THE UNINTENDED CONSEQUENCES OF INDUSTRY MANDATES: HOW EMV IS CHANGING THE U.S. PAYMENTS LANDSCAPE

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ABSTRACT

The 2015 mandate of Europay MasterCard and Visa (EMV) "chip card" technology in the U.S. left the payments market primed for the adoption of alternative technologies. The goal of this study is to determine the factors that contribute to the adoption of new, alternative payment technologies by integrating the Technology Acceptance Model (TAM) and Switching Cost Theory and operationalizing both theories in a consumer context. Through a survey of 210 chip card and mobile payment users, this study finds the TAM dimensions of self-efficacy, perceived usefulness, and social influence are key determinants of a user's propensity to use a new technology in a mandated consumer context and introduces switching costs as an important antecedent to a consumer's likelihood to use an alternative payment technology. More generally, this work integrates those theories to gain insight into how industry mandates influence user behavior with regards to consumer acceptance of alternative technologies.

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CHAPTER 1

INTRODUCTION

As the technology incorporated into the payments ecosystem evolves over time and new industry mandates are put into place, the payments industry in the U.S. becomes more open for the emergence of alternative technologies. Europay, MasterCard, and Visa (EMV) is a global standard for authenticating face to face transactions processed at the point of sale on credit and debit cards (EMVCo, 2014). EMV technology uses chip embedded cards instead of the traditional magnetic stripe (magstripe) on the back of the card. Pulled by forces stemming from the EMV protocol which required merchants in the United States to be EMV compliant by October 1st, 2015 (Visa, n.d.), the payments industry in the U.S. introduced this global standard which impacts multiple stakeholders including issuers/banks, cardholders, merchants, payment processors, and point of sale vendors.

The rollout of EMV in the United States was widely criticized, with claims of mismanagement that affected all stakeholders. Through this mismanagement, the emergence and adoption of mobile payment technologies which may not have been viewed as market disruptors and differentiators prior to the EMV migration has now occurred. With cardholders confused by how to use EMV cards, uneducated over why the migration occurred, and frustrated over longer transaction times, mobile payment technologies such as Apple Pay, Samsung Pay, and Android Pay have grown in popularity. "Mobile wallets feel faster, more convenient, and less awkward to use than the chip" (Chen B. X., 2016). The goal of this research is to better understand the

mechanisms that influence cardholders to use an alternative technology, such as a mobile wallet, in lieu of his or her chip card. Specifically, this paper identifies the TAM dimensions and switching costs that are antecedents to a cardholder's propensity to use Apple Pay, Samsung Pay, or Android Pay.

This paper is organized in several sections. First, an introduction, including an overview of payments, payment technologies, and EMV is presented. Next, a review of theory in the areas of Technology Acceptance and Transaction Cost Economics/Switching Cost Theory is presented to provide insight into the tradeoffs for cardholders in switching to a new technology. Consumer surveys of actual chip card and mobile payment technology users were conducted and two studies with corresponding research models are introduced; including an initial pilot study followed by an expanded study. Contributions to both theory and practice are then presented with suggestions for future research.

CHAPTER 2

HISTORY OF PAYMENTS

The need to pay for goods and/or services has existed throughout human civilization and has evolved over time, matching the technological abilities of the era throughout history. The earliest evidence of payments dates back to 8,000 BCE where clay tokens were used to represent transactions (Waymire & Basu, 2008). As the human race evolved, so did our methods of payment. From the introduction of metal objects in 5,000 BCE, to paper money in China in 960 AD, to the issuance of credit in the late 1800s. The idea of using credit as currency originated with the use of credit coins and charge plates directly between the consumer and a single merchant and developed into a closed loop system between bank customers and participating merchants, then finally a small cardboard card was introduced to the market in 1946 which allowed patrons to pay their restaurant bill. This piece of cardboard was branded Diner's Club, and paved the way for the emergence of competitive solutions (Woolsey & Starbuck Gerson, 2009).

By the 1960s, the cardboard charge cards had been replaced with plastic, and the idea of revolving balances for consumers was franchised to banks across the United States by Bank of America under the name BankAmericard. The InterBank Card Association (ICA) was also formed during this time as a direct competitor to BankAmericard, and with interbank cooperation, these two industry pioneers offered an open loop system which allowed consumers to utilize their revolving balances wherever credit cards were accepted. The pieces of paper containing a written account of the transaction details were soon replaced with card imprinters, also referred to as knuckle

busters. The knuckle busters allowed cashiers to easily get an imprint of the consumer's card instead on a paper slip instead of writing everything out by hand. The transaction details and amount were then called into the issuing bank for an approval code. The cardholder would then sign the imprinted paper, and the slip would be sent to the bank with the merchant's daily cash deposit. These manual devices were slowly replaced with electronic cash registers in large retail chains during the 1970s, but the release of affordable standalone payment terminals in the 1980s combined with lower costs of the magnetic stripes, originally invented by IBM, allowed merchants of all sizes the ability to eliminate the paper intensive process of the knuckle buster; therefore, improving efficiency, security, and ease of use for the cardholder.

Hypercom and VeriFone were the first equipment vendors to introduce affordable electronic payment processing terminals to the masses. These terminals used the merchant's existing analog phone line to not only communicate and obtain authorizations from issuers based on card data loaded onto a magnetic stripe on the back of the card, but also to settle the day's credit card transactions without having to take paper slips to the bank (Atsea, 2014). With consumers seeing the value and efficiency in swiping a card, banks took notice and implemented the use of magnetic stripe technology to automate the banking world with ATMs and debit cards. The addition of the magnetic stripe not only increased the acceptance of credit/debit cards, but also reduced the amount of fraud that was related to obtaining paper slips for credit card transactions while speeding up funding for the merchants (Frellick, 2011).

Combating Fraud Through Innovation & Industry Mandates

Payments technology evolved over the years in an effort to promote efficiency and security. The transition from paper to electronic transactions occurred with the standardization of the magnetic stripe, the black stripe on the back of plastic credit and debit cards which provided real-time approval instead of relying on the paper slips used with knuckle busters. The paper slips made counterfeit fraud an easy process for criminals, but created time consuming processes for merchants and issuers. Often, verification from the bank would take days, delaying funding to the merchant. The introduction of the magnetic stripe streamlined this process, but forced thieves to get innovative as well. In the 1990s, the magnetic stripe technology was commonplace with many organizations incorporating this technology into ID badges, school lunch cards, etc. This made the technology required to load magnetic stripe data onto blank cards readily available to criminals (Frellick, 2011).

