

COMPARATIVE STUDY AND ANALYSIS OF E-WALLETS

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ABSTRACT

The aims of this paper are to compare digital wallets. The purpose of this paper is to contribute to the design of e-wallets. e-wallets are intended to replace the existing physical wallet, with its notes, coins, photos, plastic cards, loyalty cards etc. we have researched in details about the features and services provided by the some popular e-wallets and how they are being more popular by their different promotional plan.

The research also lightens up the security aspects of the apps or e-wallets that how they are enabling us to do the shopping and keeping our details of the cards and our personal information on the app. In this paper given more importance to service, working procedure along with security.

The goal of this article is to propose a new technical approach regarding the "e-wallet" concept. Although the "e-wallet" concept has many implementations, we consider that we can improve the present level of knowledge by joining the Near Field Communication technology and the "classic" concepts about money. We studied the present level of knowledge in the scientific literature and in the industry and we proposed new elements for e-transfers. Also, we made an experiment and the result consist cashless transaction based on the e-wallet platform emulators using the Near Field Communication technology. Our electronic prototype will be able to act as a wallet by using only a mobile smart phone because the proposed architecture embeds concepts like money, cards, payments and receipts in a single secured mobile application.

Keywords: *Communication technology, Electronic Prototype, E-Wallets, Mobile wallets, Mobile applications*

I. INTRODUCTION

A digital wallet is a system that securely stores users' payments information and passwords for numerous payment methods and websites. By using a digital wallet, users can complete purchases easily and quickly with near-field communications technology. They can also create stronger passwords without worrying about whether they will be able to remember them later.

Digital wallets can be used in conjunction with mobile payments systems, which allow customers to pay for purchases with their smart phones. A digital wallet can also be used to store loyalty card information and digital coupons.

Digital wallets largely eliminate the need to carry a physical wallet; by storing all of a consumer's payment information securely and compactly also digital wallets are a potential boon to companies that collect consumer data. The more companies know about their customers' purchasing habits, the more effectively they can market to them. The downside for consumers can be a loss of privacy.

Digital wallets allow many in developing nations to participate more fully in the global financial system. Digital wallets allow participants to accept payments for services rendered, as well as receive funds or remittances from friends and family in other nations. Digital wallets do not require a bank account with a physical firm or branch, often allowing those in more rural areas too.

1.1. How It Works

In addition to being less clunky than a traditional wallet or purse, a digital wallet has beefed up security features that make it far safer for consumers, no matter where they shop. This is because digital wallets are all based on encryption software that replaces traditional forms of payment with secured data when money exchanges hands. The first step is downloading an app or software program that is able to receive all of the financial information you want to provide. Once you input your payment details, you are free to shop wherever digital payments are accepted.

For instance, making a purchase through an online retailer takes seconds to complete, since all you have to do is provide your digital wallet username and password to pay. Your credit card or bank account information is already linked to the wallet, so there is no need to type that information out on the website to complete the transaction. For in-store purchases, a tap of the smartphone with the digital app up and running offers the same speed and accuracy of transferring money. So long as retailers have a point of sale system that is enabled to receive digital payments, you can use your phone to pay. But don't worry, you often still need to enter a PIN or password to authorize the payment. In either case, there is no need to carry physical cards, and the information transmitted to the retailer is secured.

While the security features of digital wallets get high praises from businesses and consumers alike, there are some caveats to using technology-based tools to complete everyday transactions. In some cases, the provider of the digital wallet may be storing information about where your money goes, how much you spend, and at which retailers. This information can be invaluable to businesses en masse, given that a company's marketing can become eerily targeted down to each individual consumer. In using a digital wallet, you may be subject to ongoing monitoring of your spending, the types of accounts you use, and where you shop.

There are also concerns about the complexity of payment transfers at the point of sale. Data has to be pushed through a user's smartphone app and operating system first, then to the source of payment, and then to the retailer. Unlike swiping (or inserting) a credit card, there are multiple points where your data could be

vulnerable when using a digital wallet. In most cases, digital certificates are used to keep issues relating to security problems at bay, but consumers still need to be aware of the risks.

