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An Analysis of how COVID-19 Revolutionized India's Payment Infrastructure

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Abstract: In the past decades, the number of trades in India has increased at a CAGR of 23 percent. The introduction of fresh and novel financial services such as UPI for contactless transaction, NETC for contactless toll payments through Fast Tags, BBPS for contactless bill payments has securely positioned the cashless sector on an upward growing emphasis. This growing pace is anticipated to expand as innovative banking services and applications throughout industries emerge. The emergence of unique and modern merchant services, increased internet penetration, a rising desire for speedier financing options, and a significant boost from the administration and authorities to utilise online technologies have all led to the expansion in electronic transactions in India. Before 2010, online payments grew in the single figures. Between the year 2010 to 2016, this percentage increased to 28 due to the introduction of speedier financial mechanisms in the nation, then it skyrocketed to 56 percent just after demonetisation in the year 2016. COVID-19 has expedited the transition to online alternatives. UPI has had an incredible CAGR of 414 percent ever since inception in 2016 has become the foremost cashless transaction system in terms of scale. In addition to UPI, BBPS and NETC have increased at a comparable rate. Since 2018, BBPS and NETC have grown at CAGRs of 500 percent and 123 percent, accordingly, due to support from the government. Cashless platforms have moved from a being commercial entity for institutions to a profitability and crucial tool for acquiring customers.

Keywords: COVID-19, Digital Payments, Online Banking, Digital Wallets, Digital Banking, Virtual Transactions, Pandemic

I. INTRODUCTION

The deregulation of the financial market and the diffusion of innovations like ATM and MICR in the year 1990, India's electronic payments environment has seen a continuous development. Following that, different payment instruments like wallets, coupons and virtual cards were introduced in the year 2010. India is witnessing faster development in contactless banking than most of the established cashless nations. The demonetization that happened in the year 2016 and the ongoing drive by the administration and regulations towards a cashless economy has accelerated the development. The online banking Industry in India was worth at 1,638.49 trillion INR in year 2019 and is anticipated to rise to 4,323.63 trillion INR by the year 2024, growing at a CAGR of 22 percent. Advancements in technology have also aided the sector. In the recent decade, the nation has witnessed several distinctive and cutting-edge technological breakthroughs in the online payment business. The emergence of millennial crowd that grew up with smart phones and broadband has accelerated the acceptance of technical advances in online banking.

The COVID-19 pandemic has significantly hampered the Indian economy. The isolation phase in India, which lasted for quite a few months in the year 2020, has changed the way India spends and makes payments because of lifestyle interventions. Whilst the upper and middle segments of the current population were mostly indoors, the lower counterpart encountered several difficulties in meeting their demands. Individuals were exploring new ways to cope, operate, trade, and employ electronic payments across the continuum. A significantly developed ecosystem is driving a major customer preference for cashless transactions and electronic transfers. Customers may also understand the benefits and drawbacks of multiple electronic payment instruments, indicating a full-grown consumer landscape. An elevated drive towards educating consumers, with usage information, assistance for training and issue resolution, and protective services that enables consumers to stay safe, can propel India towards becoming a cashless economy. It is now far beyond the first few adoptions phase, and the bulk of people are using it. The overwhelming fact is that the labor class group is also becoming a part of this digital revolution.

A. Research Background

In India, technological advancements and growth of equipment characteristics have resulted in a steady change of contactless banking during the last twenty years. While the traditional cell phones were confined to USSD, the introduction of smart and touchpad phones along with internet has brought a whirl of new opportunities in the payments industry. Cashless platforms have evolved significantly, with the introduction of QR code recognition and conversational banking.

