

# Engineering and Advancement of Digitization through Unified Payment Interface

## Abstract:

Unified Payment Interface introduced in 2016 is an instant real-time payment system developed by National Payments Corporation of India facilitating inter-bank transactions. The interface is regulated by the Reserve Bank of India and works by instantly transferring funds between two bank accounts on a mobile platform. Unlike wallets, the payer and the payee can use two different payment service providers. Unified Payment Interface has brought revolution in payment system in India, making instant real-time payment system possible. This study is focused on looking at engineering side of Unified Payment Interface and its impact around advancement of digitization. Here we see behind Unified Payment Interface engineering infrastructure and how it works. This study also elaborates on urgencies of digitization through Unified Payment Interface mode in India. Study was carried out by taking survey, using Right to Information Act, and understanding computing side of Unified Payment Interface. In survey 214 individuals were asked 20 questions irrespective of age, location, sex, income background, education and religion in India. Findings were listed with both positives and negative aspects highlighted.

*Keyword: UPI; Unified Payment Interface; Payment Infrastructure; Fintech; India, India UPI.*

## 1) Introduction:

As the saying goes 'Money makes the world go 'round'. This has been true for a very long time. But what constitutes money, or rather the shape and form of money, has changed over time. In the early days, money was a physical representation of value like a lump of gold. This evolved into banknotes and coins as a medium of exchange that we still use today. This is what we now call cash. Notes and coins have been around for centuries. The first man-made coins were invented separately in India, China, and in cities around the Aegean Sea between 700 and 500 BC. Paper money was introduced during the Song Dynasty in China in the 11th century. In recent years, the most sophisticated mobile-based payment system that could be proven to provide considerable value for customers and Indian banks was the Unified Payment Interface (UPI) platform [1-5].

The availability of non-cash payment infrastructure is increasing significantly in our country translating in consistently growing non-cash transaction volumes. While cash transaction volumes on country level seem to be increasing in absolute terms, electronic payment transaction volumes are increasing faster. This results in a diminished share of cash in the total payment mix. Indian banks are increasingly offering their customers cutting-edge platforms through which to access financial services. Formerly, in order to use any service, the consumer had to go to a branch. The traditional banking system has evolved as a result of mobile and online banking. The customer can now take advantage of services with little to no branch visits now. The most

important and devoted consumers of the banks are seen using both traditional and digital banking services like electronic banking [6-11].

Unified Payment Interface (UPI) has brought revolution in payment system in India, making instant real-time payment system possible. Developed by National Payments Corporation of India (NPCI) under the guidelines of Reserve bank of India, the Unified Payment Interface (UPI) has become new face of cashless payment. India continues to be driven by use of cash, less than 5% of all payments happen electronically; various studies have shown that India uses too much cash for transactions. The ratio of cash to gross domestic product in India is one of the highest in the world. The number of currency notes in circulation is also far higher than other large economies. Some studies show that cash dominates even in malls, which are visited by people who are likely to have credit cards, so it is no surprise that cash dominates in other markets as well [12-14].

### **1.1.What is UPI?**

Unified Payments Interface (UPI) is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing & merchant payments into one hood. It also caters to the “Peer to Peer” collect request which can be scheduled and paid as per requirement and convenience. **Unified Payments Interface** (UPI) is an instant real-time payment system developed by National Payments Corporation of India facilitating inter-bank transactions. The interface is regulated by the Reserve Bank of India and works by instantly transferring funds between two bank accounts on a mobile platform [14, 15].

Payment service providers (PSPs) to provide the interface to the payer and the payee. Unlike wallets, the payer and the payee can use two different PSPs. UPI, built on IMPS allows a payment directly and immediately from bank account. There is no need to pre-load money in wallets. It allows payments to different merchants without the hassle of typing one’s card details or net-banking password. Remark, the use of debit, credit and prepaid cards also nearly doubled during the same period. Both pre-existing and new players in the financial ecosystem benefited and both new and pre-existing digital payment systems saw increased utilization. This system successfully encouraged close collaboration between technology and financial service providers, and created winning opportunities across the ecosystem. The number of transactions via UPI was 1.2 times higher than the number of debit card transactions in 2018-19 [16, 17]. Currently, NEFT, RTGS or IMPS system are used to send or receive money. For all of these you are required to furnish detailed information of the recipient, the IFSC code of bank account number etc are required [18].

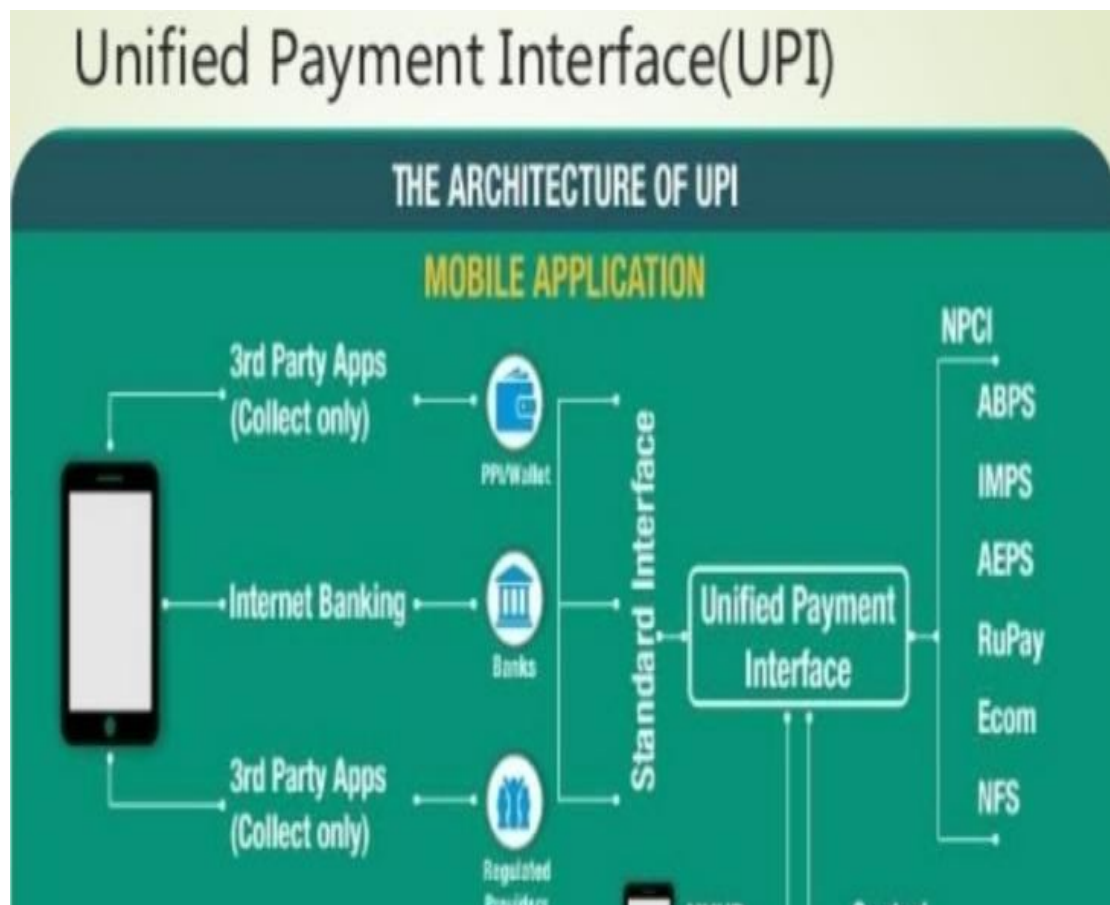
### **1.2.How UPI is leading to advancement towards Digitization?**

