

Boston Fed Team Puts Mobile Payments to the Test

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I. Introduction

While consumer awareness of mobile and digital wallets is growing, many are still unfamiliar with how wallets actually work and have yet to try making a mobile payment. Several critical factors help enable mobile payments and foster greater consumer usage. For example, to use a “Pay” wallet, i.e., Apple Pay, Android Pay, or Samsung Pay, consumers must have near field communication- (NFC) enabled mobile phones, while digital wallets, such as Visa Checkout and Masterpass, are device-agnostic. Consumers must also have credit or debit cards that their issuing banks support for the specific Pay wallet. Finally, consumers need retail locations to use mobile and digital wallets, so merchant acceptance is key.

The Boston Fed’s Payment Strategies group led a mobile-digital wallet analysis project that included the author and five colleagues¹ from different areas of the Bank to test mobile payments. Between June 2015 and May 2016, the team conducted field research using iPhones and Android mobile phones to make proximity and remote purchases.² Efforts included setting up Pay wallet accounts and Visa Checkout, Masterpass, Amazon, and PayPal digital wallet accounts, adding credit and debit, making in-store and online purchases, and handling returns. Members documented their experiences and findings in diaries.

II. “Pay” Wallets

Account creation and authentication during set-up process

During the creation of the Pay wallet accounts, the team noted that Apple Pay, Android Pay, and Samsung Pay have comparable processes. Mobile wallet apps come preinstalled on some devices or consumers can download the apps from the respective app stores.³ Users provide similar personal information (e.g., first and last name, email address, password, birthdate, and ZIP code/location) to create a Pay wallet, but each input process differs slightly:

¹ We would like to thank the team members: Christine Capota, Nathan Cooper, Leslie Kirshner, Michael Nealand, and Emilie O’Malley for their participation in this project.

² Some of the information about the mobile and digital wallets features has been updated to reflect current offerings and capabilities, which may not have been available during the team’s field research period.

³ Apple Pay is preinstalled on iPhone 6/6S and newer models. Android Pay and Samsung Pay are preinstalled on newer, compatible mobile phone models, but some older models require customer download of the mobile wallet apps.

- **Apple Pay** – User references this information (i.e., name, email address, password, and contact) from his Apple ID account.⁴
- **Android Pay** – User can set-up Android Pay with Google account credentials, which include name, email address, password, birthdate, and phone number.
- **Samsung Pay** – User provides first and last name, email address, password, birthdate, and ZIP code to enroll in Samsung Pay, or can register with his Facebook account information.

For all three Pay wallets, enabling mobile phone lock (using fingerprint and/or PIN authentication) is a prerequisite. Samsung Pay and Android Pay disable the phone's screenshot capability during the account creation process.

Payment card enrollment

The process to add a participating issuer's credit and debit cards to each Pay wallet is also similar. For all three mobile wallets, a user can scan the payment card data using the phone camera⁵ or manually type in the account number. An Apple Pay user can also add the payment card number on file in his iTunes account, but must manually enter the three- or four-digit card security code (i.e., CVV/CVC).⁶ In each case, the user must confirm the card details and accept terms and conditions established by the card issuer and wallet service provider.

After confirming the card information and agreeing to the applicable terms, the user performs a final verification using a secondary channel, such as email or text message. The issuing bank sends a verification code to the customer's email address or to the mobile phone number associated with the card account. The email address and phone number are partially masked, and cannot be altered. When the user receives the verification code from the issuing bank, he enters it into the specific Pay wallet app. If the issuer does not have the customer's contact information (e.g., user is the secondary card account holder), he may be prompted to call the issuing bank to complete the verification process. Once the customer's identity has been verified, the issuer confirms via text message, push notification, email, or regular mail that the card has been successfully added to the mobile wallet.

Users can remove stored credit/debit cards from the mobile wallet at any time using the app. In one instance, a team member noticed that the credit card account credentials stored in her Apple Pay wallet were compromised.⁷ She contacted the bank, which immediately issued a new credit card number to her Apple Pay wallet. The bank was able to automatically update the last four-digits of the new account number on the card art in Apple Pay without changing the payment token stored in the mobile phone, which allowed her to continue using the mobile wallet even though she did not receive her new plastic credit card for several days.

⁴ Apple ID is a personal account Apple customers use to access services, such as the Apple Store, iTunes Store, iCloud, iMessage, etc.

⁵ Scanning a payment card using the phone camera captures the user's first/last name and 16-digit PAN. CVV, billing address and ZIP code must be entered manually.

⁶ Apple customers can store a payment card (on file) with their Apple ID account for iTunes Store, App Store, and iBooks Store purchases.

⁷ The cause of the credit card compromise was unrelated to it being stored in Apple Pay.