With a single track of data loaded onto the magnetic stripes of credit and debit cards, thieves could use a cardholder's purchase receipt to get all of the data needed to produce a counterfeit card. The receipt detailed the card number, expiration date, and occasionally, the cardholder's name. Armed with a purchase receipt, a thief could easily obtain an embossing machine and encoding device. The blank card would be swiped through the encoder and the stolen data would then be loaded onto the card's magnetic stripe. From there, a thief could run the card through a card printer to add any graphics and press the embossed information onto the card. Recognizing this as a major threat to data security, on July 3rd, 2003, a Visa mandate was introduced to the payments industry

which required all new point of sale (POS) solutions to print only truncated card data on cardholder receipts. This gave manufacturers of existing devices three years to create programming to update equipment already in use in the marketplace with applications that support truncation. Although the rules allowed for the first four and last four digits of the card number to be present on receipts, the majority of vendors programmed POS devices and solutions to only output the last four digits on receipts (Michigan Retailers Association, n.d.).

As the United States shifted gears into the digital age, POS vendors were forced to replace analog based systems with network-based solutions which were IP (Internet Protocol) or SSL (Secure Socket Layer) based. This opened up a whole new world to data thieves and gave them access to large amounts of card data. The most notable thieves in U.S. history were called the Shadowcrew, led by Albert Gonzalez. Gonzalez started out as a computer hacker, but his sophisticated knowledge of hacking and coding progressed into various ATM skimming operations and other identity theft actions, eventually leading to his arrest in 2003. Gonzalez avoided jail time by agreeing to act as an informant for authorities and provided ongoing evidence against other Shadowcrew members, leading to nearly thirty arrests (Gaudin, 2009).

While working as an informant for U.S. authorities, Gonzalez assembled a team of friends and acquaintances to help him carry out what he referred to as "Operation Get Rich or Die Tryin." Between 2005 and 2007, Gonzalez and his accomplices hacked into unsecured network ports at various retail locations to gain access to the card data that was constantly flowing through these systems as customers completed transactions at the

POS. Large retailers including Dave & Busters, Barnes & Noble, DSW, and Office Max were all victims; however, TJ Maxx was the most notable where nearly forty six million credit and debit card numbers, many including PIN numbers, were stolen. From there, the hackers grew more sophisticated, writing sniffer codes and Structured Query Language (SQL) injection to grant them access into the network of one of the United States largest payment processors, Heartland Payment Systems. With the sniffer code in place, Gonzalez and his accomplices were able to steal track data of over 130 million cards during a seven month period. This track data was then auctioned off on the internet where it would be purchased and loaded onto the magnetic stripe of blank cards. During Operation Get Rich or Die Tryin, Gonzalez and his accomplices were responsible for the theft and sale of over 170 million credit and debit cards, the largest theft in U.S. history. Gonzalez was arrested on three federal indictments in 2008 for his role in Operation Get Rich or Die Tryin. This time he could not avoid jail time, and in 2010 Gonzalez was sentenced to twenty years in federal prison for his crimes (Verini, 2010).

The code that Gonzalez and his accomplices created was sold and incorporated into data breaches at major retailers for years after his 2008 arrest. These breaches occurred at merchants of all sizes, from your small breach localized to a single location, to large scale thefts like Target experienced in 2013. Most of the world's face to face counterfeit credit card fraud occurs in the United States, which is the only country seeing consistent growth in this type of fraud (Coppin, n.d.). The reason behind this consistent growth has been pinpointed to the use of magnetic stripes on credit and debit cards as

opposed to chip/EMV technology, which was already adopted (in some cases more nearly twenty years earlier) by over eighty countries.

EMV History

Chip card technology has been commercially available for over forty years, with the value of this technology first presented as a way to combat magnetic stripe counterfeit fraud by French banks in the early 1980s. After extensive field trials with chip cards, by 1994, all credit and debit cards issued by French banks contained an embedded chip for additional security. Following the conversion to 100% chip-based payment technology, France saw a dramatic decline in not only counterfeit card fraud, but also lost/stolen fraud. Based on the reported drop in fraud experienced in France, multiple European countries began issuing their own chip cards throughout the early 1990s. Although these countries all experienced a similar reduction in both counterfeit and lost/stolen credit and debit card fraud, the advantage experienced by the countries who had adopted their own chip standards was only experienced at the domestic level. With each country developing their own standard, any cardholder traveling outside of their country was forced to use the magnetic stripe as a fallback since there was not a consistent standard amongst early adopters (EMVCo, 2014).

When the U.K. and Japan considered a transition from magnetic stripe to chip, both initially stalled the transition, insisting on a global standard. This gap was validated by the three existing international payment associations (Europay, MasterCard, and Visa), and the three competitive organizations began working on an international standard for chip technology in 1994. This newly developed standard went through one year of field

trials in 1997 before being officially published in 1998. Once the international standard was released, the participating issuers of these three international payment systems abandoned the individual domestic standards, allowing cardholders and merchants to benefit from the increased chip security both domestically and abroad. In 1999, a formal joint venture between Europay, MasterCard, and Visa was formed and known as EMVCo. This new joint venture would be responsible for maintaining the EMV Chip Specifications as the international payments landscape evolves. This evolution included the addition of new key members to EMVCo with Japan Credit Bureau (JCB) joining in 2004, American Express in 2009, and UnionPay and Discover joining in 2013. Each individual organization maintains an equal stake in EMVCo and its efforts in maintaining an international payments standard with the goal of eliminating counterfeit fraud (EMVCo, 2014).

With the global standards in place, the United Kingdom started to make the transition to EMV in 2003, beginning with a pilot of 600 cards and 180,000 merchant locations in Northampton. With one of the most efficient EMV adoptions, the UK was able to transition all credit/debit cards and POS terminals to EMV between January 2004 and December 2004. In just a single year, the UK was able to boast a successful and nearly seamless transition to EMV. A key driver to the successful adoption in the UK was a consolidated effort within the country's banking industry combined with effective government interaction. The banking industry and government jointly launched the "I HEART PIN" campaign which was a pre-implementation intervention that was presented

on billboards, television commercials, print ads, and regular progress reports detailing adoption statistics (Wizbowski, 2015).