India moved a step closer towards becoming a cashless economy with the launch of UPI. Unified Payments Interface (UPI) is an instant payment system developed by the National Payments Corporation of India (NPCI),

an RBI regulated entity NPCI'S flagship product, UPI has revolutionized digital payments. UPI has already reached citizen scale and NPCI is working on making it grow multifold from here. With most major global payments players including Google and Whatsapp relying on UPI, India is fast emerging as the leader in the Fintech space. UPI – based transactions witnessed a new high of 955 million during September 2019, compared to a mere 1 million. during December 2016, right after demonetization [13, 18]. Also, India has around 240 million Smartphone users and is expected to grow to 520 million by 2020. Various Government initiatives like National Optical Fiber Network and Pradhan Mantri Jan Dhan Yojana will provide a significant boost in UPI's user base. UPI is a great step in right direction and it is set to become an efficient alternative to mobile wallets. UPI will help in making cashless payment faster, easier and smother for people in India. The purpose of this study is to study advancement towards digitization through UPI [19, 20]. The study aims to include all factors which lead to digitization through UPI. In this article, we focus on Advancement towards Digitization through UPI. Given the enormous growth in electronic payments today, it begs the question: What is state of advancement towards digitization in India through Unified Payment Interface (UPI)?

### 1.3.Engineering and Advancement of Digitization through Unified Payment Interface:

Indian banks have made it a priority to provide a wide range of services by utilizing numerous electronic networks, including mobile banking, automated teller machines, and digital payments, for more than 20 years. The Unified Payments Interface (UPI), which was introduced in 2016 as an instant real-time payment and settlement system, currently makes up a whopping 47% of India's retail clearing and settlement systems. This has inspired the researchers to conduct a study on a variety of UPI transactional metrics, including user knowledge, happiness, problems experienced by users, and time taken to resolve issues. As a standard interface or platform for all digital payment systems in India, NPCI created the Unified Payment Interface (UPI). The UPI Network is owned, operated, provided services by, and coordinated by NPCI. With the help of the Unified Payment Interface, standard Application Programming Interface (API) specifications can be used to enable digital payments on mobile devices [2, 18, 21].



## **2. Research Methodology**

The key objectives of this article are:

- Answering or gaining insight into key questions regarding the use of cash and the organization of cash cycle
- Analyzing the findings (similarities/differences) across different payment methods.
- Providing an objective overview of advancement towards digitization through UPI.

### **Significance of Study:**

The research will be significant to Government organization, different Fintech companies, scholars in digital space, Non-government organization and other individual users as it studies advancement towards digitization through UPI. Furthermore, it helps government to see ground reality of India's cashless economy. It's more relevant in case of Fintech companies already in this space or have a want of getting started in this space. Besides, the research output would be important for other researches as references for subsequent studies to be made in this area.

### **2.1.Data Collection**

Data collection is the process of gathering and measuring information on targeted variables in an established system, which then enables one to answer relevant questions and evaluate outcomes. Data collection is a component of research in all fields of study including physical and social sciences, humanities, and business. While methods vary by discipline, the emphasis on ensuring accurate and honest collection remains the same. The goal for all data collection is to capture quality evidence that allows analysis to lead to the formulation of convincing and credible answers to the questions that have been posed. Regardless of the field of study or preference for defining data (quantitative or qualitative), accurate data collection is essential to maintaining the integrity of research. The selection of appropriate data collection instruments (existing, modified, or newly developed) and clearly delineated instructions for their correct use reduce the likelihood of errors. There are two types data used for this research:

2.1.1. Primary Data : In this technology-driven world, meaningful data is more valuable than gold. Fintech organization need highly validated data to make informed decisions. This is very reason why many companies are proactive in gathering their own data on use of UPI [22]. Primary data helps in collecting first

hand information without alteration. In this study primary data is used by collecting survey in form of