With its various configurations, the online banking phenomenon has resulted in a spate of retailers accepting online currencies. Just in a matter of 2 - 3 years, the number of shops accepting electronic money forms has surged from approximately 1.5 Mn in the year 2016-2017 to more than 10 Mn. Transactions based on QR Code payment reception sites with cheap initial investment have proven critical in fostering broad adoption amongst retailers, boosting functionality, and establishing a positive loop for the industry. Paytm QR code, for instance, is noticeable at sales outlets, restaurants, local traders and has become equivalent to hard money in our country. Paytm has approximately 12 Mn merchants that use a plethora of facilities to enable cashless transactions from all tools like wallets, UPI, debit, and credit cards, as well as from configurations such as Quick response codes and Point - of - sale endpoints, invoicing, and stock monitoring. Another instance is the India Post Payments Bank also known as IPPB which is integrating smaller stores and suppliers into its QR billing network and offering clients QR based cards which are like debit cards but with an integrated Quick Response Code to authenticate accounts. The RBI along with the Indian government, industrial organisations, and financial businesses have all contributed to the advancement of electronic transactions in India. RBI has worked rigorously to guarantee that India has cutting-edge payment infrastructure that is secure, structured, progressive, and affordable. NPCI known as National Payments Corporation of India is an auxiliary body in that operates commercial money transfer services. NPCI is a joint effort of RBI and the Indian Banks Association. It has continually aimed on advancements in the online payments sector by establishing financial instruments like IMPS, USSD based transactions, etc. NPCI has become a central characteristic in which financial institutions have joined hands to follow a similar goal of driving online and cashless transactions.

B. Purpose Of Research

- 1) To understand the advancements in Digital Payments Infrastructure.
- 2) To study the various categories and year on year growth of Payment Instruments.
- 3) To understand the emerging trends and future of Digital Payments in India.
- 4) To analyze the impact of the pandemic both sector-wise and instrument-wise.

II. REVIEW OF LITERATURE

Rashi Singhal (2020) in her study talking about the importance of digital banking and payments in India has said that digital banking is the new lens that the world is looking through. The government of India took the decision of demonetization to get rid of counterfeit currency, corruption, and black money. And to solve this, the government introduced their Digital India Program which would make financial systems transparent and hence help with their initiative. With the help of digital payments, the sender and the receiver are abstained from transacting in hard cash as all transactions are carried online and are recorded. In this case, the receiver can be either a person, a business entity or partner bank. The most commonly used mode of Digital payments is using mobile wallets. A person can simply add money to his or her mobile wallet and with the help of either UPI or QR codes can make payments to either shopkeepers or some other person. Some of the popular mobile wallet options available today are Amazon Pay Wallet, Paytm Wallet, Mobiwik, Pocket etc. UPI transactions have also garnered a lot of attention post demonetization. The most popular application used for UPI transactions is Google Pay. UPI has made money transfer and payments so simple that, there is no longer a need for providing account number or IFSC code. Payments can be simply made if you know the other persons mobile number or UPI ID. The increased use of digital payments in India is a result of the increased penetration and usage of high-speed internet and smart phone devices. Even in remote areas of India, the usage of mobile phones and internet today is commendable. The Digital India initiative undertaken by Government of our country made it imperative for every individual to have a bank account and link their Aadhar Number to their accounts to reduce fraudulent identities. But to ensure smooth functioning of Digital Banking and system, it is necessary to educate both the banking officials and people at large as to how to use technology. Many banking employees are not technologically sound and hence training them is of foremost importance. Along with that, imparting proper knowledge to senior citizens and remote areas of the country is a must as these people may fall prey to fraudulent activities. Another major obstacle in the smooth functioning of Digital banking system is the strength of the IT infrastructure in our country. Though there has been an increase in internet penetration in our country but there is still lack of power supply in many rural areas and not just that, there are power cuts too with a load shedding of almost half a day in interior locations. Due to this, Digital and Internet banking are down most of the times. Moreover, it is imperative for banks to educate individuals and empower them as even today a lot of people think that Internet banking is attached with some charge and thus consider safer to visit physical branches. Thus, there is a need to establish education centers and programs and to strengthen the backbone of Digital Banking and Payments to facilitate a seamless banking experience.