Overall, digital wallets are a lot less susceptible to being stolen or lost, and a lot more organized for the person using it. With the help of advanced technology, digital wallets are becoming far more popular because of their security features and streamlined payment processes. However, before jumping onto the digital wallet bandwagon, be sure to understand your privacy rights with the provider of choice, and know that the complexity of payments can lead to vulnerability of your payment information.

II. PERFORMANCE EVALUATION

In last few years the use of e wallets has increased over the cash transaction. Data published by the Reserve Bank of India tells a story of a massive boom in both adoption and usage of mobile wallet as a mode of payment.

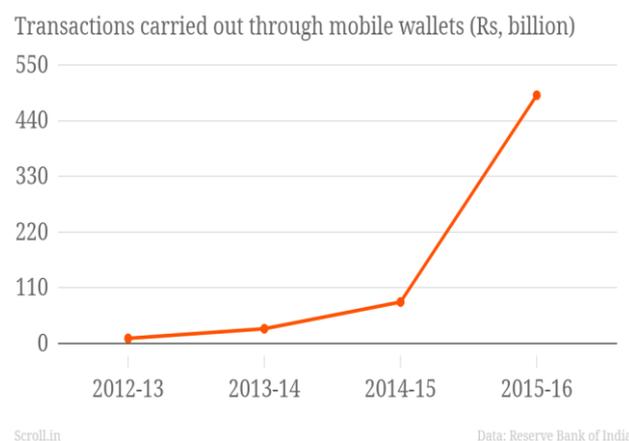


Fig.1 Year wise transaction using mobile wallets

Over the past four years, mobile wallet transactions have jumped from Rs.10 billion of transactions in 2012-'13 to more than Rs.490 billion in the year 2015-'16. Taxi app Uber's adoption of Paytm went some way in popularizing mobile wallets among those who weren't before using the services, and even pushed its competitor Ola to build a wallet of its own.

But it's not just the value of transactions that is overwhelming; it's the rate at which mobile wallets are being adopted by users. Scroll crunched the numbers put out by RBI and it turns out that the value of transactions carried out through mobile wallets have grown by a humongous 500% between 2014-'16. Meanwhile, the numbers of transactions carried out through m-wallets have doubled in the same time period.

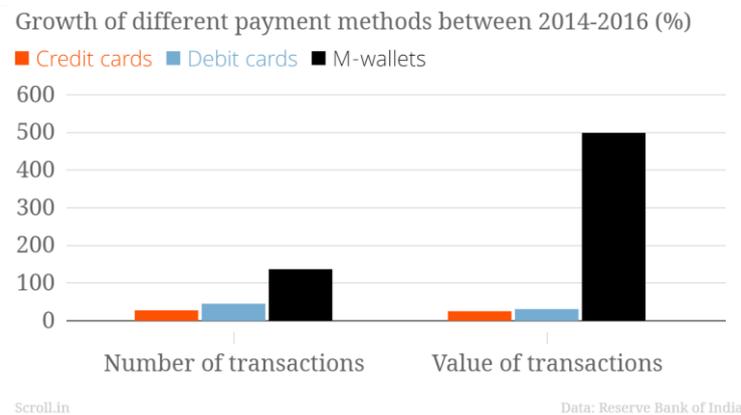


Fig.2 Number of transaction and value of transaction between the year of 2014-16

By comparison, the number of debit and credit cards transactions grew by 25%-50% in the same period. On the other hand, the value of transactions done through plastic money grew by a modest 25%.

However, that is not to say that mobile wallets are going to make your debit card redundant any time soon. Even though electronic transactions make up for only about 10% of all the transactions in this cash-dominated economy, plastic money has the lion’s share of it.