With the European Union seeing a collective 80% reduction in fraud related to counterfeit credit and debit cards, migration plans were announced in both Canada and Australia in 2003. The Australian rollout was simply a preventative measure as the country did not experience the widespread counterfeit fraud issues as other developed nations (Fintech, 2015). Canada, however, was experiencing a steady rise in counterfeit fraud, resulting in the need for intervention. Leveraging the standards by EMVCo and following the field test model for EMV migration which was utilized in France and the rest of the European Union, Canada launched the payment industry trial period between 2007 and 2009, with unique trial periods identified for both card deployment and POS deployment during the national rollout in 2008. In Canada, chip cards were deployed at a faster pace than chip enabled POS terminals. Issuers maintained ongoing communication with cardholders regarding the difference in processes between swiping magnetic stripe cards and dipping EMV chip cards (Black, 2012).

Despite being rolled out at similar times, EMV was not adopted as quickly in Australia as it was in other countries. With deadlines consistently extended, the liability shift in Australia was not completed until April of 2014, approximately eleven years after the first major Australian bank issued the initial chip cards. Although the first chip cards were issued in 2003, only one million EMV cards had been issued amongst the country's eight million cardholders. Unlike the EU and Canada, Australia did not engage in pre-

implementation interventions, nor did the country and its population in general share the escalating issues surrounding counterfeit credit/debit card fraud (Fintech, 2015).

One advantage that Australia shared with the EU and Canada, however, was a consolidated banking industry with government backed campaigns regarding EMV. As a result, Australia was able to convert 80% of POS terminals to EMV ready hardware within ninety days (Manasso, 2015). In addition to rapid POS conversion, the second major undertaking in the Australian EMV adoption was the conversion from chip and signature to chip and PIN (Personal Identification Number). Under the initial EMV rollout in Australia, PIN entry was an optional, less secure, method of cardholder identification. This second undertaking took place in October of 2014 and would shift the cardholder identification method to require customers to enter their PIN with each face to face chip card transaction. In preparation for the change in verification requirements from chip and signature to chip and PIN, the Australian banking industry in conjunction with the government launched ongoing "No PIN, No Pay" campaigns beginning in January 2014, allowing ten months of consistent advertising in major newspapers and television stations. With effective pre-implementation efforts in place, Australia experienced a 95% adoption of chip and PIN by August of 2014, two months ahead of the October deadline (Manasso, 2015).

The last minute push from chip and signature to chip and PIN was a successful endeavor for banks; however, Australian cardholders were not prepared for the extended time it would take to complete an EMV transaction. Unlike the magnetic stripe cards the Australian cardholders had become accustomed to, the new chip enabled cards had to be

inserted or "dipped" into the card slot in the terminal and left there while until the transaction was complete. As a result, Australia saw a surge in what is known as "contactless payments." Contactless payments utilize near field communication (NFC) to communicate with the POS by tapping the smart card with NFC enabled in the chip on the POS device. This method of payment results in an expedited transaction experience when compared to traditional contact EMV where the card is dipped in the device. Since mobile phones are now widely enabled with NFC functionality, PayPal teamed up with Australian based merchant acquirer Tyro Payments to introduce the country's first mobile payment solution, Tyro Mobile. Unlike other mobile wallets, Tyro Mobile allows PayPal to communicate directly with the POS, bypassing an external terminal completely and ensuring security by utilizing face recognition. With increased security and faster processing times, contactless payments have become the most widely used form of payment in Australia (Fintech, 2015).

The U.S. EMV Migration and the Rise of Near Field Communication

In October of 2012, the U.S. card associations (Visa, MasterCard, American Express, and Discover) announced plans to bring the global chip standard to the United States, the last country to adopt the global standard. The four associations in the U.S. gave issuers, merchants, and credit card processors three years to adopt EMV, setting a liability shift from issuer to merchant on counterfeit face to face credit/debit card transactions to occur on October 1st, 2015 (Visa, n.d.). As evident in Figure 1, two years after the associations announced their plan and one year prior the liability shift date, the

U.S. had made minimal traction in migration efforts with only 7.3% of cards being EMV ready, accounting for only 0.12% of transactions.

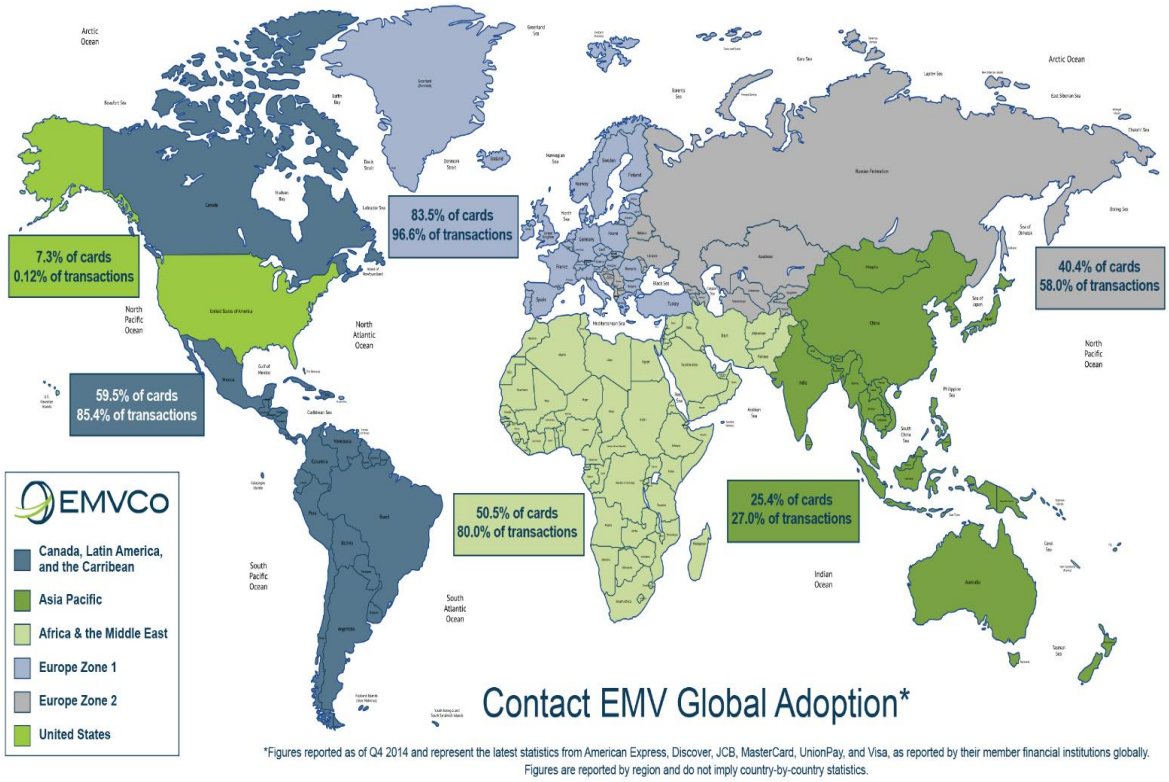

Figure 1: Contact EMV Global Adoption as of Q4 2014 (EMVCo, 2014)

