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Towards a Cashless Economy – Is it Reliable and Safe?

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ABSTRACT

Time has come for India to move towards a cashless economy. Primary reason is to curb generation of black money. Recently The Indian government has declared that the nations' higher denomination currencies are invalid and advised its citizens to go for a cashless mode of payments. New technologies such as Unified Payment Interface [UPI], Phonepe etc. have been introducing by the government to promote cashless transactions. In addition, public and private banking sectors also introduced their own apps, net banking facilities as services for their customers to access their bank accounts in a digital manner. Private payment service providers like paytm, ezrecharge etc. also involve in promoting people to move towards digital banking. These Technologies are always a double edged knife. When a country itself is ready to use digital mode of payments, security threats would become an important havoc. Whether all the listed modes and leftovers are really safe for handling confidential details? This question will surely arise in every common man point of view. Even if those techniques are safer to use, whether all the citizens know at least a few methods to access their accounts in a digital way? These sorts of doubts will come to mind. This paper discusses about some of the widely used payment methods that are currently in practice throughout the world as well as in India, its pros and cons, security vulnerabilities happened, future challenges etc. that India has to face, if it decides to move completely to the digital mode of payment.

Keywords: Bank, Cashless Economy, Payment modes, Reserve Bank of India (RBI), Security.

1. INTRODUCTION

Almost all the developing and developed countries are making use of various means of payment modes (WorldPay, 2015). Several modes of payments are emerging day by day to facilitate the people to do safe and ease transaction. Technologies such as Online Banking, Mobile Banking and ATM facility helps an

individual to do the transaction anywhere and anytime. One factor that makes the literates to use these means is Time. Valuable time has been saved for them if they use these techniques. Even then, the rate of cashless transaction is comparatively low (BT Online, 2016). With respect to cash and coins at present, the reason people used to say is they were unaware of these technologies and believes that these are not safe and unreliable. Despite these causes, more countries encourage their citizens to move into this cashless community, to curb black money and to pull out the saved ones into usage. India is no exception from this. The ratio of illiterates in India is still high. But, the government forces its citizens to use digital mode and not the hard cash. As the number of cashless transactions increase, many private and public sectors payment providers, wholesale merchants etc. provide concession to make use of their applications to do the transaction. So this is the time, not only for providing more payment modes and apps, but also to give proper security and trust for the individuals to enjoy the upcoming cashless environment.

This paper has been organized in the following sections: Section 1 gives a brief introduction about the countries involving in promoting cashless economy and India's stand on it, section 2 identifies the broadly used techniques throughout India, section 3 discusses about the methodologies or technologies adopted by it, section 4 analyses their drawbacks and limitations. Security breaches happening in those technologies are briefly studied in section 5. Section 6 concludes with the future challenges that have to be faced by the cashless societies.

2. LITERATURE SURVEY

The primary benefits of a cashless economy has been briefly given in (CivilsDaily). Among them, focus has to be given to the points on curbing generation of black money and the amount being spent on printing and maintaining the cash and coins by the concern governments.

Section 1: Top countries having cashless transactions are listed in the Figure 1 (BT Online, 2016). Figure 2 shows the various payment modes that are widely in practice throughout the world (Visually).

Section 2: India is one of the fastest growing nation that migrates towards cashless. Figure 3 shows the statistical report of the Asian continents' percentage of accepted payment methods (Visually). It further states that India has got a considerable growth in using digital payments. This has started before the declaration of demonetization in India on November 8, 2016. It proves that the citizens of the nation started to use these technologies prior to the governments' legal announcement of promoting digital modes.

Section 3: Payment modes suggested in (Reserve Bank of India) are the methods that are legally approved by the central bank of India, RBI. According to them, payments have been classified into the following:

Paper-based Payments

1. Cheques
2. Drafts

According to RBI (Reserve Bank of India), 60% of non-cash transactions like cheques and drafts with nearly 11% of value share are in practice. As RBI gives popularity towards electronic payments, there will be a steady decreasing of traditional payments over a period of time.