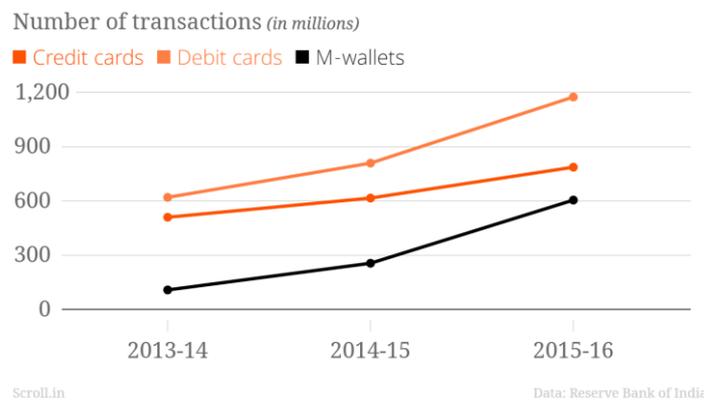


Fig 3.Different mode of transactions

For instance, debit cards saw more than 117 crore transactions during the last financial year and credit cards added another 78 crore transactions in the same period. As compared, mobile wallets managed a healthy 60 crore transactions but that’s considering the fact that many users actually use their debit/credit cards to put funds into their digital wallets.

III.WHY DIGITAL WALLETS ARE PREFERRED OVER CASH TRANSACTIONS

Digital Wallets are software applications predominantly mobile where your payment information is stored in a unique form. This information may include encrypted card data as well as other unique user information such as social security, ID, etc. In its simplest form it is a cache of your deposited money, and can

be used for transactions on certain wallet applications. The money can be used to recharge or pay your mobile bill, book a movie ticket, and even to transfer funds to other wallets. Many online merchants have integrated with digital wallets as one of the payment methods at a checkout.

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IV. ADVANTAGE OF DIGITAL WALLETS OVER CARD BASED TRANSACTIONS

- No need to carry cash and issue change.
- It's secure, simple and convenient to transact via your phone.
- There are a number of benefits, discounts and rewards.
- You have access to multiple features in one app
- Collaboration with major E-commerce and merchant sites let you integrate your wallet as a checkout payment method.

V. COMMON SECURITY VULNERABILITIES IN A DIGITAL WALLET

5.1 Registration process

One of the first steps in using a digital wallet is registration. This process includes steps to verify your identity. It's important that this process is properly followed to also preserve the sanctity of your card details. Some common vulnerabilities include

- ✓ A fraudulent user registering a digital wallet under a victim's mobile number
- ✓ An overwhelmed registration process due to the registration of a large number of users using automated bots
- ✓ Taking over another user's identity by re-registering as that user
- ✓ Enumerating a registered user's personal information by exploiting weaknesses in the registration process
- ✓ The registration process does not identify fraud verification of the user's information card information

5.2 Generic mobile application vulnerabilities

- ✓ Sensitive data like personal ID information and card information is stored in plain text form
- ✓ Sensitive data is also transmitted over the network in plain text
- ✓ There is little protection against generic MitM attacks like SSLStrip.

- ✓ The wallet app is also poorly protected against reverse engineering which steals encryption keys and executes other implantation methods
- ✓ Any user specific information being sent to 3rd Party APIs is vulnerable

These vulnerabilities are somewhat unique to digital wallets. They may differ between apps, but generally speaking they are a broad summary of common vulnerabilities.

Some wallets may also have additional features which present unique vulnerabilities

- A weak user identity verification which leads to an attacker impersonating a user
- The possibility to login as another user from a mobile device not belonging to the real user
- The possibility to replicate or guess tokens assigned to different users and transactions
- Insecurities in wallet replenishing and money transfers
- Refilling the wallet with more than the Net banking or Credit/Debit card transaction by using parameter or response manipulation
- Transferring money fraudulently from another user's wallet account (swapping to and from the account numbers, or using negative amounts while transferring money)
- For any product related transactions (movie ticket buying, gift card, bill payments, etc.) tampering with parameters to perform transactions with less amounts than the original product cost
- Checking local storage for sensitive data such as PIN, stored payment tokens, encryption/decryption keys, etc.
- Transacting using NFC
- Checking if the tokens stored offline for wallet payments can be replayed—using them more than once
- Checking to see if the tokens stored in the local database are not encrypted and using them for direct transactions checking for flaws in other methods of transactions using NFC.

VI. TYPES OF MOBILE WALLETS AND THEIR DIFFERENCE

The Reserve Bank of India has increased the limit for semi-closed pre-paid wallet limit to Rs 20,000 from Rs 10,000. After the ban of high-value currency, the government is taking several measures to encourage people to use electronic mode for making payments.