Dr. Sowmya Praveen K & Dr. C.K. Hebbar (2020) in their study talking about the impact created on the Digital Payments Industry due to the outbreak of the COVID-19 pandemic have said that the Covid-19 pandemic has had a devastating impact on the whole economic system, including our Indian economy. Lockdowns have been in effect around the country with an aim to curb the spread of the pandemic. Almost all sectors in our got impacted due to the lockdown as people were confined at their homes. This has had a significant impact on the payment infrastructure. There has been an upward trend in the utilization of Digital payments mode before Covid- 19, but after the pandemic effect, the number of users has skyrocketed. When it comes to digital mode of payment, there are different categories through which payments can be made such as UPI, NEFT, IMPS, RTGS, POS Machines, Digital Payments Banks, and Wallets. The topmost reasons for increasing usage of Digital Payments are the ease of usage, availability out of banking hours and the fact that there is no need to physically visit the banks. Although there might be numerous benefits of using online banking system. But there are disadvantages too. The cons include fraudulent sites, server related issues and lack of trust and awareness related to safe banking methods. Technology is extremely important in today's rapidly changing technological era. Majority of the individuals favor cutting-edge innovation to legacy processes. This has a major effect on the world of knowledge and technology. Many developments have taken place in the financial and banking market in recent years as well. A majority of clients choose to make payments digitally rather than via conventional ways. The use of online payment methods has expanded dramatically as a result of the Covid-19 pandemic. Digital payments became prominent when demonetization took effect in India in the year 2016. With the Digital India initiative of taking every sector online, banking systems were also rearchitected to help people adopt Digital banking as their new mode of payments. But since people in our country have a conventional mindset, the popularity of online payments did not spread wide across. This was also due to lack of knowledge and basic bank account required by people belonging to rural India. But COVID-19 has acted as a pioneer in steering the entire country towards digital banking as banks were shut and people had to refrain themselves from moving out of their homes to curb the spread of the virus. This survey has also led to the same conclusion that people are quite willing to stick to digital means of payments if there are some basic enhancements from the banks. This includes reduction in downtime, more transparency in terms of transfer and withdrawal charges, providing enough information and helping with demos to underprivileged, senior citizens and people who are not well versed with technology and lastly making people aware about various fraudulent activities that can take place by imparting proper knowledge and imbibing trust. In their study focusing on the effect COVID-19 has had on the Digital Payment infrastructure, Dr. Rashmi Mate & Dr. Atul Kapdi (2020) have talked about how the pandemic has acted as a catalyst in increased Digital payments adoption. Digital payments are performed using various web techniques of which Mobile or Digital Wallets are one. A digital wallet is nothing but a wallet within a mobile phone that would act like a physical wallet where in money is stored in digital form. It is nothing but a mobile phone application that acts like a conventional wallet and facilitates paperless transactions. There are a lot of advantages of using digital wallets or digital modes for payments such as coupons, cashback offers, transparency, real time transactions, etc. The COVID-19 pandemic has had a tremendous impact on almost all sectors in our country. Sectors like automobiles, manufacturing units, retail outlets, travel and hospitality are amongst the ones that faced numerous effects. With an aim to curb the spread of the pandemic, people were advised to not move out, maintain physical distancing and work from home. Many sectors enabled remote working but at the same time, few were not able to digitize and hence were out of the race. Due to this a lot of people had to either suffer from pay cuts or had to lose out on their jobs. This decreased the spending of the consumers. People were cautious about shopping for beauty, fashion, travel, and other luxury items with an aim to save money as no one know how long the situation would last. Due to this, the first few months of the pandemic had an impact on the digital payments. But soon there was a trend in buying groceries and essential items online which showcased the importance of Digital payments during the pandemic. Also, to avoid spread of the virus due to transfer of physical cash, businesses as well as restaurants started promoting online transactions which gave a boost to digital payments sector. Owing to the pandemic, there has been a lot of improvement and enhancement in the digital payments infrastructure. People can now pay their house rents as well as education fees online and enjoy cashbacks on them which has increased the adoption of online payments. According to the statistics, majority of digital transactions in India happened in Chhattisgarh followed by Andhra Pradesh and Haryana. While very less transactions happened online in Mizoram, Nagaland, and Meghalaya. Studies showed that about 52 percentage of the people were aware about what Digital wallets are and how they function and about 70 percent of the people said that Google Pay is their preferred online payments partner. About 66 percent of the people said that they started relying on Digital Payments owing to the Pandemic situation. The main reason behind this is the ease of transferring money and doing online transaction at our fingertips along with transparency. Also, people considered online transactions to be safer than handling cash due to the fear of the pandemic.

III. RESEARCH METHODOLOGY

To address the key research objectives, this research has adopted qualitative method conducted by observing and analyzing already present information. This research framework constitutes of a combination of previous research and associated work explaining the impact of COVID-19 on the Indian payments infrastructure and how the pandemic has assisted in the paradigm shift from a cash intensive to a cashless economy. This study employs a descriptive research design to understand the disruption, progression, various categories, acceleration in the adoption of digital payments, trends, and analyze the impact of the pandemic on various sectors and payment instruments.