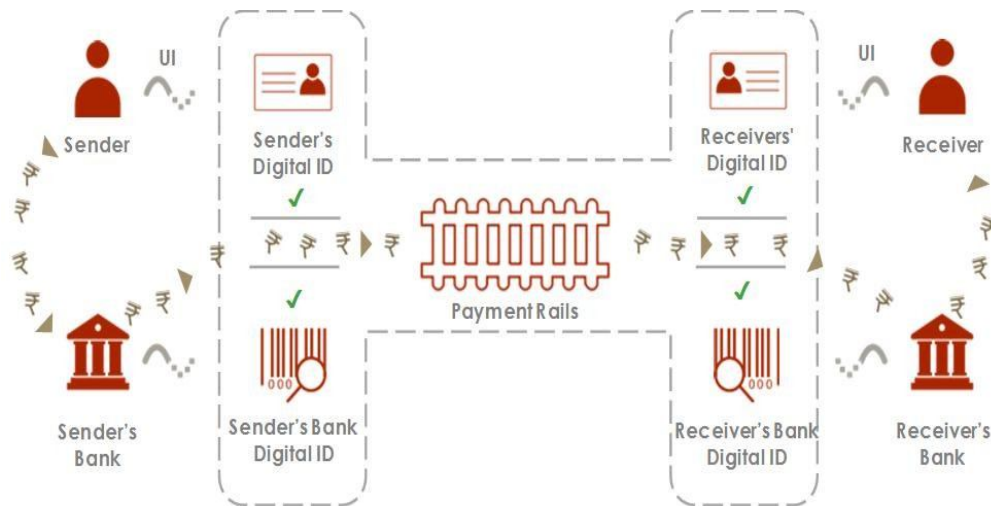


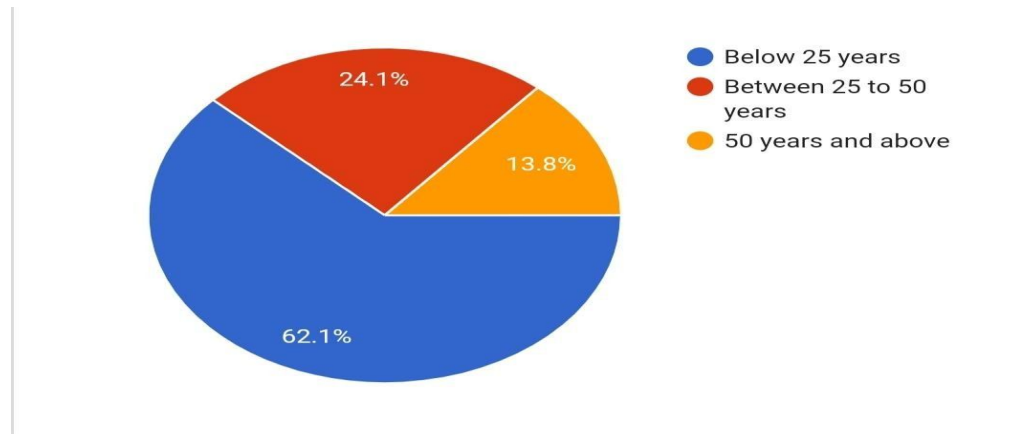
Figure 2 These steps have been summarized in the above diagram.

questionnaire from individuals and for better national coverage twitter was used.

2.1.2. **Secondary Data:** Secondary data is a form of data collection in which data is collected from already existing research or data. Existing data is used for wider coverage on research topic with more effectiveness and efficiency in detailing. These documents can be made available by public libraries, websites, government reports and data or data obtained from already filled survey etc. Secondary research is more cost effective than primary research, as it makes use of already existing data. The secondary research in this project comprises of government data and research data from different organization and previous research work of individual researchers [23].

### 3. Results:

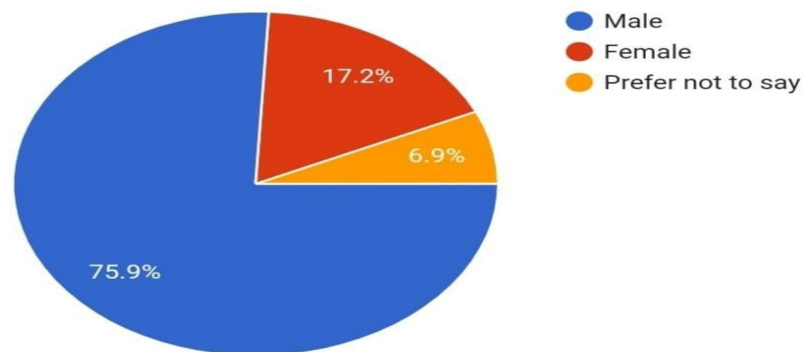
#### 3.1.Group:



#### INTERPRETATION:

The result shows that majority of the respondents i.e. 62.1% falls under the category of below 25 years and 24.1% falls under 25-50 years and the remaining 13.8% respondents belong to the 50 years and above age group. It indicates that the survey is mostly conducted among the young generation..

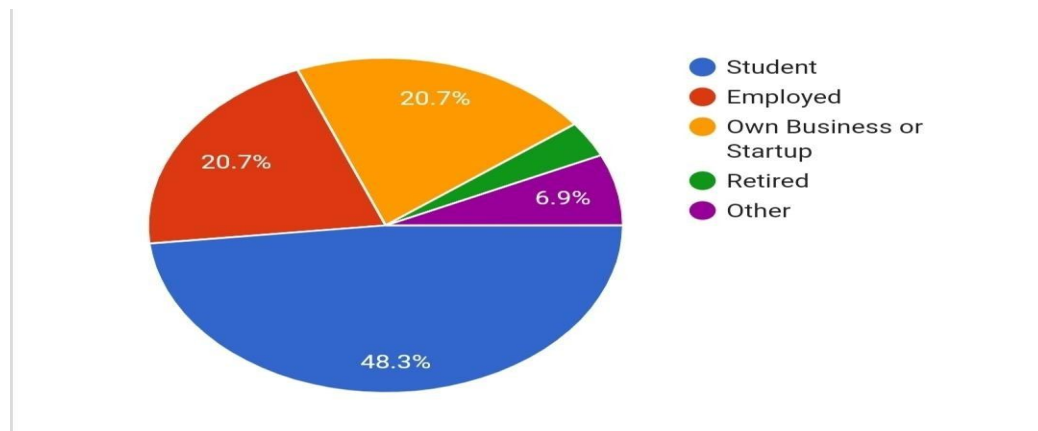
#### 3.2.Gender:



### INTERPRETATION:

The results shows that the majority of the respondents i.e. 75.9% are male who participated in the Unified Payment Interface survey, where as only 17.2% females participated.

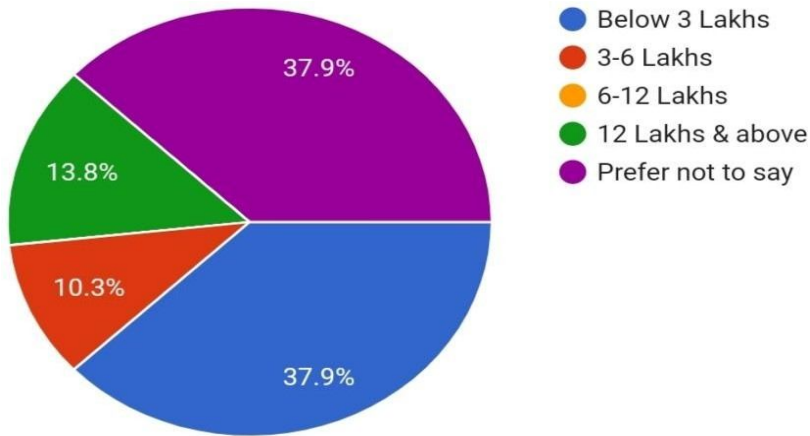
### 3.3.Occupation:



### INTERPRETATION:

The results shows that out of the total respondents 48.3% are students, 20.7% are self employed, 20.7% have their own business, and 6.9% belong to the others category and 3.4% which consists of lecturer and retired persons.