Now most of the individuals have shifted to mobile for making payments. There are different types of m-wallets available and they differ when it comes to payments and KYC norms.

Here are few things to know when using mobile wallets.



Fig 4.Mobile applications

6.1 Pre-paid Payment

Pre-paid payment instruments are types of payment solutions which can be used to purchase goods and services, including funds transfer, against an amount which is stored in such instruments. The amount in pre-paid instrument can be transferred by cash, by debit, or by credit card.

The pre-paid instruments include smart cards, internet accounts, internet wallets, mobile accounts and mobile wallets.



Fig 5.Plastic card for payment

6.2 Closed Payment

These are usually issued by business houses or e-commerce companies, where some amount of money is locked with the merchant in case of a cancellation or return of the order.

Closed payment instruments issued can be used to purchase goods and services from him or business. These instruments do not permit cash withdrawal or redemption. No third party payments and settlement are allowed in such instruments.

Flipkart.com, Jabong.com, and Makemytrip.com offer closed wallets.



Fig 6.Closed Payment

6.3 Semi-Closed Payment

Semi-closed wallets such as Paytm, which do not permit cash withdrawal or redemption, but will allow you to buy products at merchants which have tied up with them and also allows performing financial services at listed locations.

As per RBI "these are payment instruments which can be used for the purchase of goods and services, including financial services at a group of clearly identified merchant locations/ establishments which have a specific contract with the issuer to accept the payment instruments".

Other semi-closed wallets are Oxygen Services and Citrus Payment.



Fig 6.Semi-Closed Payment

6.4 Open System Payment

Open System Payments like m-Pesa from Vodafone, ICICI Bank can be used for purchase products, including funds transfer at any card accepting merchant locations and also permit cash withdrawal at ATMs.

Semi-Open System Payment

Airtel Money is a semi-open wallet, which will allow the customer to transact with merchants at PoS that have a tie-up with Airtel. You can't withdraw cash or get it back. Another example for semi open is Gift Cards issued by banks.



Fig 6.Open system Payment

6.5 KYC for Mobile wallets

The RBI increased the limit to Rs 20,000 from Rs 10,000 for which minimum details of the customer is required. The outstanding amount in a wallet at any point of time should not exceed Rs 20,000 during any given month.

For amounts between Rs.20,000- Rs.50,000 official valid documents should be submitted and will be issued only in electronic form.

If an account is full KYC compliant, the limit on the wallet is Rs.1, 00000 and the balance should not exceed Rs.1, 00,000 at any point in time.

Advantages

Mobile wallets have become one of the fastest ways to do financial transaction such as recharges, bill payments, bus tickets, shopping etc., can be done at finger tips.

Using mobile one can send and receive money instantly unlike before when transferring funds would require beneficiary information like account number, IFSC code etc.

Disadvantages

There is a limitation when it comes making payment as maximum amount which can be used in wallet is Rs 20,000 in a month. There is also a restriction depending merchant tie ups.

Individuals will not receive any interest for amount available in mobile wallets. There is always a risk if you lose your mobile since many wallets don't require an additional level of authentication.

VII. E-WALLET TYPE

To start with, let us know what types of Payment Platforms these apps have to offer. Starting with Google Tez, the app has a simple UI and offers payment through UPI only. You can send or receive money using UPI with Google Tez. Both Paytm and PhonePe offer mobile wallet service, credit/debit card payment option, and UPI. You can also pay bills and recharge your number using Paytm and PhonePe. BHIM app is a simple app that uses UPI as a mode of payment that comes with offline transaction support as well.

7.1 Some popular e-wallets and their services

7.1.1 Paytm

Paytm is an Indian e-commerce system and digital wallet company, based out of Noida, India. Paytm offers online use-cases like mobile recharges, utility bill payments, travel, movies, and events bookings as well as in-store payments at grocery stores, fruits and vegetable shops, restaurants, educational institutions with the Paytm QR code.

Strategy structure which was offered by our Indian Government towards innovation are Make in India, Start-up India and Skill India. And Paytm was one among such innovation which came as an alternative to the cash transactions. Demonetization has given Paytm an elevate in the India's money exchange economy and constrained individuals, and specifically the little vendors to look for alternatives.