IV. DISCUSSION

A. Disruption in the Payment Infrastructure amid COVID-19

- 1) *Progression in the Indian Payments Infrastructure:* The payment infrastructure in India has evolved phenomenally through the past decades. There has been tremendous innovations and introduction of new products and instruments which has completely revolutionised the payments space. All these advancements have been proven to be a blessing for the consumers. There has also been an increased usage in digital ways of payments in the last few years. This was mainly due to the easy accessibility of smart phones, speedy internet, ease of use, flexibility, and convenience. The below chart shows the revolution the Indian Payments infrastructure has gone through over the decades.

1935	•Formation of RBI
1981	•Introduction of Credit Card in India by Andhra Bank
1987	•Opening of the first ATM in country by HSBC Bank
1999	•Introduction of e-Payment gateway by Billdesk
2004	•Introduction of RTGS by RBI
2005	•Introduction of NEFT by RBI
2006	•Introduction of first mobile wallet by Times Group
2008	•Formation of NPCI
2010	•Introduction of IMPS by NPCI
2012	•Introduction of RuPay Card Scheme by NPCI
2016	•Introduction of UPI and NACH

Fig. 1 Progression of Payment Infrastructure in India

2) Various categories of Payment Instruments

- a) *Unified Payment Interface* – UPI or Unified Payment Interface is the most popular digital payment available and widely used today. It mainly garnered popularity during the COVID-19 pandemic. With the help of UPI, a consumer can make payments by scanning the Quick Response i.e., QR code. Popular applications like Google Pay and Paytm have their own QR codes which is now found in almost every outlet including fuel stations, grocery stores, local vendors, restaurants, ecommerce deliveries etc. for which payment is made with the help of these applications itself.
- b) *Near Field Communication* – Near Field Communication or NFC makes use of a technology known as magnetic secure transmission. With the help of NFC, consumers can make contactless payments using their debit or credit cards by just tapping their cards on the POS machine.

- c) *Gift/Rechargeable Cards* – These cards can be recharged by any amount and can serve as travel cards, food cards, shopping cards, etc. Often these cards come with their own reward and loyalty programs for example the Starbucks Card which has various levels and rewards for every purchase made using the card.
- d) *Payments through Message* – A lot of E-commerce giants nowadays make use of this technology where in a payment link is shared by the merchant with the customer in an SMS. By clicking on the link, consumers can complete their transaction either using credit, debit card, UPI, or Net Banking.
- e) *Online Payment Gateway* – Payment Gateways are typically used in online shopping like pharmaceuticals, groceries, food, ecommerce, etc. Using this technology merchants can direct consumers from their cart to a gateway like PayPal or PayU and receive payments from customers securely. It is widely adopted payment technology.

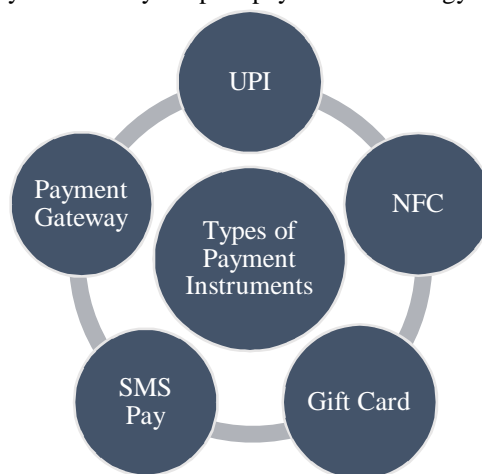


Fig. 2 Categories of Payment Instruments

- 3) *Year on year growth in various Payment Instruments*: There has been an increase in the adoption of Digital modes of payment during the COVID-19 pandemic as people were confined at their homes and were working remotely due to the shutting down of offices. Also, there was a fear amongst the people that physical transaction through hard cash will lead to transmission of the virus and hence people started transacting online. Even restaurants, retailers and other merchants began accepting online payments on a large scale and encouraged their customers to do online payments. Figures 3,4,5 and 6 below illustrate the year-on-year growth in the usage of various payment instruments like UPI, NEFT, IMPS and BHIM Aadhar Pay. The bar graph represents Volume in lakhs while the line graph represents Value in crores. The period between 2018 to 2022 can be divided into Pre-COVID, COVID & Post-COVID era. From the following chart it is quite evident that before the pandemic, there was a steady growth but during and after the pandemic, this growth has been accelerated.