Electronic Payments

1. Electronic Clearing Service [ECS] Credit and debit: This service started in early 1990's to help the bank customers pay their interests, dividends, utility bills and Easy monthly instalments [EMI] etc.
2. Regional ECS [RECS]: RECS, a miniature of the National Electronic Clearing Service [NECS] that operates within the jurisdiction of RBI.
3. Electronic Funds Transfer [EFT]: This system found in the late 1990's that makes the customers of any bank to do fund transfer electronically.
4. National Electronic Funds Transfer [NEFT] System: the NEFT system has been introduced for transferring of funds. It helps customers to schedule their payments on the mentioned date and time. A minimal charge will be levied when customers do transfers between heterogeneous banks.
5. Real Time Gross Settlement [RTGS] System: RTGS is a unique payment system where the amount transfer is done on
6. "real time" i.e., without any delay, and in gross manner. This means, these transactions will never be joined in the queue of normal transactions. Once it is done, it is final and cannot be undone.

Clearing Corporation of India Limited [CCIL]: In April 2001 banks, essential merchants and monetary foundations jointly constructed this consortium for clearing and settlement of currency exchanges, share markets etc.

Other Payment Systems

Pre-paid Payment Systems includes Smart cards, Magnetic stripe cards, Internet accounts, Internet wallets, Mobile accounts, Mobile wallets and Paper vouchers.

1. Mobile Banking System: Cell phones as a medium for giving keeping money administrations have been achieving expanded significance. Save Bank drew out an arrangement of working rules on portable managing an account for banks in October 2008, as indicated by which just banks which are authorized and directed in India and have a physical nearness in India are allowed to offer versatile keeping money subsequent to acquiring important consent from Reserve Bank of India. The rules concentrate on frameworks for security and between bank exchange plans through Reserve Bank of India's approved frameworks.
2. ATMs/Point of Sale [POS] Terminals/Online Transactions: Directly, there are more than 2 lakhs ATMs in India. Reserve funds Bank clients can pull back money from any bank terminal up to 5 times in a month without being charged for the same. To address the client benefit issues emerging out of fizzled ATM exchanges where the client's record gets charged without real disbursement of money, the Save Bank has ordered re-crediting of such fizzled exchanges within 12 working days and commanded pay for deferrals past the stipulated period.

There are more than five lakh POS terminals in the nation, which empower clients to make instalments for buys of products and ventures by method for credit/charge cards. The PoS for tolerating card instalments

likewise incorporate online instalment doors. This office is utilized for empowering on the web instalments for merchandise and enterprises. The online instalment are empowered through possess instalment entryways or outsider specialist co-ops called go-betweens.

National Payments Corporation of India [NPCI]

Under RBI, it encompasses other organizations to operate Retail Payment Systems (RPS) in India.

1. Immediate Payment service [IMPS]: Round the clock services for the interbank fund transaction through handheld devices (National Payments Corporation of India: NPCI).
2. Unified Payments Interface [UPI]: The Unified Payments Interface offers construction modeling and a set of Application programming Interface [API] determinations with encourage on the web instalments. It plans with improve what's more provide a single interface over know NPCI frameworks Furthermore making interoperability and unrivaled client knowledge (NPCI – UPI Procedural Guidelines).