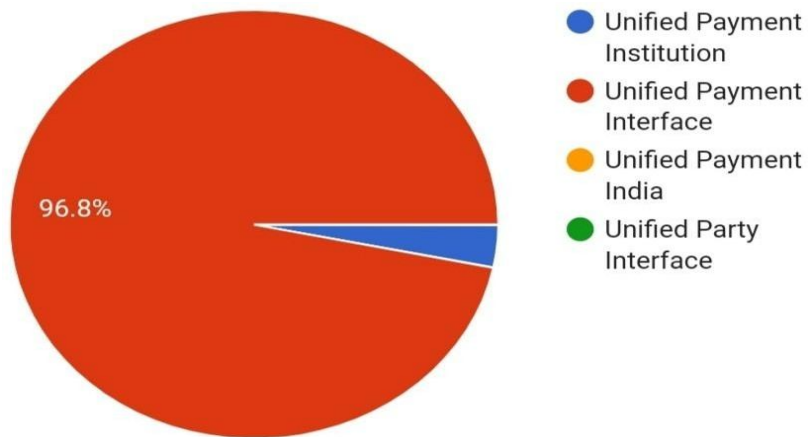
### 3.4.Income



**INTERPRETATION:**

Among the total respondents 37.9% belong to the below 3 lakhs income group,37.9% didn't prefer to say their income group,,13.8% belong to the 3-6 lakh income group and the remaining 10.3% belong to the 12 lakh and above income group.

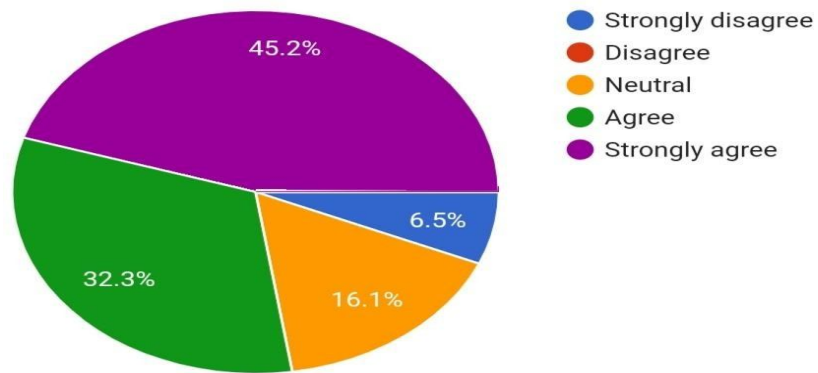
**3.5.What is full form of UPI?**



**INTERPRETATION:**

Among the total respondents 96.8% knew correct full form of UPI. 3.2% of respondents didn't even knew full form UPI.

**3.6.Is UPI better than previous transaction modes?**



**INTERPRETATION:**

The survey shows that 45.2% of the respondents strongly agree, 32.3% of respondents agree, 16.9% decided to stay neutral where as 6.5% strongly disagreed. It concludes that not all but majority of the respondents agree on UPI being better payment mode.

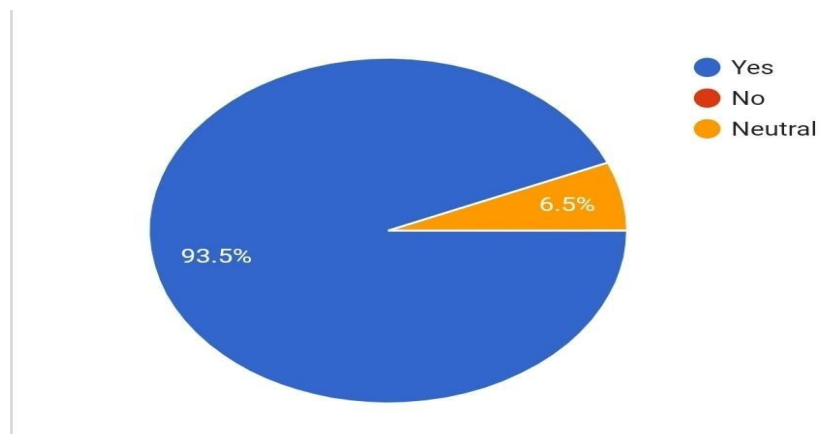
**3.7.Do you see general acceptance of UPI growing?**



#### **INTERPRETATION:**

It shows that there is increase in popularity and acceptance as a payment mode as 96.8% of participants responded with yes and 3.2% of participants responded with maybe. In all we can agree on general acceptance of UPI growing.

#### **3.8.Does UPI have friendly User Interface?**

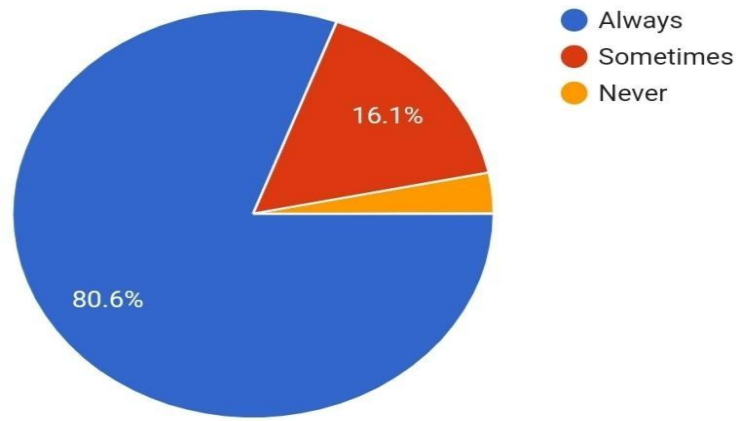


#### **INTERPRETATION:**

From the above chart, it is evident that the 93.5% respondents perceive UPI of having friendly user interface and 6.5% choose to be neutral. As majority of respondents are inclined towards UPI having a friendly user

interface. It's a positive sign for NPCI as users are finding UPI's interface easy to use, and friendly in nature.