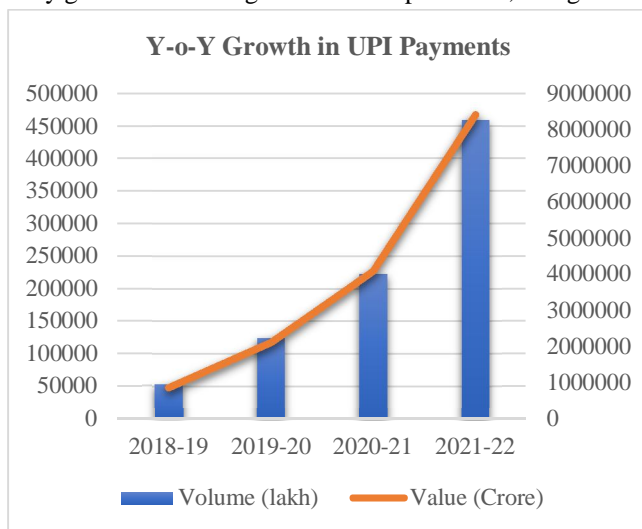


Fig. 3 Year on Year Growth in UPI Payments

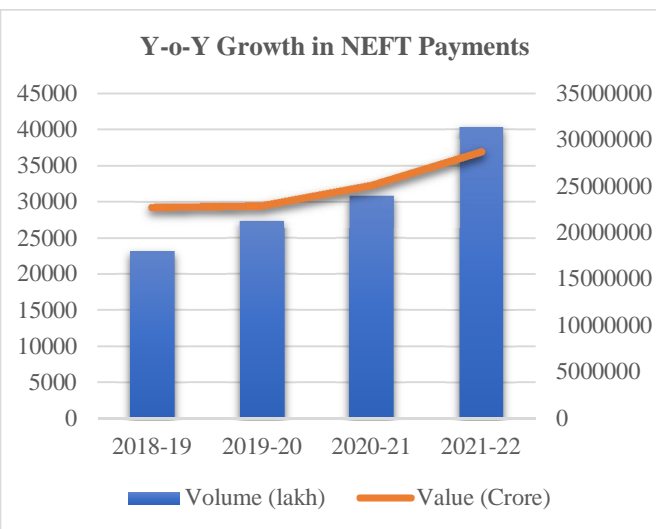


Fig. 4 Year on Year Growth in NEFT Payments

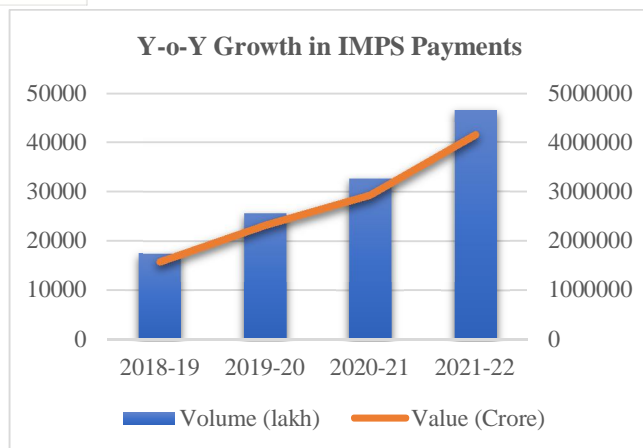


Fig. 5 Year on Year Growth in IMPS Payments

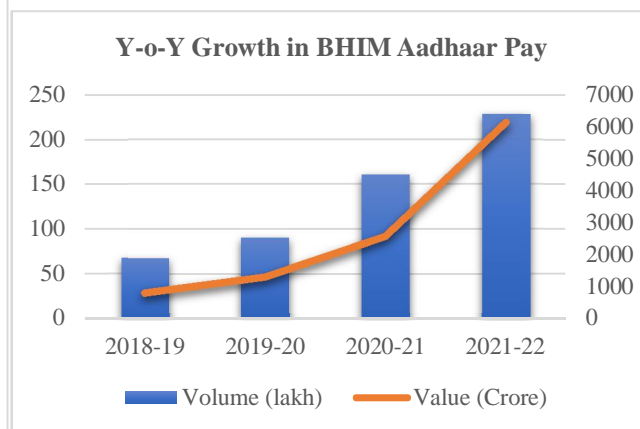


Fig. 6 Year on Year Growth in BHIM Aadhaar Pay

4) Emerging trends in the Indian Payments Sector

- a) *Increased funding in Digital Payment Solutions* - The COVID-19 issue might lead to an increase in electronic transfers, as proven by PayPal recording their greatest ever inventory turnover in heritage on 1st May 2020 and adding 7.4 Mn net new bank users in April 2020. To handle the growing market, financial institutions will have to provide high availability. Digital payment activities have mostly focused on attaining adherence to standards like as Payment Systems, which are intended to stimulate productivity and competitiveness.
 - b) *Better Collaborations Between Financial Institutions and Businesses* - There are currently some countries wherein contacts amongst customers and enterprises are entirely digital for money flow regardless of the specific reason. For example, taxation payout and gathering, dividend yield, primary social assistance transmissions, reimbursement recoveries, and deferred transactions are all fully digitized.
 - c) *Managing self and Business Transactions will Become Crucial* - Consumer banking clients and corporations alike will seek assistance from credit intermediaries on how to properly spend their own money and prepare for potential emergencies such as the COVID-19 catastrophe. Institutions must provide financial knowledge solutions to consumers and assist them in managing their changing economic position. To do this, institutions must speed up financial management solutions by leveraging analysis platforms to generate critical user feedback, predict growing demands in the period after the pandemic, and develop financial instruments to satisfy its customers.
 - d) *Prioritizing access to Financial Services* - The COVID-19 crisis had the greatest impact on customers who do not have access to cashless transactions. Chronic unemployment will cause a serious financial constraint, and measures are all in the works to stretch public subsidies and disaster aid to marginalized people. India has effectively used computerized Identifiers to minimize the number of people without bank accounts and move forward towards an electronic payment. Authorities must consider how they could improve rules to better assist electronic authentication process to speed up accessibility and promote economic growth.