The shoppers started utilizing computerized instalment modes and Paytm is currently enrolled as a safe versatile wallet and is slowly expanding its relationship with more providers. In India Paytm is constantly growing to be the top platform for mobile, e-wallet and commerce. After demonetizing the 500 and 1000 rupees notes Paytm understood that it can be successful only by offering services towards Cashless Economy.

Paytm is a successful technological innovation which has created a balance between cost and efficiency. Paytm offers so many flexible services, promoting Cashless economy and also supporting the Digital India.

Today Paytm is not only popular for its e-wallet services also for its different features. It is the one platform where we can do all our general works only by opening a single application "Paytm".

Paytm has its own Bank which has been started in November 2017. Where a Paytm user can open their accounts only by doing the KYC verification on the Paytm.

It also provides the feature of shop now and pay later which is known as Paytm Post-paid. The post-paid limits varies according to the user and their transaction on the Paytm.

And today all of us are fond of doing shopping online so it also provides the shopping platform named as Paytm mall. Here we can do the shopping of our desired product.

Hence Paytm is the app with one app with multiple services.

7.1.2 PhonePe

PhonePe is a financial technology company headquartered in Bangalore, India. It was founded in December 2015. It provides an online payment system based on Unified Payments Interface by National Payments Corporation of India (NPCI).

It is licensed by the Reserve Bank of India for issuance and operation of a Semi Closed Prepaid Payment system.

PhonePe received its licence to operate on 26 August 2014 and began operations in December, 2015. However, in April 2016, the company was acquired by Flip kart. Flip kart's Vice President in Marketing, Sameer Nigam was assigned as their new CEO.

In August 2016, the company partnered with Yes Bank to launch a UPI-based mobile payment app, based on the government-backed UPI platform.

In this application wallet is directly linked with the bank through upi. Using UPI pin we can make any transaction to the merchant or retailer. It has also the feature of scan the code and pay that makes the wallet more convenient to pay at any store faster without any much security restriction.

Either we can pay the money from the PhonePe wallet if it has money or we can directly pay from our bank partner using PhonePe wallet. This makes it also more convenient app. It does not provide that much feature as much provided by the Paytm but as we are discussing about the wallet so PhonePe basically deals with the feature of wallet.

Here all types of payments like electricity bills, DTH recharge, credit card bill, recharge, gas, water bill etc.

7.1.3 Google Pay

Google Pay (stylized as G Pay; formerly Pay with Google and Android Pay) is a digital wallet platform and online payment system developed by Google to power in-app and tap-to-pay purchases on mobile devices, enabling users to make payments with Android phones, tablets or watches.

As of January 8, 2018, the old Android Pay and Google Wallet have unified into a single pay system called Google Pay. Android Pay was rebranded and renamed as Google Pay. It also took over the branding of Google Chrome's auto fill. Google Pay adopts the features of both Android Pay and Google Wallet through its in-store, peer-to-peer, and online payments services.

The rebranded service provided a new API that allows merchants to add the payment service to websites, apps, Stripe, Braintree, and Google Assistant. The service allows users to use the payment cards they have on file with Google Play. The Google Pay app also added support for boarding passes and event tickets in May 2018. As in the picture it is shown that this app was previously known as tezz but now it is in front of us as Google Pay. It is one of the most simple app or wallet among all the wallets discussed above where we can transfer the money very simply through the mobile number registered with the bank if that number is linked with the Google pay app also. We also have the option to message from here to the sender to know whether the

money is being transferred to the right person. The messaging system of this app makes it more convenient to get the confirmation very easily. Google pay is directly linked with the bank using UPI so whatever the money is being transferred is done directly from the bank.

7.1.4 BHIM (Bharat Interface for Money)

BHIM (Bharat Interface for Money) is a mobile payment App developed by the National Payments Corporation of India (NPCI), based on the Unified Payments Interface (UPI). It was launched by Prime Minister Narendra Modi at the DigiDhan Mela at Talkatora Stadium in New Delhi on 30 December 2016. It was named after B. R. Ambedkar and is intended to facilitate e-payments directly through banks as part of the 2016 Indian banknote demonetisation and drive towards cashless transactions.