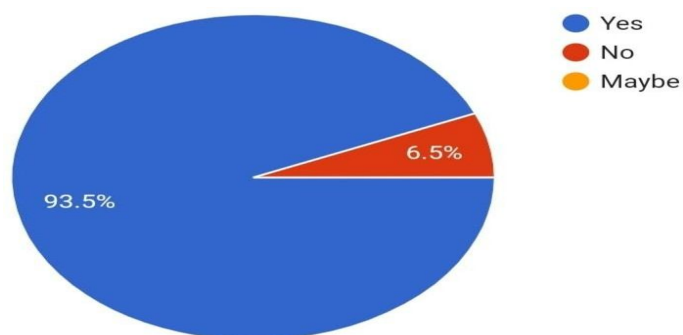
### 3.9. How often you use UPI?



### INTERPRETATION:

Prime reason asking this question was to generate amount people using UPI over other digital payment mode. From the above chart it shows that majority of the respondents i.e. 80.6% used UPI always, 16.1%% are occasional users and 3.3% never used UPI. Government needs to bring a boost in form of promotion etc to make UPI first preference among digital payment users in India.

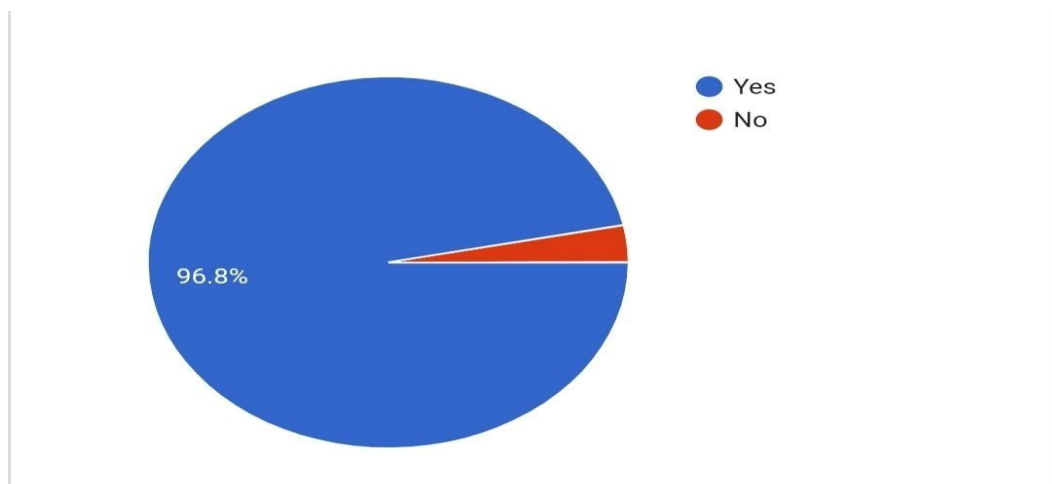
### 3.10. Did UPI increase your number of Digital Transaction?



**INTERPRETATION:**

This was asked to gather influence of UPI (Unified Payment Interface) in increasing digital transactions. . From above chart it is pretty clear that UPI led to increase in digital transaction as 93.5% of respondents agreed with it. As 6.5% of users didn't see any increase in their digital payment. This means UPI has really helped in increasing digital transaction in our country.

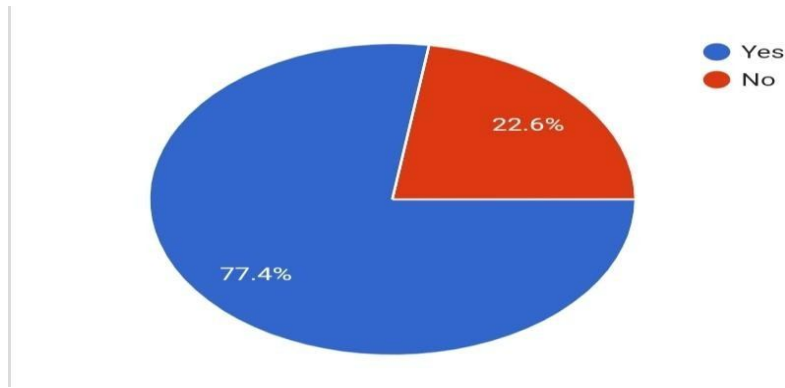
**3.11. Do you feel safe using UPI mode of Transaction?**



**INTERPRETATION:**

Question was asked to know user preference in terms of security related features in Unified Payment Interface mode. The results show that 96.8% respondents felt safe using UPI mode whereas 3.2% felt UPI mode to not be safe.

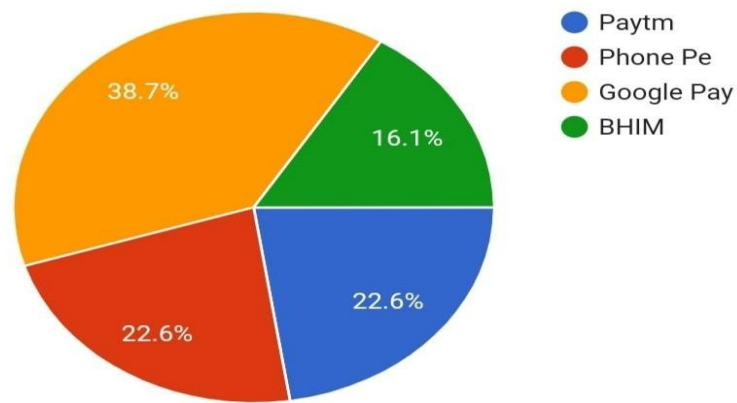
**3.12. Do you use UPI for bills and utility payment on daily basis?**



**INTERPRETATION:**

This question is asked to know respondents preference in using UPI in their habitual lifestyle activities. Respondents have shown good levels of 77.4% as yes and 22.6% didn't use UPI as alternative for their payment. One of the major reasons of using UPI is that it is available 24x7 followed by its ease of use, direct access and its security sadly being one of the lowest.