In-store purchases

Team members used the Pay wallets to make in-store purchases at a variety of merchants, such as supermarkets, pharmacies, department stores, restaurants, and taxis. Retailers included national chains with multiple locations and small local merchants. Overall, the team observed that merchant acceptance of NFC contactless payments and retail staff familiarity with the mobile wallets increased throughout the project, possibly due to more stores with NFC-enabled readers and stronger marketing efforts.

It is challenging to determine whether a merchant terminal accepts contactless payments (i.e., if the NFC reader is enabled). In some stores, even if the POS terminal displays a contactless symbol, the reader is not turned on. The lack of clear marketing creates customer uncertainty about whether they can use a Pay wallet at that merchant location. They may be looking for each Pay wallet's respective logo instead of a contactless symbol on the POS terminal and hesitate to pay or ask questions, especially when there is a long checkout line.

Staff training on the Pay wallets varied, even within the same store location. Most employees were aware of the technology, and sometimes even assisted customers through the mobile payment process. However, in one department store (at different locations and on separate occasions), cashiers told team members that Apple Pay would likely not work despite the mobile wallet's logo on its POS terminals; yet the transactions were completed successfully. Had the customers not been familiar with the technology, they would have used an alternate form of payment and perhaps been discouraged from trying again.

When the Pay wallet transaction was successful, team members had positive experiences. It takes about the same amount of time to complete a Pay wallet transaction and a credit/debit card transaction. With the exception of Android Pay, users do not need to unlock their phones to use the mobile wallet. Some retailers require the customer to inform the cashier that he wants to use a Pay wallet so that the cashier can select the option on the POS system to initiate the contactless payment.⁸ The customer then taps his phone over the contactless reader with his fingerprint on Touch ID. The mobile wallet is automatically activated to pass the payment information to the terminal, a notification appears on the phone screen (e.g., Apple Pay displays a check mark with the word "Done"), and the phone vibrates to confirm that the transaction is successful.⁹ Depending on the merchant, mobile wallet purchases over a certain dollar amount may require signatures.¹⁰ Mobile wallet users receive printed receipts, and can also receive email receipts if offered by the merchant. Users can also view their mobile wallet transaction history within the mobile app.

In-store returns

Team member experiences making returns varied.¹¹ Some merchants' systems processed returns and credited the customer's original payment method automatically without needing the card or phone. In one instance, the cashier requested the credit card that corresponded to the last four-digits on the original receipt. When the team member explained that she had paid using Apple Pay, the cashier told her to tap

⁸ It is not clear why this varies between merchants, e.g., is it a function of the POS hardware, software, or other factors.

⁹ This process does not apply to Samsung MST transactions, which mimics the magnetic stripe transaction process.

¹⁰ At one supermarket if the transaction exceeds a certain amount (e.g., \$50) a customer using Apple Pay must show the last four digits of his device account number/payment token to the cashier who enters it into the POS system. Staff at this retailer had a detailed set of instructions on Apple Pay and where to locate the information.

¹¹ All returns were made with accompanying original receipts.

her phone for the refund. At other retailers, cashiers told team members to swipe their cards for the returns, even though the last four-digits of the payment token was printed on the original receipt.

In-app purchases

Team members tested in-app purchases of online goods and services (e.g., Uber, Starbucks and Dunkin' Donuts account reloads) using Apple Pay and Android Pay at participating merchants.¹² Apple Pay in-app payments were simple and seamless. The customer selected the Pay/Buy with Apple Pay icon during the online checkout process through the retailer's app. The apps that the team tested provided various features, e.g., displaying a pop-up message with the option to select a payment card from the Apple Wallet; automatically using the default card; and/or automatically populating the shipping address field with the customer's default contact information.¹³ Team members found this last feature convenient, especially for purchases at rarely frequented merchants. To authenticate and complete the transaction, the wallet user placed his fingerprint on the phone's Touch ID (or entered his PIN), similar to an in-store payment. Once the transaction was complete, the Apple Pay user received an email confirmation and receipt. One team member who tested Android Pay to make an in-app purchase indicated that the experience was similar to Apple Pay.

III. Digital Wallets

Team members created accounts with several digital wallets to make remote (online) payments via mobile web browser and merchant apps. The wallets included Visa Checkout, Masterpass, Amazon Payments, and PayPal. Because digital wallets are device-agnostic, they are accessible from any mobile phone with a web browser.

Account creation and authentication during set-up process

The account set-up process, which can be done before or during checkout, was similar across digital wallets – team members entered first and last name, email address or mobile phone number, and password. They confirmed their email address (via a link) to activate a new account. If they were registered Amazon customers, they were able to use information already stored in their Amazon accounts to pay for purchases at online merchants that accept Amazon Payments.