Similar to Australia, the U.S. did not conduct field trials or pilot tests during the three years payments industry stakeholders had to prepare for the looming liability shift. Unlike all EMV adoptive countries, the U.S. did not have government backed advertising campaigns or other pre-implementation initiatives to prepare cardholders and merchants for the migration. Combined with the size and landscape of the local banking industry spread over approximately 8,000 banks and 4,000 credit unions, banks and industry groups are left with the large task of educating the public (Manasso, 2015). However, an

Associated Press poll completed July 9th through July 13th, 2015, showed banks were falling short in their efforts to educate their customers on what these new cards are, why they are receiving them, and how they are supposed to use them. With roughly one quarter of the 1,004 adults surveyed reporting they understand why their bank issued the new card. An even bigger concern identified was the fact that very few cardholders know how to use the cards. Unlike the traditional magnetic stripe card which requires one quick swipe on the terminal, the new chip cards are inserted into a slot on the terminal and left in the device until the transaction is complete (Cohorst, 2015).

Although cardholder education was at the forefront of EMV migrations in other countries, many experts in the U.S. believe the high cost of the conversion and scramble to potentially issue more than one billion cards in 2015 left card issuers preoccupied with other activities in preparation for the move. EMV migration is estimated to cost banks in the U.S. nearly two billion dollars for items such as cost of plastic, chip costs, and new automated teller machines (Bose, 2015). Banks who act as both a credit card issuer and traditional banking institution will have even higher costs, as in addition to the tangible items required to make the move, branded debit cards (those with a Visa, MasterCard, Discover, or American Express logo) will require investments in infrastructure for the issuing bank (pymnts, 2014). Debit in the U.S. is also unique as there are a total of seventeen separate debit networks as compared to only one debit network in Canada. A debit card transaction will go through the assigned debit network when a PIN is entered at the point of sale. The attraction of using a PIN at the time of payment is that it can be less expensive for merchants to process the transaction and it offers an extra layer of

security. Since the U.S. has a vast and varied debit landscape with a high number of networks, none of which had an EMV specification at the time the EMV migration was announced, this posed a major hurdle for banks (pymnts, 2014).

As briefly noted above, another high cost item for issuers is the upgrade to the bank's existing infrastructure which would be needed to support chip and PIN where the card is dipped and a PIN is entered by the cardholder into the point of sale. Due to the high cost and potential cardholder confusion, the majority of issuers have declined to pursue chip with PIN verification, despite the fact that this method of verification is far superior in combatting fraud associated with lost and stolen cards as compared to chip with signature verification. This is similar to the stance taken by Australia during their EMV migration which ultimately led to the surge in contactless payments.

In November of 2015, Attorneys General from eight states across the country coauthored a letter to the card associations and their top issuing banks urging them to incorporate the true global standard of chip and PIN into the rollout of EMV. In the letter, the coauthors acknowledge the advancement the U.S. payments industry is making by requiring EMV; however, they indicated that the decision to move to chip and signature as opposed to chip and PIN is unacceptable in their respective jurisdictions due to the fact that this will do nothing to combat lost/stolen card fraud. With the U.S. accounting "for about half of the global loss from fraudulent transactions, despite that it is responsible for only a quarter of total card payments" (Sussman, et al., 2015), these state representatives are demanding an immediate call to action; demanding that issuers

do everything they can to protect themselves, consumers, and merchants from potential fraud-related losses.

The aforementioned Attorneys General were not alone in their push for U.S. issuers to adopt chip and PIN instead of chip and signature. Brick and mortar merchants impacted by the new mandate were perplexed by absence of a PIN requirement with the U.S. EMV migration. On October 21st, 2015, the House of Representatives Committee on Small Business heard testimony from small businesses regarding the challenges they face in the wake of the EMV mandate with one owner citing a Federal Reserve statistic stating chip and PIN transactions were seven times more secure than signature based transactions since it is the PIN that authenticates the cardholder (National Retail Federation, 2015). In addition to security concerns, the small business owners who participated also voiced frustration over the impact to the bottom line of the merchants with owners testifying that equipment needed to become EMV compliant would cost thousands to hundreds of thousands depending on the type and size of the business, despite the fact that EMV applications were not yet available for the soon to be chip compliant equipment (Daly, 2015; The National Association of Convenience Stores, 2015).

Costs, insufficient cardholder verification, and the availability of EMV applications are not the only items of high consideration for merchants. During testimony, merchants reported being completely unaware of the October 1st deadline as processing banks had not reached out to provide education on EMV. Based on recent studies performed by financial analysts and payment consultancy firms, this lack of

communication with regards to EMV between payment processor and merchant seems to be yet another problematic gap in the U.S. migration. In a study held in early 2015 by financial analyst Gilles Ubaghs, a reported 30.2% of merchants had never heard of EMV and 36.8% stated they would not adhere to the requirements of the migration. A summer survey of U.S. merchants by Randstad Technologies found that 42% of participants had either never heard of EMV or had not taken a single step to comply with the mandate. Another survey administered just one month before the October 1st deadline by well-respected payments consultancy firm The Strawhecker Group found that only 27% of U.S. merchants would be EMV ready on October 1st. Aside from lack of awareness, Randstad's Dick Mitchell noted that merchants are not being pushed by their customers to move to an EMV POS solution. What is the reason Mitchell identified for the lack of cardholder advocates? Once again, it comes down to a lack of education (Armerding, 2015).

In an effort to gauge cardholder knowledge of the impending October 1, 2015, liability shift in the United States, surveys of consumers were completed by both CreditCards.com and ACI Worldwide, an organization which works with multiple payments industry stakeholders. Although their surveys were similar, these organizations are completely separate entities with no affiliation. The results obtained by both firms, however, were very similar.

ACI completed a telephone survey between August 27th and August 30th, 2015, using two probability samples for a total of 1,008 participating adults. The first sample consisted of randomly selected landline phone numbers and the second sample consisted

of randomly selected mobile phone numbers. Key findings from the ACI survey are summarized below:

- Approximately 59% of cardholders surveyed have not received a chip enabled credit and/or debit card.
- 67% of survey respondents reported their issuer and/or bank has not explained EMV or its impact on the process for how they pay at the point of sale.
- Of the 41% of cardholders surveyed who had received a chip enabled credit and/or debit card, only 32% were aware of the U.S. migration to EMV, and the majority of those who were aware had no knowledge of the actual reason for the migration (ACI Worldwide, 2015).