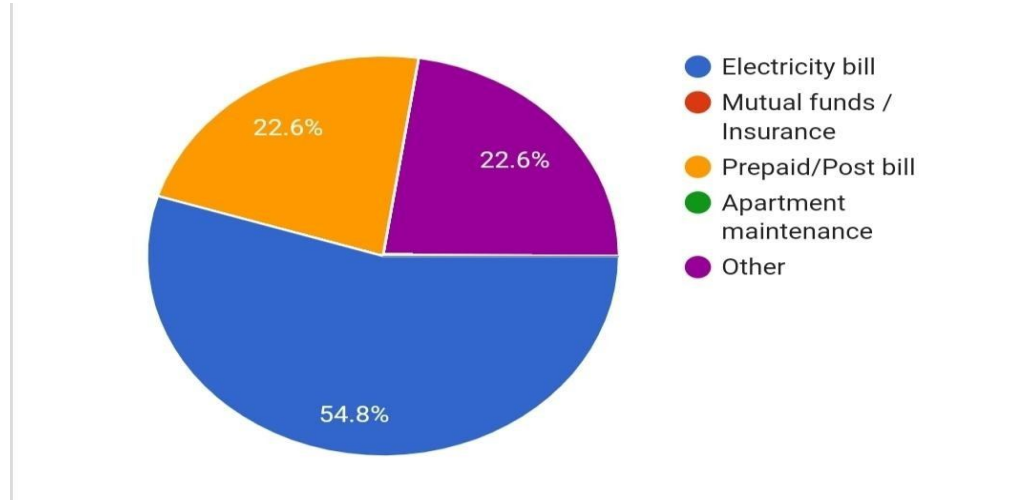
**3.13. What's your preferred payment app?**



**INTERPRETATION:**

This was asked with intention of knowing which Fintech company has major share in UPI payment space .The above chart clearly shows that 38.7% respondents used Google Pay, 22.6% used Phone Pe, 22.6% used Paytm and 16.1% used Bhim app. Thus, it is easy to make UPI space being one of most saturated industry in India.

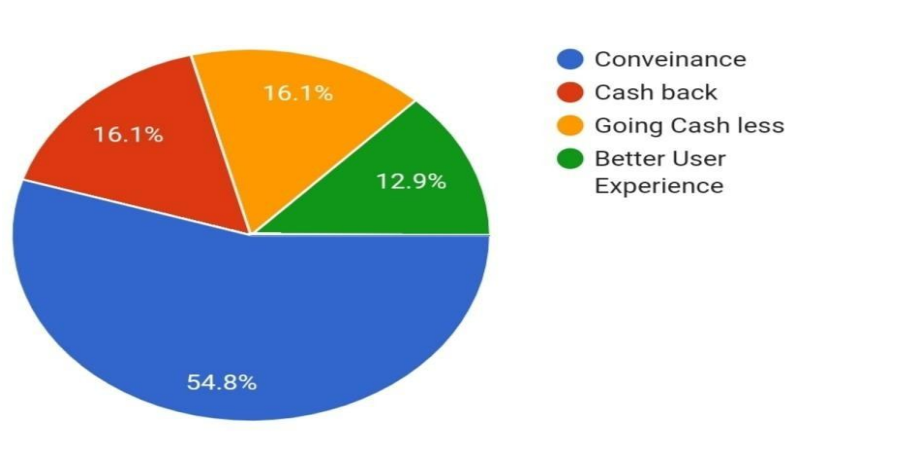
### 3.14. Which services do you pay using UPI linked apps?



#### INTEPRETATION:

This was asked as to know for which utilities UPI feature is used more in number. 54.8% respondents have responded with electricity being prime reason, 22.6% responded with prepaid/postpaid bill payment and 22.6% responded with other reasons. Fact to be noted people didn't choose payment of mutual funds and apartment maintains as their option.

### 3.15. Why do you prefer paying through these payment apps?

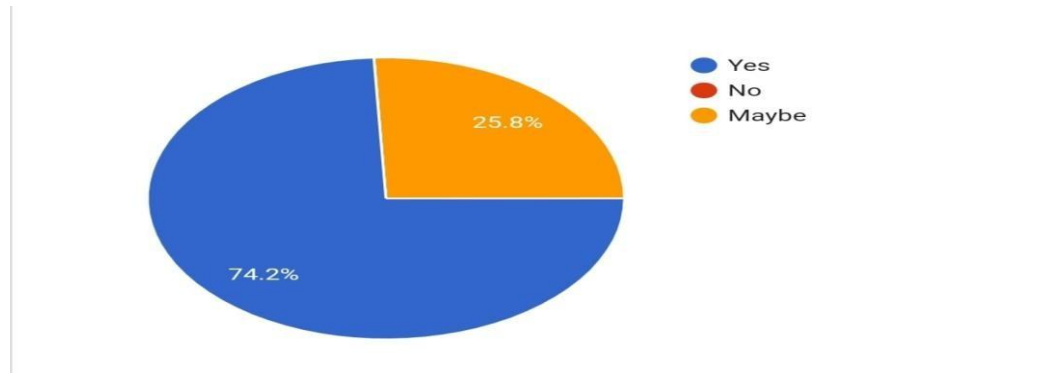


#### INTERPRETATION:

This was asked to gather information regarding reasons for usage of UPI linked apps. 54.8% respondents cited with convenience as their reason, 16.1% cited with feature

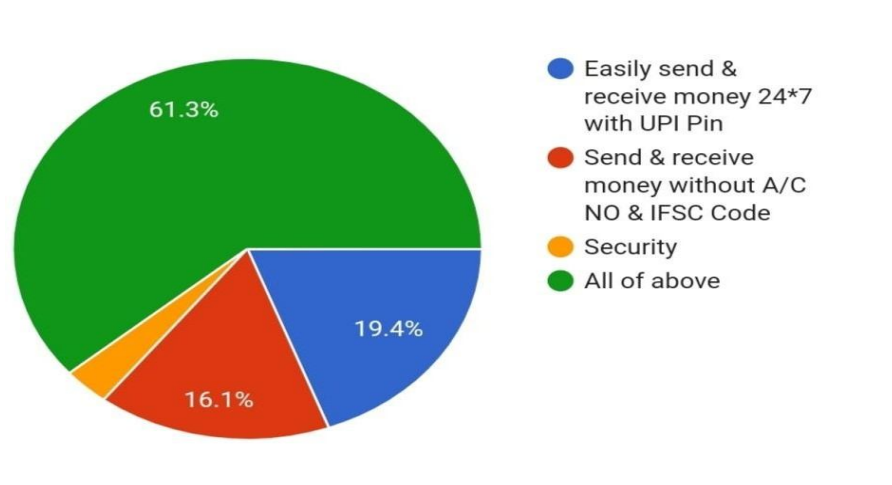
like cash back, 16.1% cited with going cashless as their reason and 12.9% of respondents cited with having better user experience as their reason for usage. It is interesting to note that most respondents cited with reasons like convenience and going cashless.