COUNTRIES	CASHLESS TRANSACTIONS
1-Singapore	61%
2-Netherlands	60%
3-France	59%
4-Sweden	59%
5-Canada	57%
6-Belgium	56%
7-United Kingdom	52%
8-USA	45%
9-Australia	35%
10-Germany	33%
11-South Korea	29%
12-Spain	16%
13-Brazil	15%
14-Japan	14%
15-China	10%
India	2%

Figure 1: List of countries using cashless transaction

Source: Mastercard Advisor's Measuring progress toward a cashless society

Source: BT Online



Figure 2: Shows the world wide payment methods in practice
Source: Visually

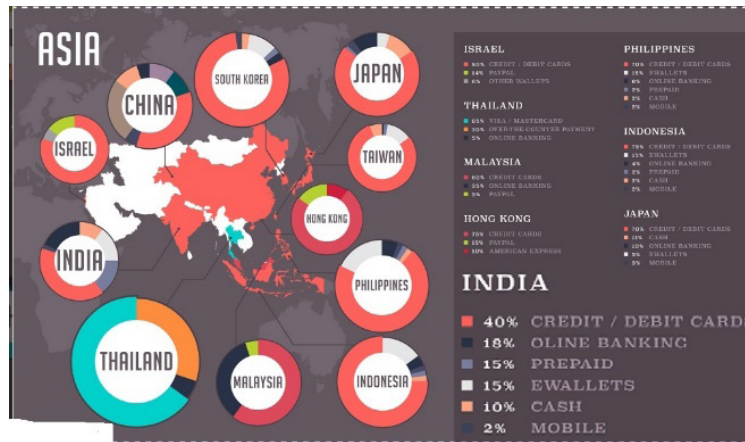


Figure 3: Percentage of payment modes in the Asian continent
Source: Visually

Section 4: This section deals with the Limitations of the above discussed payment technologies. Just because, a country has adopted these many techniques, it does not mean all those are well secured (Dr. Tejinderpal Singh, 2013). (Shafiq ur Rehman et. al., 2012) Says that even though these many technologies have been invented and are prevailing, there is always a gap and lack of hesitation for the people to use it. Usability enhancement and security are the major factors that cause this hesitation. (B. Suh and I. Han, 2002) Backings to a similar point specified by having distinguished an absence of “trust” in security highlights offered by e-instalment sites and outsider contribution as a noteworthy obstruction of appropriation to these methodology. The upcoming sections will give a brief note on limitations of these technologies.

Section 4.1: This section discusses about the various technologies that have been designed and developed to replace the cash based transaction. Simultaneously the scope of all those technologies are also been elucidated.

Card System

High percentage of cashless transactions are under card system. Provision of debit cards to the customers is done at the time of account opening itself. There are several other cards such as credit card, gift card, etc., which are used by the customers, according to their living status. The popularly used cards are debit and credit cards that provide ease transactions. (Priya et. al., 2016) Gives a brief support of how the technologies of these cards mainly swapped the cash transaction. Plastic Cards having magnetic stripes at the back is designed to store the credential data such as Format code to indicate the card type, Primary Account Number, Account Holder's Name, Discretionary code indicating the Card Code by the card issuer. These magnetic stripes are made up of tiny magnets (Money | Credit & Debit Management).

Another form of plastic cards is Chip Based Cards. These are embedded with a microprocessor on the front and magnetic strip at the back. Euro pay, Master Card and Visa [EMV] are the three major companies that provide the standards for chip based cards. Various card holder verification methods [CVMs] are available to authenticate the card holder. It includes Signature, PIN, Cardholder Name and other credentials. When the consumers use these cards in ATM and POS, the PIN or Signature can be used for authentication.

The Contactless Near Field Communication [NFC] enabled smart cards are getting popular. It includes two devices, NFC enabled chip based cards and NFC enabled terminals. These two devices identify each other by means of Radio Frequency and get initiated for payment. The advantages of such transactions are its speed and feasibility. Highly protected digital transaction is provided by storing the credentials of the consumers in a secured way. These EMV cards can also be used in Automated Teller Machine [ATM], Point of Sale [POS], and online transactions. But because of low security, various breaches are there to misuse it that are straightforwardly discussed in section 5.

