumes in Million, Values in Billion												

Source: NPCI Website https://www.npci.org.in

Table 12: Financial Analysis

National Payments Corporation of India											
Income & Expenditure Accounts from FY 2009-2010 to FY 2019-2020											₹ in Crore
Particulars	Year ended 31-Mar-10	Year ended 31-Mar-11	Year ended 31-Mar-12	Year ended 31-Mar-13	Year ended 31-Mar-14	Year ended 31-Mar-15	Year ended 31-Mar-16	Year ended 31-Mar-17	Year ended 31-Mar-18	Year ended 31-Mar-2019	Year ended 31-Mar-2020
Income											
Revenue from Operations	18	71	99	136	217	326	377	504	677	902	1,099
Other Income	0	5	9	13	20	27	32	45	51	79	122
Total Income	18	76	108	149	237	353	410	549	729	980	1,221
Expenses											
Operating Expenses	3	11	19	17	23	26	39	60	65	78	82
Employee Benefits Expenses	1	8	20	28	37	49	65	94	129	149	157
Administrative and Establishment Expenses	0	4	8	12	16	19	22	25	29	30	23
Depreciation and Amortisation Expenses	0	3	16	36	51	42	49	48	68	92	127
Other Expenses	2	3	6	8	21	47	50	70	85	154	313
Total Expenses	6	29	69	101	148	184	225	296	377	503	702
Surplus Before Tax	12	47	38	48	89	169	185	252	352	478	519
Tax Expense											
Current Tax	-	18	8	12	31	53	64	80	124	169	138
Mat Credit entitlement	-	-	-3	3	-	-	-	-	-	-	-
Deferred Tax	-	2	9	0	0	5	1	9	0	2	-7
Total Tax Expenses	-	20	13	16	31	58	65	89	124	171	131
Surplus after Tax	12	27	25	32	58	111	119	163	228	307	388

Annexure 1: Enabling Regulation

The Payment and Settlement Systems Act (PSS Act 2007) provides the legal framework for the payment and settlements systems of the country. This Act enables the Central Bank to regulate and overlook the payments and settlements network of India. Under this framework, the central bank issues instructions to banks and has the authority to approve or disapprove any payment platform along with designing new policies for payments. To maintain a system as per international standards, the RBI has adopted a three-forked approach consolidating all existing payment systems, the development of payment systems and the integration of payment and settlement systems. The RBI has a robust institutional framework and at the highest tier is the National Payments council which lays framework and guidelines for implementing a sound and robust payments system. This committee is led by the Deputy Governor in charge of the department of Information Technology and represented by the Executive director-in-charge of the department of Information technology, with representatives from banks and SEBI and NSE. The National Payments Council is assisted by 5 task forces each of which is headed by a member of the NPC and comprises of experts from different domains. The task forces are:

- Task Force on Monetary Policy and related issues
- Task Force on Payment and Settlement systems Oversight
- Task Force on Legal issues
- Task force on technology related issues
- Task force o systems and procedures related issues [16]

RBI in its latest policy Vision document (2018) stresses certain domains where effective policies should be implemented. These include policy framework for Central Counter Parties (CCPs), risk management, regulation of the payment gateway service providers and the payment aggregators, etc. The RBI also plans to have an exit-policy for the overall hygiene of the payments ecosystem. There will also be a framework for the imposition of penalty for those who do not adhere by the guidelines of the PSS Act. It also seeks to have a framework to monitor new technology and innovations.