 - e) *Increased Adoption of Paperless Transactions* - Study on alternatives for converting hard cash into electronic information will intensify in future. Numerous nations are currently testing using CBDC money which is predicted to be the reality of a post pandemic economy. It is anticipated that the commercial transactions would be the first one to transition to virtual currency, rather than heavy transactions. If this becomes an actuality, lenders may need to assess their present financial architecture to verify whether they possess the capability to incorporate Central Bank Digital Currency formats.
 - f) *Incorporating Fraud Management Systems* - The ambiguity caused by the outbreak of the virus provides possibilities for scammers to hit at the most susceptible levels of the organization. Institutions should strengthen their monitoring measures to identify risks throughout the various organizational layers. Considering the potential of making payments swiftly and efficiently has become particularly vital in the current scenario, institutions should examine and evaluate the efficacy of risk detection and planning tools, as well as implement suitable safeguards.
- 5) *Policies and amendments by Government to support Digital Payments*: Various policies and amendments have been made by the Government of our country to support and accelerate the adoption of Digital Payments

TABLE I

SR NO	GOVERNMENT REGULATION	IMPACT
1	Contactless processing for vendor onboarding	During the pandemic, NPCI has fastened the process of onboarding the vendors by making it completely contactless with the help of video KYC to increase the usage of UPI payments and increase the adoption of digital transactions.
2	Encouraging cashless transactions	The government of Gujrat made it mandatory for all the local grocery outlets to only accept payments through online modes and not accept cash payments to contain the spread of the pandemic. This will in turn increase the use of cashless transactions by both consumers and the vendors.
3	Creating awareness regarding scams in online transactions	Online transactions might have a lot of benefits, but it also comes with its own cons. There are a lot of fraudulent activities that can take place for which banks have been instructed to educate their customers on how to safely use online banking through frequent SMS, emails, and calls.
4	Limiting withdrawals from ATMs to INR 5000	The Reserve Bank of India has proposed to restrict withdrawals from ATMs beyond 5000 Rs and if customers want to withdraw more, they must bear heavy transaction charges. This will prevent customers from using cash and thus increase the adoption of online transactions.
5	Incorporation of PIDF by RBI	RBI has come up with PIDF i.e., Payment Infrastructure Development Fund of 500 Cr. This has been done to motivate the deployment of PoS architecture in Tier 3 to Tier 6 cities to increase the acceptability of digital payments.