SMS Banking

Mobile phones either low end or higher end models infiltrated into everyone's day to day life. Having identified this, the central bank of India has introduced "Short Message Service" [SMS] Banking. Initially it provides the following services:

- Alert messages will be sent to customer's registered mobile numbers.
- Any sort of fund transfers over the desired limit will be notified.
- Malfunction of access an account, would be detected instantly.

Additionally, SMS banking also helps to know the balances and mini statements instantly by just sending an SMS. The primary advantages of this service are (Vikas Chandra Pandey, et.al):

- Comfort
- Immediate alerts
- Availability
- Connectivity

Charges will be levied from the customers' account for this service either monthly, quarterly, semi-annually or on annual basis based on the banking firm. In addition, the Mobile network operators' [MNO] also charges the customer for their SMS service.

Mobile Payment System

Penetration of smart phones and passion towards the usage of social networks lure the people especially, youngsters to get addiction towards internet on the go. One device for all purpose - a motto is becoming popular now. It paved the way to a new technology called “Mobile Banking”, where the smartphones are used as the payment device. Even though the percentage of Mobile Banking is low when compared to card system and net banking, now in India as the usage of Smartphones increases, the e-payment system is also growing in a rapid rate (Business Insider). Several ease technologies are booming day by day, to encourage mobile payment system (Iamwire, List of mPOS Machine & Solution Providers in India) (Iamwire, List of Mobile Wallets & UPI Payment Apps in India).

Near Field Communication enabled Mobile payment is emerging which simplifies and limits the time spend for payment in a high rate. More mobile applications are being designed to read the details from RFID based cards. These applications stores the information of card and the cardholder in the hand held devices. This helps the user to do purchase by a single tap, without carrying their credit cards. The main disadvantage of this system is, any person in a crowd can easily grab the details of nearby RFID enabled credit card into their mobiles. This type of issues can be minimized by keeping the credit cards inside an aluminum foil.

Net Banking

E-Banking is an electronic payment system, running popular since 1990's. Through net banking, the consumers can easily do bank related processes like e-statement and fund transfer via their palm hold devices itself. Most of the banks have developed their own websites for customer convenience. Customers have to register their name for net banking through proper channel. Through authentication process, the consumer can avail permission to access their bank particulars. Facilities such as Fund Transaction and getting Mini Statement can be processed. (Dr. Lakshminarayana Bhat A, 2016) States that even though the impact of using online banking is more among customers, only private banking customers are highly satisfied with their service. There is always a gap between the services provided by private sectors when compared with government sectors. Nearly 70% of India lays in rural areas and nearly 50% of population is Illiterates (IndiaOnlinepages.com). During 2016, (Internet World Stats) reports only 36.5% of population is using internet. In such scenario, the online banking is also utilized by very few citizens of the nation. Moreover, the percentage of internet access in developed areas are mostly used for social media entertainments by teenagers and to gain the up to date news by the mid-aged people. Thereby it is obvious that the percentage of utilizing e-transaction would be less. To shift to digital payments, broadband services are the base. Having known this fact, as per (LiveMint) report, the Indian government is in a plan of investing a huge amount in connecting all the rural villages with high speed optic fiber internet cables. On the other side, Government relaxes its rules for private broadband service providers also.

Bio-metric Based Banking

(Jim Marous, 2016) Various biometric techniques such as fingerprints, retina scans, etc., are being used in banking now-a days. The advantages of Bio-metric based banking is that people no need remember any passwords. Accessing email, net banking, watching online streaming videos etc., are being done by using finger prints itself. (Jim Marous, 2016) “Media and telecoms research at Deloitte” reports 31% of youths

were using the fingerprint authentication enabled smart phones, compared with 8% of those aged over 65. Very soon these high class technologies will be available at an affordable price. The vice president of digital at Pittsburgh-based PNC Bank Tom Trebilcock says that “the days for having passwords are numbered”. As per his sayings, if Bio metric based transactions gains popularity and becomes affordable, surely people of any country would feel comfort. Technologies Other than finger print identifications such as voice and face recognition, vein recognition etc. are somewhat slower.