Annexure 2: Board of Directors

Name	Designation
Mr. Biswamohan Mahapatra	Non-Executive Chairman, NPCI
Mr. Dilip Asbe	MD & CEO, NPCI
Mr. Deepak Kumar	Chief General Manager-in-charge, Department of Information Technology, RBI.
Prof. G. Sivakumar	Department of Computer Science and Engineering, IIT Bombay
Dr. Santanu Paul	CEO and MD, Talent Sprint
Dr. Amitha Sehgal	Hon. Secretary, All India Bank Depositors' Association (AIBDA). (Independent Director representing the interest of ultimate users of NPCI services)
Mr Venkatraman Srinivasan	Partner, M/s. V. Sankar Aiyer &Co, Chartered Accountants
Mr. Ravindra Pandey	Dy. Managing Director (Strategy) & Chief Digital Officer (CDO), SBI
Mr. Sunil Soni	Chief General Manager - Information Technology (Chief Technology Officer), Punjab National Bank
Mr. Sudhiranjan Padhi	General Manager, Customer Excellence Alternate Delivery Channels Department, Bank of India
Mr. Ajay Kumar Kapoor	Senior Executive Vice President, Business Technology Group, HDFC Bank.
Mr. Pankaj Gadgil	Head – Self Employed Segment, ICICI Bank Limited
Mr. Siddharth Rungta	Managing Director and Country Head, Global Liquidity and Cash Management, The Hongkong and Shanghai Banking Corporation Limited
Mr. Rajiv Anand	Executive Director, Axis Bank

| Mr. Premnath Salian | Managing Director and CEO, Abhyudaya Co-operative Bank Limited |

Source: npci.org.in

Annexure 3: Risk Management

Enterprise Risk Management

The NPCI has robust policies in place to manage risks, as it involves issues regarding payment systems which also interfaces with the rest of the banking system. It adheres to strict policies regarding risk management for ensuring safety, security and sustainability of the payments system. The NPCI has a set of principles to follow with respect to risk management in all the dimensions of Recognition, Improvisation, Segmentation, and Knowledge. NPCI has Board-level Committees for Governance, Risk and Compliance which are the Risk Management Committee (RMC) and the Internal Risk Management Committee (IRMC).

Operational Risk Management

For day to day activities, the NPCI has a operational risk management mechanism in place for risk arising from failure in internal processes and systems, human error, or from external events - from payment and settlement systems. The NPCI follows a comprehensive operational risk management framework.

Fraud Management

The NPCI has implemented a real time Fraud monitoring and management framework. This is a value-added service to all members of the NPCI to monitor and detect fraud in real time. This mechanism is in place for all the on-line products offered by the NPCI. The system has the capability of handling acquirer level monitoring; online predictive scoring based on transaction pattern data and automated Compromise Point and Period (CPP) analysis. The NPCI holds many workshops for banks across the country, educating them about the risks of fraud and demonstrating the features and use of this system. It has also sounded in the past about possible risks and frauds to its member banks.

Settlement Risk Management

Settlement risk arises when an entity has insufficient funds to meet its financial obligations at the present date but may fulfil them at a future date. This could lead to principal risk (risk of losing transaction value due to bankruptcy or default). In this situation, both parties are exposed to settlement risk. In view of such risk, NPCI takes an affirmative position in the settlement process and performs a risk-based approach safeguarding enterprises against settlement risk and reports any incidences of default to the RBI and its member banks. NPCI has formed the Settlement Guarantee Mechanism which includes pledged cash collaterals and pooling of funds which are a

committed line of credit for payments, to address impacts of liquidity or credit risk. It has effective tools in place to monitor any situation leading to systemic risk. If a temporary failure arises, then the amount is replenished by the defaulting member bank itself. In the case of permanent failure, the total financial obligation of the defaulting bank will be borne by the surviving member banks that have borne transactions that day under the payment system. The amount received is to be used to replenish the funds if the Settlement Guarantee Fund (SGF) to meet settlements.

Business Continuity Plan

NPCI seeks to protect the interest of its customers and stakeholders by offering uninterrupted services. NPCI has a Business Continuity Plan in place to nullify service outages, impacts on business caused by uncontrollable factors and restore services in the minimum possible time frame. For this purpose, the NPCI has accomplished ISO22301:20112 Business Continuity Management System (BCMS). This system seeks to minimize risk, loss and durations of disruptions in business operations.