B. Impact of COVID-19 on the Payments Industry:

1) Sector-wise Impact:

- Aviation Industry** – Due to the COVID-19 pandemic, there has been a huge impact on both domestic as well as international travel. Even flights that were previously booked have been cancelled due to the various restrictions by different nations. As a result, there has been huge payment losses as the airlines had to refund all the amount and were prohibited from taking fresh bookings.
- Hotel Industry** – Since hotels were forced to shut down as to maintain physical distancing, only home delivery of food was allowed that too with time limitations. Thus, there has been huge payment losses.
- Travel and Hospitality Industry** – Since people were isolated to curb the spread of the virus and due to lockdown restrictions, the travel and hospitality sector has taken a toll. There have been huge payment losses due to various prohibitions.
- E-Commerce Industry** – During the pandemic, a lot of people became unemployed, and many were receiving pay cuts, due to which people were hesitant to buy non-essential items online which in turn led to huge payment losses for the E-Commerce Industry. At the same time the essential items segment as seen a surge as people were seen buying groceries, medicines as well as online consultations during the pandemic.
- Retail Industry** – The retail industry pertaining to the non-essential segment has also taken a toll due to closure. Be it clothing or footwear, people were not buying these non-essential items to save on money. But when it came to essential items, there has been a surge in the buying behaviour of the consumers during the pandemic as people were stocking essential items due to fear of missing out.
- Healthcare Industry** – The one industry that has seen the highest surge is the healthcare and the pharma sector. Since people were buying medicines and taking consultations there has been huge increase in the payments.

- g) *Insurance Industry* – Due to the fear of pandemic, a lot of people have begun to insure themselves and their families as the risk of mortality became high during the COVID-19 pandemic and everyone wanted to make sure their family can survive even in their absence which has led to increased payments both online and offline.
- h) *Telecom Industry* – As people are working remotely and are isolated, there has been a surge in the telecom payments due to the increased need for internet packages and calling packages to connect with their friends and family.
- i) *Education Industry* – People have started to upskill due to the fear of being laid off. Many universities began offering courses online which has led to increase in the payment spends in this sector.

2) *Instrument-wise Impact:*

- a) *Bank Accounts* – Due to the pandemic people as well as businesses have been forced to transact online and to do so it is imperative to have a bank account.
- b) *Digital Wallets* – People are increasingly using mobile wallets these days. They put certain amount in their wallets which they use for their daily use as they can easily track their expenses. But nowadays there has been an increase in the transaction fees due to which several vendors do not accept payments through wallets.
- c) *ATM* – As there is an inclination towards digital payments due to the fear that physical cash can end up transmitting the virus, ATM transactions have seen a downfall.
- d) *PoS Machine* – Since physical outlets have seen a reduction in business due to lockdown, the payments through PoS machines have decreased.
- e) *Card Payments* – Card transactions have seen a boost as people are switching to digital modes of payment over physical cash to avoid the transmission of the virus.
- f) *Online Gateways* – Online payment gateways have seen an increase in transactions as people have started buying everything online from essential goods to pharmaceutical items.
- g) *Online transfer* – Online modes of payments like UPI, IMPS, NEFT, QR Code have seen a tremendous increase as all the merchants and vendors are promoting these modes of payment by providing great discounts, vouchers and cashbacks.

C. *Future of Digital Payments in India*

The payments industry is at a crossroads. The combination of statutory standards and the financial services innovation has opened new ways the world is looking at payments. At a period where financial firms are making huge advances into the payments business with creative technologies, lenders and card providers are constantly struggling to remain current and worry being reduced to simply becoming an essential player for external parties if they are unable to change.

To stay viable, lenders and card providers must reinvent the transactions encounter via electronic payments services, build personalized relations with consumers via excellent service, and collude rationally with other financial institutions and fintech firms to unlock largely unavailable sources of income.

At the moment, alternatives are mostly centered on particularly less value increased volume end to end transactions, payments through online shopping, and microfinance initiatives in emerging nations. However, as cashless transaction become more prevalent across most economies around the world, novel opportunities such as instant B2B transactions and cross-border money transfers are quickly evolving. By properly placing themselves and capitalizing on their key aspects, innovators may provide affordable and appealing banking services and prosper in this new transactions ecosystem. The very first goal including both financial institutions and card firms in such a circumstance is to keep up to date in this unfamiliar setting. In the long run, the goal is to flourish in the new terrain by investigating possibilities and reinventing value offerings. This necessitates a thorough examination of the difficulties and possibilities that await the financial institutions, as well as the use of digitalization, they may transform themselves from closed-looped organizations to accessible, interactive, and customer-centric organizations.

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