**3.16. Do you see more concentration in market with companies coming up with their own payment mode linked to UPI?**



**INTERPRETATION:**

The results show that 74.2% of respondents agree to more concentration in market with companies coming up with their own payment mode. With 25.8% responding with maybe as their answer, it's clear from above chart of more companies entering this space resulting to saturation.



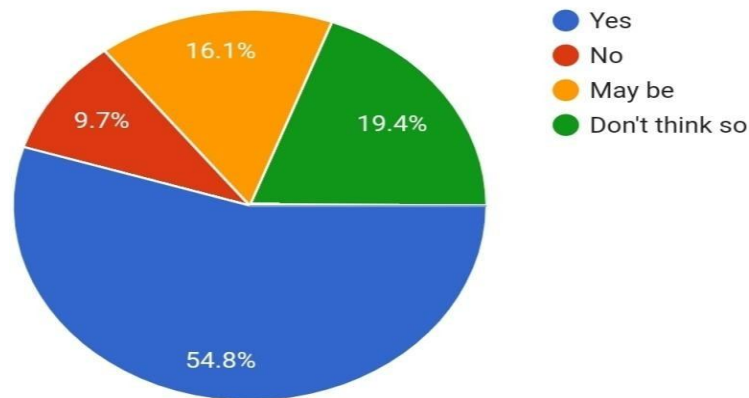
**3.17. What is benefit of UPI?**

**INTERPRETATION:**

It is good to see that most of the users 61.3% went with all of above as their choice, 19.4% choose feature like easy send and receive money 24\*7 with UPI pin, 16.1% choose feature like send and receive money without A/C NO and IFSC code and 3.2% choose security as their option.

It is to be noted that respondents were well aware of features that UPI bought with it.

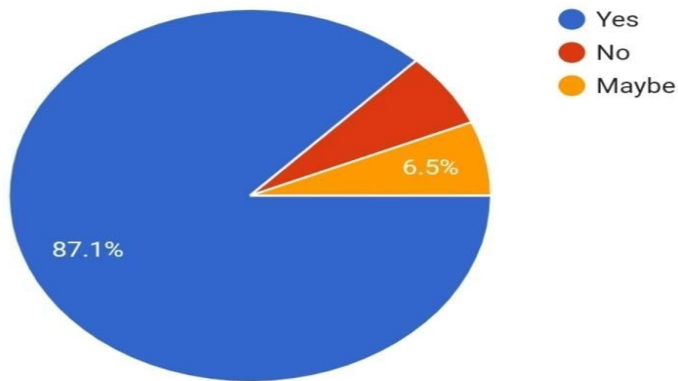
**3.18. Do you think shift towards Digitisation was due to Demonetisation?**



**INTERPRETATION:**

Demonetisation touted to be most important reason for individuals to go for digital payment. This was asked to gather opinion from respondents on their views. 54.8% of respondents choose yes, 19.4% went with don't think so as their view, 16.1% choose may be and 9.7% choose no as their option. The results show varied difference in opinion of respondents.

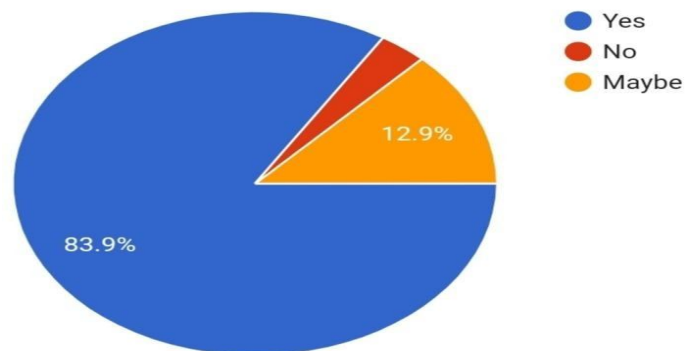
**3.19. Do you see India moving towards more cashless economy?**



**INTERPRETATION:**

This being the most important question of survey had significance as to know whether India was moving towards more cashless economy. As seen in chart 87.1% choose yes, 6.5% choose no and 6.5% choose maybe as their option. It is great to see respondents having positive view of India moving towards more cashless economy.

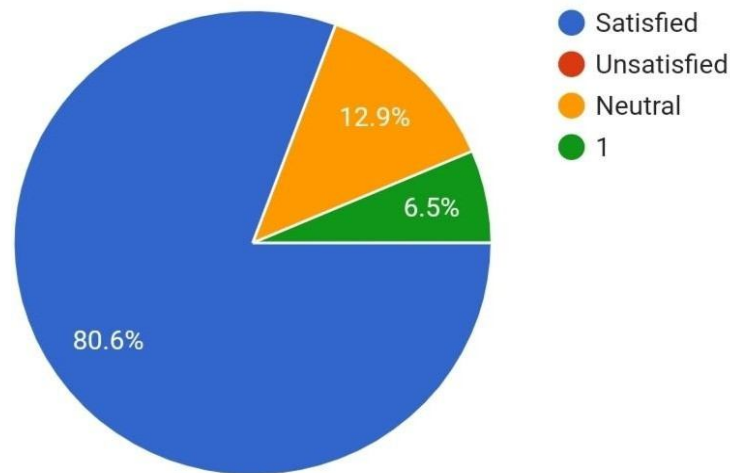
**3.20. Do you think Government had big role behind UPI success?**



**INTERPRETATION:**

It was asked to seek respondent view on government influence on making UPI a success. It shows that majority of the respondents 83.9% felt government role in UPI success, 12.9% responded with maybe and 3.2% responded with no. It worth noting participants felt government influence resulted to success of UPI.

### 3.21. Rate your overall experience using UPI?



#### INTERPRETATION:

This was asked to gather respondent's opinion on their experience using UPI. It shows that 80.6% respondents were satisfied, 12.9% respondent choose neutral as their option and 6.5% choose 1 star that referred to poor usability of UPI mode. It is worth to note overall experience of respondents was positive in nature.