For the cardholders surveyed who had received at least one chip enabled credit/debit card, age and geography both played a role in the respondent's awareness of EMV. ACI noted, however, that awareness does not coincide with understanding the reason behind the migration as indicated in the final bullet point above. Figure two summarizes the ACI results on level of awareness by age range.

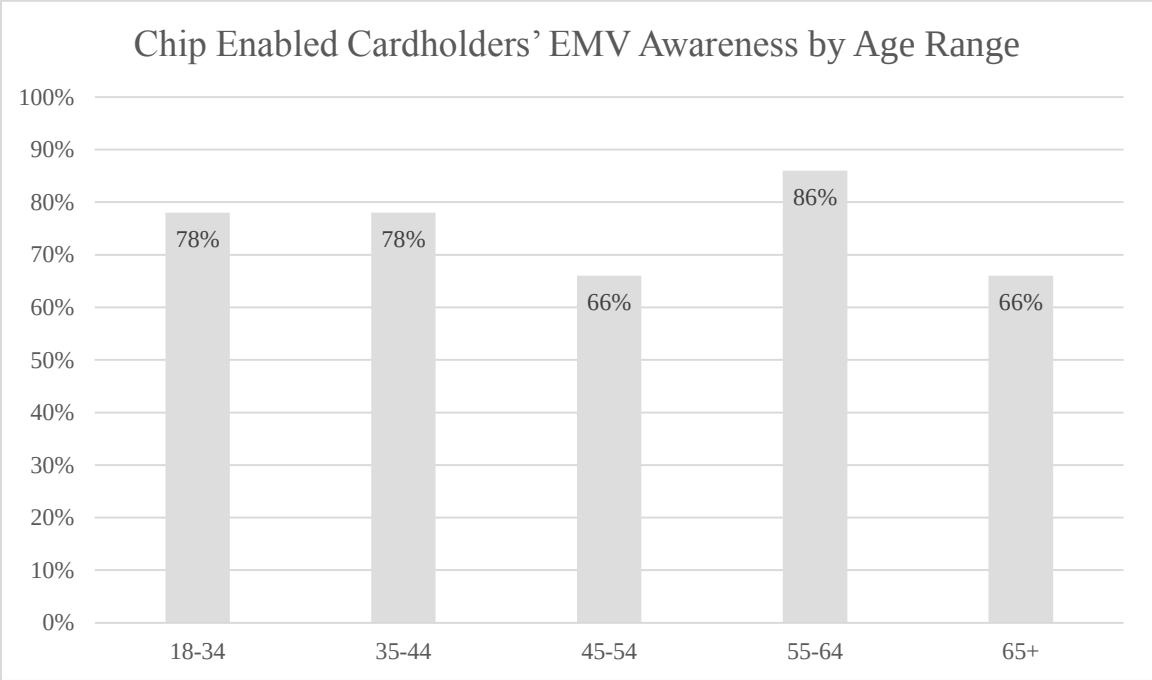

Figure 2: ACI Survey Results: Chip Enabled Cardholders' EMV Awareness by Age Range (ACI Worldwide, 2015)

The CreditCard.com survey was conducted on their behalf by Princeton Survey Research Associates International (PSRAI). PSRAI completed the telephone survey in two campaigns which occurred September 3rd through September 6th, and September 17th through September 20th; less than one month prior to the date of the EMV liability shift. The sample of 2,004 adult cardholders was determined to be nationally representative and was limited to adults in the continental U.S. Similar to the results obtained during the ACI survey, CreditCards.com's results showed that 60% of cardholding adults did not have a chip enabled credit or debit card. In addition to EMV related questions, CreditCards.com also gathered data on respondents' age, as well as income and education level. When analyzing the demographic related responses, the youngest adults surveyed

with the lowest income and education levels were the least likely to have received a chip enabled credit and/or debit card at the time of the survey (Mecia, 2015).

For the cardholders who have had the opportunity to pay a merchant with their chip card on a chip capable device, the lack of education from issuers is a pain felt by cashiers, the consumer, and the individuals standing in line behind the cardholder. Samantha Masunaga from the Los Angeles Times observed EMV cardholder behavior at a Trader Joe's location, and witnessed many issues as consumers made their way through the line. "One man pulls his card out of the terminal too quickly, prompting the cashier to reset the transaction while covering the card slot to prevent any premature movements. Another woman smiles apologetically at the next customer in line as she repeats her transaction" (Masunaga, 2015). Although the Trader Joe's spokesperson would not offer a comment to the LA Times reporter, she did overhear cashiers at the telling customers that the reason for the checkout delays were due to the EMV cards. In addition, one nineteen year old customer told the reporter that she now resorts to getting cash to avoid the extra minute it takes for her to pay with her chip card as compared to the magnetic stripe card she had been swiping prior to the mandate.

A 2017 report by the U.S. Payments Forum noted that the additional time cardholders are spending at the point of sale may result in a market preference for contactless or NFC payments and that the "adoption of contactless transactions in the U.S. can greatly improve the cardholder experience…Merchants and cardholders benefit from both perceived and actual reduced transaction time compared to contact methods" such as dipped chip card transactions (U.S. Payments Forum, 2017) NFC, or near field

communication, utilizes electromagnetic radio fields to submit and/or exchange data. This technology is similar to radio-frequency identification (RFID), but unlike RFID, NFC is designed to only communicate with devices that are in close proximity. In the payments world, there are two types of NFC devices: passive and active. Passive devices can only transmit data and include contactless chip cards. Contactless chip cards allow cardholders to tap a physical card on a payment terminal to complete a transaction. Active devices, such as smart phones, can transmit and receive data via NFC. This allows the cardholder to add payment cards into mobile wallets such as Apple Pay, Android Pay, and Samsung Pay. These solutions communicate with the point of sale via a secure channel and utilize encryption when sending sensitive payment information to the point of sale. Similar to contactless cards, the consumer simply taps their phone or holds it slightly above the terminal to complete a transaction (NFC, n.d.). When it comes to streamlining the cardholder experience at the point of sale, a 2015 Visa report noted that NFC or contactless transactions reduce the card to terminal interaction time by 84%. This timeframe may be more acceptable to consumers who are used to paying by swiping magnetic stripe cards, where the card to terminal interaction time is 88% lower than dipping a chip card into the terminal. The combination of low cardholder experience with EMV and a dramatic increase in transaction completion time may result in cardholders deciding not to accept this new technology and abandon it in favor of a faster, easier way to pay (Kohler, 2015).