Benefits BHIM

BHIM allow users to send or receive money to or from UPI payment addresses, or to non-UPI based accounts (by scanning a QR code with account number and IFSC code or MMID (Mobile Money Identifier) Code).

Unlike mobile wallets (PayTM, MobiKwik, mPesa, Airtel Money, etc.) which hold money, the BHIM app is only a mechanism which transfers money between different bank accounts. Transactions on BHIM are nearly instantaneous and can be done 24/7 including weekends and bank holidays. BHIM also allows users to check the current balance in their bank accounts and to choose which account to use for conducting transactions, although only one can be active at any time. Users can create their own QR code for a fixed amount of money, which is helpful in merchant-seller-buyer transactions.

Users can also have more than one payment address. If the 12-digit Aadhaar number is listed as a payment ID, the BHIM app will not require any biometric authentication or prior registration with the bank or UPI. Version 1.3 allows users to use mobile numbers from their contact book to send money and also save payment addresses for future use without needing to type the address again. User can also check the transaction history, which only shows transactions through BHIM.

7.2 Best between Google Tez/ Paytm /PhonePe/ BHIM

So after knowing about the basics of these mobile payment apps, we can compare them based on what these apps offer and how convenient they are to use. Let us talk about these apps based on certain fixed parameters.

7.2.1 Payment Support

There are various modes of payments that can be used on mobile platforms. While not all of the applications support all modes, these apps are basically aimed at integration and ease of payment, keeping the medium as universal as possible.

Firstly, UPI is supported in Google Tez, Paytm, PhonePe, and BHIM app. While Google Tez utilizes UPI to offer Nearby Payment option, BHIM app gives you offline support to make transactions using UPI even without the internet.

The second payment method is a mobile wallet. Paytm as well as PhonePe offer you mobile wallet services. You can top-up your Paytm or PhonePe wallets using your credit/debit card or UPI. These wallets can be used for a quick transaction by scanning QR Codes, or online shopping. Paytm even has a full-fledged online shopping platform named Paytm Mall for extended wallet usage.

You can save your credit/debit cards on Paytm and PhonePe for faster checkouts. Google Tez and BHIM, on the other hand, keep you connected via UPI so you're carrying a virtual debit card with you always. While Bill Payment and recharge options are easily accessible on Paytm and PhonePe, Google Tez does not support online bill payment.

7.2.2 Cashback and Rewards

One of the benefits of using mobile payment platform are the attractive rewards and cashback. Talking about Google pay first, it converts your bank account into an easy mobile wallet service. Cashback and Rewards cash on Google pay is added directly to your account, so you can use it anywhere you want.

Paytm, on the other hand, adds cashback and rewards to your Paytm wallet only. So you cannot use your rewards beyond the places where Paytm is accepted. Anyhow, you can convert your cashback amount to Gold with Paytm, which is good. PhonePe cashback is also limited to your PhonePe wallet only. It does not get transferred to your bank account.

Lastly, all the applications that are listed here support multiple languages so you are not limited by English or Hindi as the only languages. Multilingual apps make localization of mobile platforms easy and more accessible.

7.2.3 How cashback works

A company can offer cashback in several ways, including purchases on cashback sites. However, the most common method is via credit card usage.

The idea is that the more customers spend on their cashback credit card, the more cash they can earn. Provided they make minimum payments on time and stay within their credit limit, cashbacks are an effective way for customers to earn back from their purchases.

VIII. CONCLUSION

While all these Mobile Payment platforms offer some unique features, they're fit for usage by different audiences. While BHIM makes it easier for you to make payments without an internet connection, Google Tez is a secure way to use UPI for quick nearby payments.

Paytm and PhonePe are full-fledged wallets and integrate multiple functions in them. The only drawback with Paytm and PhonePe wallets is that they come with monthly limits of Rs.20,000 (for Paytm, you can have eKYC done to increase the limit to Rs.1,00,000). However, for PhonePe, the UPI limits are similar to those of BHIM and other UPI apps.

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