#### Summary Of findings:

- Most of respondents are fully aware of UPI system services.
- Frequency of the usage of UPI service is still not yet reached the targeted rate.
- Since demonetisation a greater number of customers are using UPI services.
- Most of the customers are using Google pay to transfer money.
- The knowledge levels towards UPI system are up to mark.
- Cash back is major motivating factor to use UPI services.
- Transaction processing time is less through UPI system
- Transaction through the UPI system is secured.
- Very less steps are involved in processing transaction through UPI.
- It is very convenient to use and overall services provided by UPI is appreciated.

## Conclusions:

In recent years, India's rapidly growing GDP has created a chasm between a rich minority and a poor majority. The top 1% of India controls over 50% of its wealth, while the bottom half of the country barely scrapes by on 4% of the wealth. It is in this context that one must understand the payments infrastructure in India. And it is this context that makes the current payments innovation in India so revolutionary. In a short span of time, the Indian government has catapulted the country's payments infrastructure into one of the most advanced, innovative, and financially inclusive platforms in the world. By 2015 -2016, the excitement around mobile penetration in India had reached frenzy and the Indian market was bombarded with mobile-first businesses. From e-commerce to entertainment to the sharing economy, mobile businesses were taking off, and with them, so was the demand for digital payments. Seeing the economic potential of making payments easy and accessible, the government issued charters for several "payments banks" (banks that could provide basic deposit and payment services, but could not lend money) in 2015. These licenses were primarily issued to existing private corporations which had broad customer reach but did not yet play a formal role in financial services. UPI is a great step in right direction and its is set to become an efficient alternative to mobile wallets and make cashless payments faster, easier and smoother for millions of people in India. **Pro** Facilitates quick, easy, seamless, cheapest way of transferring money anytime, anywhere, Single click 2 factor authentication aligned with regulatory guidelines, You are not required to share your bank details—simply transact using a UPI ID also called a Virtual Payment Address (VPA), No need to share or remember sensitive information, You can link multiple accounts using one UPI based app and will no longer need different apps of different banks, Are beneficiary details needed-Only virtual ID is required & not additional bank approval, The QR code scan feature facilitates payment for online as well as offline purchases. All transactions are possible through this one app, as all your accounts can be linked to a single window, No need to carry wads of cash, run to ATMs, or struggle to render exact amount, Collect Payment service has made it easier to ask for payments, Hoarding of cash will reduce in system which will lead to economic boom, Indians' usually prefer using mobile for all purpose compared to computer which exponentially will help in increase of digitization, Government initiative of opening WIFI centers around common places will lead a boom of new internet user base which will eventually cater towards digitization process. Some limitations are, Access to mobile phone or internet at home. Money can be transferred through Only through Smartphone, Cash is anonymous - Anonymity Unlike electronic money, cash does not leave a digital trace. Even though banks and governments favour this traceability, the aspect of anonymity is highly valued by consumers when making ordinary day-to-day purchases, Cash is contingency and fall-back solution: Safe Haven Building on the aspects of availability and reliability, another attribute of cash is its ability to function as a Contingency or Safe Haven in case of a crisis. Not only national banks and governments but also consumers on an individual level rely on cash in case of crises. This could vary from a banking crisis or a power outage at a convenience store to the uncertainty of being able to pay electronically. In these situations,

consumers resort to cash payments to finalise their purchase, Paying in an online environment Changing the way we transact from face-to-face to remote also impacts the way we pay for these services. In many instances, the common assumption is that cash is not the ideal payment instrument for these remote purchases. Even though this holds true for some countries and regions across the world, this is not the case in all countries, Need of having bank account.

## Questionnaire

Form used to collect data.

### Study on Advancement towards Digitization through UPI

\*Required

1. Name
2. Age Group
  - Below 25 years
  - Between 25 to 50 years
  - 50 years and above
3. Gender
  - Male
  - Female
  - Prefer not to say
4. Occupation
  - Student
  - Employed
  - Own business or Startup
  - Retired
  - Other
5. Income
  - Below 3 Lakhs
  - 3-6 Lakhs
  - 6-12 Lakhs
  - 12 Lakhs & above
  - Prefer not to stay
6. What is full form of UPI?
  - Unified Payment Institution
  - Unified Payment Interface
  - Unified Payment India

- Unified Party Interface

7. Is UPI better than previous transaction modes?

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

8. Do you see general acceptance of UPI growing?

- Yes
- No
- Maybe

9. Does UPI have friendly User Interface?

- Yes
- No
- Neutral

10. How often you use UPI?

- Always

- Sometimes
- Never

11. Did UPI increase your number of Digital Transaction?

- Yes
- No
- Maybe

12. Do you feel safe using UPI mode of Transaction?

- Yes
- No

13. Do you use UPI for bills and utility payment on daily basis?

- Yes
- No

14. What's your preferred payment app?

- Paytm
- Phone Pe
- Google Pay
- BHIM
- Other

15. Which services do you pay using UPI linked apps?

- Electricity bill
- Mutual funds/Insurance
- Prepaid/Post bill
- Apartment maintenance
- Other

16. Why do you prefer paying through these payment app?

- Convenience
- Cash back
- Going Cash less
- Better user experience

17. Do you see more concentration in market with companies coming up with their own payment mode linked to UPI?

- Yes
- No
- Maybe

18. What is benefit of UPI?

- Easily send & receive money 24\*7 with UPI Pin
- Send & receive money without A/C NO & IFSC Code
- Security
- All of above

19. Do you think shift towards Digitisation was due to Demonetisation?

- Yes
- No
- May be
- Don't think so

20. Do you see India moving towards more cashless economy?

- Yes
- No
- Maybe

21. Do you think Government had big role behind UPI success?

- Yes

- No
- Maybe

22. Rate your overall experience using UPI?

- Satisfied
- Unsatisfied
- Neutral

□ **World Cash Report**

<https://cashesentials.org/app/uploads/2018/07/2018-world-cash-report.pdf>

□ **National Payments Corporation of India (NPCI)**

<https://www.npci.org.in/upi-0>

□ **Digital India**

<https://www.digitalindia.gov.in/services>

□ **Pradhan Mantri Jan-Dhan Yojana**

<https://pmjdy.gov.in/scheme>

□ **Wharton University (USA)**

<https://medium.com/wharton-fintech/your-guide-to-upi-the-worlds-most-advanced-payments-system-b4e0b372bf0b>

□ **Live Mint (Bitcoin)**

<https://www.livemint.com/Money/IPAHZn0ApfULCNcVnGa1mM/UPI-emerges-as-top-pick-for-Bitcoin-exchanges-in-India.html>

□ **RBI**

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