Although the U.S. migration to EMV is not a regulatory event in the sense that there is no government involvement in the move to a chip based payment ecosystem, it is

considered an industry mandate and is subject to regulation by the governing bodies of the payments industry. In payments, the associations (Visa, MasterCard, American Express, and Discover) are the governing bodies and set the rules related to how chargebacks (cardholder disputes) are handled, the cost of processing transactions for merchant acquirers (payment processing companies), and the rules for payment acceptance (Dwyer, 2015). Any action or mandate implemented by the associations is viewed similar to a regulatory event in the eyes of the industry players. The largest action introduced in the U.S. by the associations in the last decade is the EMV migration. Research has shown that when a mandated or regulatory event pushes a technology standard (such as chip cards), this action has the potential to accelerate technological innovations (Liu, Kauffman, & Ma, 2015).

Since the global standard requires an application be built into EMV capable terminals so contactless (tap and go) chip cards can be processed, this opened the doors for other NFC based innovations to enter the market. Just over one year prior to the October 1st deadline, Apple announced one such innovation, Apple Pay. Apple Pay is a mobile wallet solution that was originally only available directly on the iPhone 6 and 6 Plus, and the iPhone 5, 5c, and 5s via the Apple Watch (Apple, Inc., 2014). The announcement of Apple's new mobile wallet came three years after Google announced the launch of Google Wallet. After two years on the market, Google Wallet was viewed as a failed innovation by company, which invested $300 Million to develop the solution. One major issue with Google's Wallet, was the fact that the majority of cardholders could not use it. There were very few NFC enabled point of sale terminals on the market, and

the app was blocked by three of the four major wireless networks. At the time, Verizon, AT&T, and T-Mobile were working in cooperation to develop their own mobile wallet called Isis. This meant that Sprint was the only carrier allowing the Wallet app to be downloaded on its phones (Milian & Levy, 2013). With the introduction of NFC thanks to EMV and the abandonment of the Isis mobile wallet by Verizon, AT&T, and T-Mobile, both Google and Samsung have decided to re-enter and enter the mobile wallet market. Google's solution has been rebranded as Android Pay and Samsung has branded its solution Samsung Pay. With the well-timed release of these mobile solutions and the failures associated with the launch of EMV in the U.S., the payments market may be primed for a mobile takeover.

CHAPTER 3

LITERATURE REVIEW

Technology Acceptance

As new systems, solutions, and applications are released to the market, the success of technologies depends on user acceptance. Without acceptance by the user, the actual system may not be used, and potentially abandoned for something the user perceives as equally useful, yet easier to use. "The Technology Acceptance Model (TAM), based on the Theory of Reasoned Action, has been widely used for predicting the acceptance and use of information technology (IT)" (Venkatesh & Davis, 1996, p. 452). Within the TAM model, external variables have a direct impact on the user's perceived ease of use and perceived usefulness. While the perceived ease of use also impacts the user's perception of how useful a new technology can be, both the user's perceived ease of use and perceived usefulness will impact his or her attitude towards using. One's attitude towards using combined with his or her perceived usefulness will determine the user's behavioral intention to use the new system, which determines whether or not the user will actually use the technology in question, as illustrated in Figure 3.

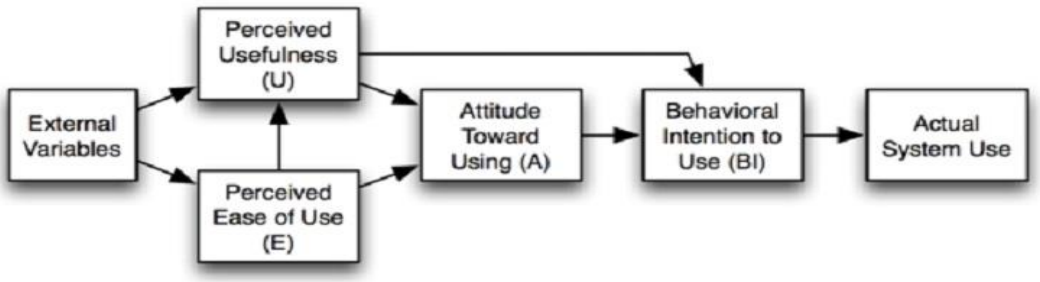

Figure 3: Technology Acceptance Model

The external variables which act as primary influencers driving a user's perception of new technologies may include items such as the characteristics of the new system, how much training the user has had, their level of involvement during the design process, and the process by which the new technology was implemented (Davis, Bagozzi, & Warshaw, 1989).

Later TAM enhancements removed attitude in an effort to focus on the key influencers of intention, which were identified as perceived ease of use and perceived usefulness (Venkatesh & Davis, 1996; Venkatesh, 2000). Since perceived ease of use influences perceived usefulness, it is important to fully understand the power behind the user's perception of what ease truly means. TAM shows us that ease of use is tied to intention; however, the true goal is to predict usage intentions, such as actual system use. The behavioral decision making and IS literature (Payne, Bettman, & Johnson, 1993; Todd & Benbasat, 1991, 1992, 1993, 1994) demonstrates that "individuals attempt to minimize effort in their behaviors" (Venkatesh, 2000). If a user perceives that a technology will take minimal effort, he or she will view the perceived usefulness in a positive manner, believing the new technology will not only minimize effort, but also increase productivity.

Another evolution of the TAM model, TAM3 (Venkatesh & Bala, 2008), identified the importance of pre and post implementation activities with regards to the acceptance and use of new technologies. Although these activities are tested in an organizational setting within this body of research, strong correlations can be made to consumer technology acceptance as it relates to EMV. Venkatesh and Bala (2008) noted

that interventions both before and after a new technology is implemented are key drivers in the acceptance and use of such systems. Prior to implementation, interventions need to be performed to decrease the likelihood of resistance and/or the development of an unrealistic perception of the system's usefulness. Pre-implementation interventions include initiation (identifying problems that validate why a new system is needed), adoption (the decision to rollout a new technology), and adaptation (modifying the technology to fit needs at an individual or group level). These pre-implementation interventions should be designed in such a manner to prevent users from forming negative perceptions with regards to the new system. These findings are relevant to the EMV rollout in the United States. As mentioned previously, pre-implementation interventions occurred in the form of government backed educational ad campaigns prior to and during the rollout of EMV in most countries with the exception of the U.S.