Despite finger print based transactions, The United Services Automobile Association [USAA], Mapa Research adopted the facial recognition technology and voice recognition in their mobile banking app and encourages its customers to register their face and voice in their database.

E-Wallet

The e-wallet is presently another cashless technique. There are two types of e-wallets: Digital wallets and prepaid wallets. The information about the owner and his identification is stored in the e-wallet. In addition, the e-wallet stores the details such as credit card number, expiry date and CVV number. The main difference is the automatic deduction of purchased amount from the bank account or card is not possible in Digital payment, whereas the amount for purchased stock is automatically transferred to the merchant’s account by prepaid wallets.

There are three types of prepaid wallets: Closed, Semi-closed and Opened wallets. A statistical data (Statista) says, in 2020 M-Wallet will be of high increase in its usage than that of other e-transaction modes. Figure-4 (Scroll.in) is the statistical report that depicts the fast growth of M-Wallets than the traditional card system.

Near Field Communication enabled Mobile payment is an emerging trend which simplifies and limits the time spend for payment in a high rate. More mobile applications are being designed to read the details from RFID based cards. These applications stores the information of the account in the hand held devices. This helps the user to do purchase by a single tap, without carrying their cards. The main disadvantage of this system is, any person in a crowd can easily grab the details of nearby RFID enabled credit card into their mobiles. This type of issues can be minimized by keeping the credit cards inside an aluminium foil.

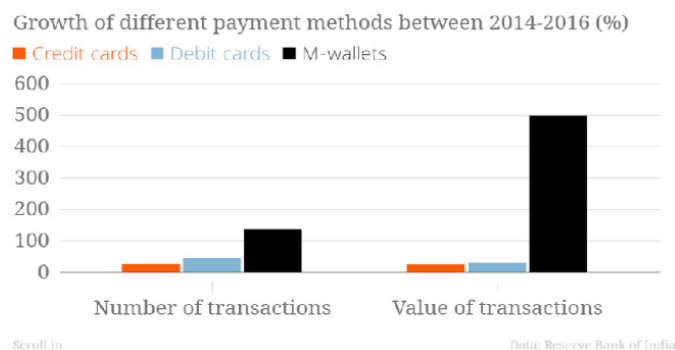


Figure 4: Growth of M-Wallets
Source: Scroll.in

Section 5: Security breaches happening in those technologies are briefly studied in. The following sections discuss about the flaws and security breaches happened in each and every widely used payment modes.

Card System

- Using Cards in ATM: There are several criminal techniques like Skimming and fake terminals fixing, by which the card number and PIN value can be hacked.
- Using Cards in POS: Here also malpractices such as skimming and Eavesdropping works in higher level. Moreover, POS in shopping centers have no privacy while entering the PIN value. So, the chances are high to steel the details of the card.
- Using Cards in Online Transaction: Interception Attacks are very common in which, Intelligent Hackers can bypass the transaction route and collect the fund in their fake account. Even though, it is advisable to change the security PIN number at regular intervals, there are many tools that can find the corresponding PIN of a card number in a fraction of a second. If the card is stolen, a protection measure is provided by blocking the card number for further transaction. But, there is some time gap, where the criminals can misuse the card.

New Approaches in Card Designing

The authorities provided Chip based cards as the solution of preventing card based frauds that includes skimming, scamming and cloning (Bindisha Sarang, 2011). The main disadvantage of this technology is Cost Expensive. Other than that, the same online frauds, hacking the data are all still existing (Dan Rafter, 2015) (Anna Iovine, Aol.Com, 2016). To do payment using Smart cards on online shopping, there is no need of any authentication. This makes ease to the hackers to grab the data and thus the fraud rate is also increased (Kim Zetter. Kim Zetter, Security, 2015).