Enrolling payment cards

Users can link any major credit and debit cards to their Visa Checkout, Masterpass, Amazon Payment and PayPal accounts. Amazon Payments and PayPal users can also link checking accounts. These digital wallets minimize steps to simplify the consumer online checkout process. For example, when the user registers with the digital wallet, his payment credentials and address information are securely stored on file with the wallet provider. To checkout and pay, the customer only needs to enter his username and password. Visa Checkout¹⁴ and Masterpass also offer a *Remember Me* feature that automatically

¹² Samsung Pay currently supports in-app purchases for participating merchants, but this service was not yet available when team members conducted their research.

¹³ Apple Pay users can enter a default shipping address, email, and phone number in the mobile wallet app.

¹⁴ Visa Checkout users can also authenticate using Touch ID on an iPhone.

populates the username, requiring only a password, which makes the sign-in and checkout process even easier. Amazon and PayPal offer similar capabilities with *1-Click Ordering* and *One Touch*, respectively.

Making a purchase

Team members preferred digital wallets for purchases at less frequented or less familiar retailers because they did not have to create new customer profiles or provide their payment credentials to each merchant. To determine if a digital wallet was accepted, team members looked for the Visa Checkout, Masterpass, Amazon, or PayPal logo on a merchant's checkout page.¹⁵ To begin the checkout process they selected the appropriate digital wallet button and then signed in to the digital wallet account with their email or mobile phone number and password. The digital wallet automatically selected the user's default credit or debit card and populated the shipping address field with the user's billing address. (The payment card and shipping address can be manually changed.) The rest of the checkout process was similar to that of a traditional credit/debit card transaction. Once the transaction was completed, the customer received an email confirmation from the merchant. If he used Amazon or PayPal, he received an email confirmation and push notification.

Returns

One team member returned a product bought using Visa Checkout, and reported that the process was the same as a credit card refund transaction.

IV. Loyalty and Rewards

The mobile and digital wallets tested support some loyalty and rewards capabilities. Some features include:

- **Apple Pay** – Users can store barcodes for loyalty and rewards cards, airline and train boarding passes, movie and other event tickets, and coupons from participating merchants in Apple Wallet.¹⁶ Walgreens and Kohl's went a step further to integrate their proprietary loyalty cards with Apple Pay. To earn loyalty points the customer taps his phone on the NFC-enabled POS reader to present his loyalty account number instead of scanning a barcode.

One team member added her Walgreens *Balance Rewards* card to Apple Wallet and tried using it at different Walgreens locations; it worked in some stores, but not in all. She first tapped her iPhone at the Walgreens' POS terminal to access her loyalty card, and tapped again to access the credit card linked to her Apple Pay account to complete the purchase.

- **Samsung Pay** and **Android Pay** – Users can store digital copies of their barcode loyalty, reward and membership cards in Samsung Pay and Android Pay. One team member added loyalty cards from merchants that were listed in the Android Pay app. He scanned his physical loyalty card to read the account number, which was saved with the corresponding card art in his mobile wallet. He also added a few cards manually, including a prepaid card for use in the cafeteria, by taking

¹⁵ Visa Checkout and Masterpass offer lists of participating merchants on their websites, however, Amazon and PayPal do not.

¹⁶ Apple Wallet stores the barcodes for passes which may include other information such as balance on coffee card, coupon expiration date, or seat number for a concert. Users can also add credit and debit cards linked to Apple Pay to Apple Wallet

photos of the barcodes with his phone camera and saving them in Android Pay. He was able to use all of them successfully, but sometimes found it difficult to scan the barcode on his phone screen at self-checkout registers.

- **Digital Wallets** – Users can apply coupon codes and loyalty programs associated with most merchants accepting Visa Checkout, Masterpass, Amazon, and PayPal. The digital wallets also offer promotional discounts for select participating merchants to encourage consumer adoption. One team member successfully applied a merchant’s promotion code that was exclusively eligible with a co-branded Visa card using Visa Checkout.

V. Key Findings

Overall, the team found this mobile payments research experience informative. Many members continue to use their mobile and digital wallets regularly, but none are ready to leave home without their physical wallets. Some of the team’s key findings include:

1. Mobile wallet awareness continues to grow among consumers and merchants. When asked, some retail associates said that they have seen a slight increase in the number of customers using Pay wallets. While shopping, team members also saw a few other consumers using Apple Pay at various retailers.
2. More education for consumers and employees on how mobile and digital wallets work is essential to achieving mass adoption. Staff awareness and levels of training vary significantly, sometimes within the same retailer and store location. Signage indicating wallet acceptance is inconsistent, creating customer confusion and negative experiences.
3. Offering robust loyalty and rewards features can help to build adoption by incenting consumers to use mobile and digital payments.
4. A consumer’s priority is to find a retailer that sells what he wants to buy rather than finding a merchant that accepts a digital or mobile wallet, especially since credit and debit card acceptance is ubiquitous. However, with an attractive value proposition (e.g., added convenience, efficiency, security, and/or savings), consumers may prefer to use a mobile or digital wallet if the option is available, leading to more frequent mobile wallet transactions (in-store and remote) that can help build consumer confidence and influence change in behavior.