Once deployment of the new technology has occurred, focus should then transition to the post-implementation interventions so that the users' level of acceptance can be enhanced by reducing the potential shock to the system that may be a consequence of implementing a new solution. These post-implementation interventions include acceptance, routinization, and infusion. Acceptance interventions are efforts which are designed to increase users' level of commitment towards actual use. Routinization involves limiting the user perception that the technology is out of the ordinary for him or her. The goal with routinization is to reduce or eliminate the newness of the technology. Once the user base becomes more comfortable with the new solution, the goal is to deeply imbed the new technology through infusion interventions. If these interventions

are done properly, users should view the new technology as something that enhances performance with reduced effort (Venkatesh & Bala, 2008). This is similar to the detail the U.K. provided in their regularly published adoption status reports after the deployment of EMV.

In taking a consolidated yet comprehensive view of TAM and its redactions as they apply to this research, the influential factors over technology adoption can be grouped as internal and external. Internally, a cardholder's perceptions, intentions, and experiences play a heavy role in his or her decision to adopt technology. One's belief in his or her ability to successfully use a new system, or self-efficacy, is important, whether it be through direct experience during potential travel to other countries or a general feeling of readiness. Self-efficacy, combined with perceptions of the quality of the new system, the system's ability to add efficiency (ease of use), and his or her control over and trust in this new purchase methodology all have a direct impact on whether the cardholder will adopt EMV. In addition to these internal forces, TAM also points to external antecedents which may consequently result in technology adoption. Although we strive for individuality, human beings have a desire to be part of the in group and we are influenced socially by the norms of this group. Frequently this influences us to adopt the latest and greatest tech craze like getting the latest version of the iPhone the day of its release. In addition to our desire to fit in by adopting technology, our level of adoption depends largely on the level of pre-implementation interventions that were utilized during the introduction of a new technology, especially in mandated contexts. The influence of these internal and external forces is outlined in Figure 4 as antecedents of technology

adoption. These factors are grounded in existing research, as substantiated by the literature review outlined in Appendix A.

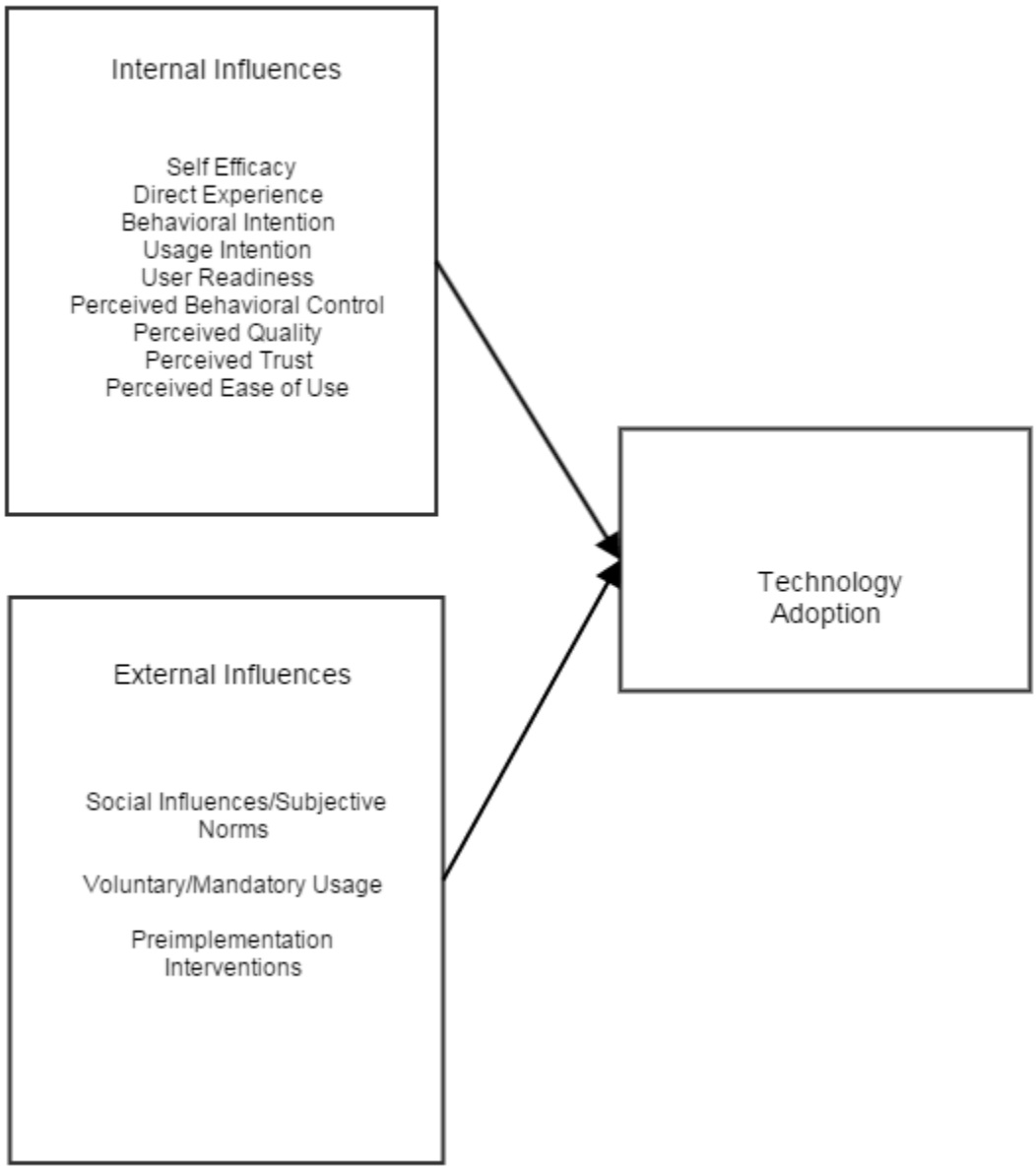

Figure 4: Antecedents of Technology Adoption

Transaction Costs of Technology Acceptance

According to Williamson's (1981) review of Transaction Cost Economics (TCE), transactions within a firm are not completely monetary in nature. The same logic with regards to transaction costs can be applied to consumers in the form of switching costs, and for the purposes of this research, the two terms will be used interchangeably. If a consumer is interested in buying a boat, he or she will encounter multiple transaction costs to consider. These costs include the time it takes to find the boat and determining if that specific boat will meet his or her needs, negotiating a price and potential warranty with the seller, and ensuring that the item they purchased is delivered in the agreed upon condition. Although the boat itself may be expensive and come at a high monetary cost, the switching process may be highly expensive for the individual in other ways during his or her evaluation of a new solution, creating switching barriers.