Another new technology based on the Near Field Communication [NFC] (Harley Geiger, 2011) (Helena Horton, 2016) includes contactless payment that needs the consumer to wave their card in merchant's Terminal.

The number of cases on fraud relating to card system will grow higher than that of actually reported by the authorities (Komal Gupta Gireesh Chandra Prasad, 2016) (Manish Sain, 2016). There is a lack in detecting the theft, the time it happened and to safeguard the content (Anuj Srivas, 2016) (Live Mint | Epaper, 2016). Vulnerabilities of new technology is that, anyone possessing the physical card can easily use it for shopping.

Card Not Present [CNP] Fraud

During Mail Ordering or Telephone ordering, the physical presentation of card is not needed. This type of transaction plays its high fraud rate by using credit card details.

Skimming and Cloning

These types of frauds are more in ATMs and POS. Placing fake keypad over the original keypad or camera focusing the keypad are the ways handled by skimmers to steel the particulars of card. Then, the skimmer can use these data for online transaction.

The duplication of cards are another type of fraud. The skimmed data are used to design similar cards. These Counterfeit Cards can be used anywhere, without card-holder's attention.

SMS Banking

(Brett Winterford, 2012) Reports that SMS banking is very easy to vulnerable since, it cannot assist the banking sector to authenticate the person's identity.

Mobile Banking

Another emerging technology is mobile banking where customers, once enrolled their mobile numbers with respective bank account, can do any sort of operations within few clicks via their handheld devices. Customers will share all there confidential details via these smart phones. Android is said to be the widely used mobile operating system for these devices. Attackers identified this and hence it is prone to vulnerability. As per the statistical report of (Kaspersky Security Bulletin, 2014) India stands at the second position where mobile banking and other mobile based threats are happening at high ratio. Hackers makes use of malware, spyware, adware to inject their code into these devices and grabs the confidential details of the customers. Codes are written by them for other mobile operating system also.

Internet Banking

Security in Internet is always a question mark. Even then the world cannot avoid using it. Future transactions are all depending on internet. At present in India the use of Internet banking has grown in a rapid pace. On the other side, security loopholes also increases. The Central Bank of India RBI, released a statistical report (Srinivasan.V.L, 2016) (NewsBTC, 2017) stating that around 8,765 cases filed by banks in the academic year 2012-13, 9500 cases in the year 2013-14, 13,083 cases in 2014-15 and 11,997 cases within 9 months of 2015-16. Listings are the various fraudulent techniques: phishing, lottery scams, ATM/Credit Card frauds etc. In the highest affected countries by online banking, India ranks ranges within the top 10 positions. Therefore, the country must focus in strengthening the security backdoors.

TOP 10 countries by number of attacked users

	Country	% of attacked users*
1	Russia	45.7%
2	India	6.8%
3	Kazakhstan	4.1%
4	Germany	4.0%
5	Ukraine	3.0%
6	Vietnam	2.7%
7	Iran	2.3%
8	UK	2.2%
9	Malaysia	1.8%
10	Brazil	1.6%

*percentage of attacked users in the country from total number of attacked users

Figure 5: Country wise Ranking Based on Attacks done by Hackers

3. CONCLUSION

Technology is always a double edged knife. If used properly it will be the most effective one for optimal utilization of time and money. But if it is in the hands of hackers and muggers then it will lead to havoc.

Only advantage is that those who are really intelligent enough can steal money. But once stolen, it will take years to trace. Security threats happened worldwide that are discussed above are a few. Despite these, there are countless threats happens day to day when security increases. Each country has its own style of payment methods based on their citizen's needs and comfort. Integrating all those will make a system much complex. In India, especially rural people, ratio of illiterates is comparatively high. Prior to the full implementations of digital payments, government must focus to fill the gaps between technology and people. Not only identifying the gaps, it must focus seriously the implementation also. On the other side, rather than depending upon foreign security providers, it must focus on in-house development of security services thereby it will greatly reduce the amount spent on it.

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