Cyber Security

NPCI has formulated robust processes for protecting the intellectual property of the organization. There is an Infosec team present in the NPCI to protect systems for major cyber threat. This team secures data, information and systems from unauthorized access, data manipulation and disruption. World class cyber security is provided to handle confidential and sensitive data. A set of comprehensive policies are designed to manage risks to information assets. The NPCI has received certifications of PCI DSS v3.2, ISO 27001:2013 and ISO 22301:2012 and has hence implemented policies, processes, organizational structure and software and hardware functions. An effective cyber security system protects data right from its inception to its disposal. Inspiration has been taken from international practices designed to protect networks, data applications, data damage and unauthorized access to win customer confidence.
Source :npci.org.in

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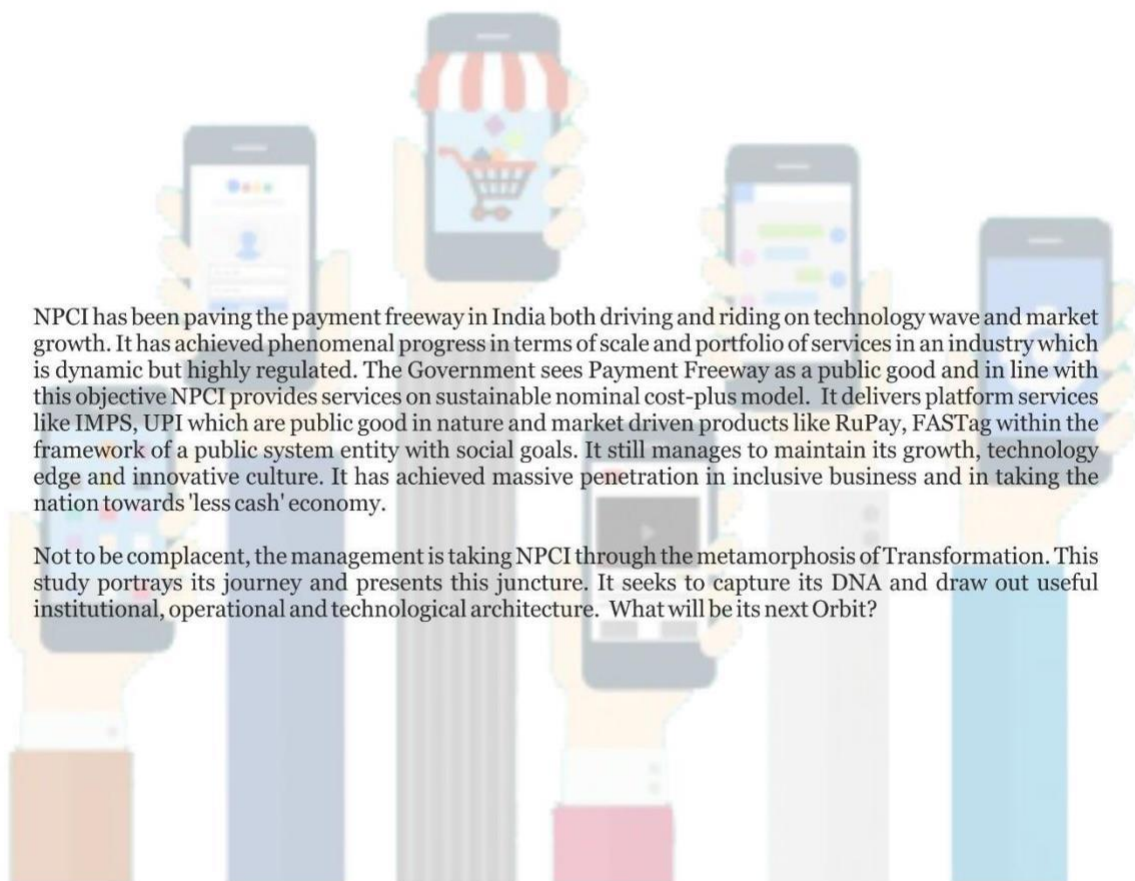
NPCI has been paving the payment freeway in India both driving and riding on technology wave and market growth. It has achieved phenomenal progress in terms of scale and portfolio of services in an industry which is dynamic but highly regulated. The Government sees Payment Freeway as a public good and in line with this objective NPCI provides services on sustainable nominal cost-plus model. It delivers platform services like IMPS, UPI which are public good in nature and market driven products like RuPay, FASTag within the framework of a public system entity with social goals. It still manages to maintain its growth, technology edge and innovative culture. It has achieved massive penetration in inclusive business and in taking the nation towards 'less cash' economy.

Not to be complacent, the management is taking NPCI through the metamorphosis of Transformation. This study portrays its journey and presents this juncture. It seeks to capture its DNA and draw out useful institutional, operational and technological architecture. What will be its next Orbit?