Specific switching barriers or costs may vary by industry, product, technological advancement, etc. and can include monetary, social, and emotional costs. The emotional expense of anxiety experienced over an individual or group's migration to a new solution, time (whether it be time researching a new solution and/or additional time it takes to use the new solution as compared to the old solution), and the possibility of being part of a social outgroup are all examples of nonmonetary switching costs which may influence adoption of a new technological solution (Nik Hashim, Alam, Pandit, & Manan, 2015). In other words, if an individual's switching costs are perceived to be high, he or she is unlikely to migrate to the product/service associated with the higher costs.

Cardholders have transaction costs associated with adapting to new technologies such as EMV and/or NFC, as well as the time it takes the cardholder to complete their literal transaction at the point of sale. In addition, the amount of time a cardholder spends researching payment solutions and monitoring the usefulness of the solution are all factored into the transaction costs associated with accepting or not accepting new payment technologies. Throughout his research, Williamson (1975, 1979, 1981, 1985) focused on three critical dimensions of transactions: uncertainty, frequency, and degree of durability. For the purpose of this research, the focal dimension is uncertainty in the sense that high uncertainty equates to high transaction costs with the understanding that the other two dimensions should not be discounted completely with frequency and durability still playing a role in the perceived costs of switching to a new payment technology.

Lin, Lin, Chen, and Liu (2015) integrated TAM and TCE from the perspective of acceptance intentions of mobile services. These researchers analyzed the relationship of uncertainty as it relates to transaction costs when accepting emerging mobile technology, specifically users' behavioral intention to adopt 4G technology. The integrated model in this case reviewed the technology and economic perspectives as influencing factors behind a consumer's behavioral intention to use new mobile technology, proposing that trust and uncertainty influence transaction costs, which effects both attitude towards using and behavioral intention to use. For the purpose of their research, the authors focused on environmental uncertainty (safe, stable mobile service) and information asymmetry (imbalance of information between user and provider). Trust was also

divided into two factors: reliability (stable service) and privacy. In an effort to measure these constructs and their ability to potentially provide a valid TAM/TCE model, a twenty six question, five point Likert scale questionnaire was posted on a university server and discussion boards with the promise that $1 would be donated to charity for each completed survey. Of the 628 responses, 499 were deemed to be valid and resulted in a nearly equal amount of men versus women, with the majority (72%) being under the age of 30. In support of the researchers' hypotheses specific to the impact of uncertainty and transaction costs, the survey results indicated that uncertainty has a statistically significant positive relationship with transaction costs, and both uncertainty and transaction costs have a significantly negative impact on one's behavioral intention to adopt new mobile technology. Trust, however, had a negative relationship with transaction costs, but proved to have a significant influence on attitude towards using; a result which also supported the researchers' hypotheses. Based on the supported integrated TAM/TCE model, a high level of uncertainty results in high transaction costs, and increased transaction costs have a negative impact on technology acceptance in a mobile environment.

According to the literature, a user's perceived switching costs include the time, money, and effort he or she believes will be required to move from one technology to another (Klemperer, 1995; Ray, Kim, & Morris, 2012). Klemperer (1995) labeled time, money, and effort as "unavoidable costs" that are incurred when switching from one system to another; and, based on prior literature, identified three user-related costs that arise from the aforementioned unavoidable costs: search and evaluation costs (time,

effort, and money spent to find, research, and evaluate a new solution), transfer costs (time, effort, and money spent to end a relationship with one system/provider and move to another), and learning costs (the time, effort, and money spent to learn and adapt to a new solution).

In the world of EMV and NFC payments, the search and evaluation costs are limited since (at the time this research was completed) iPhone users only have one platform (Apple Pay) for mobile-based NFC payments, and credit/debit card issuers were forced to provide one option for plastic to their cardholders in the form of chip embedded plastic cards. An argument could be made that the same holds true when it comes to transfer costs since users are not ending a relationship with their card issuers, nor are they ending a relationship with Apple. Both systems, in many ways, are used in conjunction with the other. If I want to use Apple Pay, I need a relationship with my issuer and I simply scan my chip card with my phone to add it as a payment type within Apple Pay. For these reasons, the user-related costs for the purposes of this research are those associated with the time and effort invested to learn and adapt to a new payment platform (money is intentionally left out since there is not an additional financial investment for the user when it comes to Apple Pay and EMV).

CHAPTER 4

PILOT STUDY

Introduction

"With the high entry barriers in the financial services market, it has been difficult for new entrants to enter and succeed, unless some portion of the market becomes *newly vulnerable*: easy to enter, attractive to attack, and difficult to defend" (Liu, Kauffman, & Ma, 2015). The newly vulnerable state of the payments sector of the financial services market brought on by EMV may allow for new disruptive entrants to change the payments landscape if users choose to adopt the new technology.

A user's attitude towards a technological advancement is determined by his or her perception of the specific technology in question. An individual's perceived confidence in using a new system as well as the user's perception of how useful and easy to use it is or will be all drive how he or she feels about the technology. These perceptions combined with environmental influences leave the user in a cycle of influence between environmental factors and his or her own perceptions. As humans, we are very sensitive to social influences and our goal to be part of the "us" and not forced to the nether realm of "them." Individuals want to be part of the in crowd and a key driver of us vs. them in today's social world revolves around the technology we adopt and use. When someone perceived to be a social influencer leverages technology as a symbol of his or her status and prestige, others' perceptions of the same technology may be subconsciously biased due to their perceptions of the socially significant individual. At the same time, the user is susceptible to the efforts of the organization launching the new solution and

responsible for rolling it out to the masses. This push of one's own internal perceptions and influence from environmental forces has an impact on the attitude he or she develops towards a new solution.

Conceptual Model and Hypotheses Development

With our mobile phones becoming increasingly ingrained in what we do from monitoring our caloric intake and daily activity to planning our day around the weather, many individuals today are becoming more comfortable with using mobile phones for more than just making a call or sending a text. One's confidence in his or her ability to effectively and efficiently use a smartphone in new ways increases with each iTunes visit. Perception of these devices becomes more useful and easy to use and those around us influence behaviors to incorporate the latest and greatest mobile trend while our provider pushes the benefits of adopting their latest and greatest solution. Combined with cardholder comfort in using payment terminals creates the perfect storm for a new way to pay at the point of sale terminals that have been a staple of checkout stands for decades. The union of these two technologies, mobile phones and credit card terminals, suggests true technological evolution through the synthesis of these two existing technologies (Liu, Kauffman, & Ma, 2015). If Apple Pay is payments evolved, as cardholders' perceptions of EMV becomes increasingly negative, they are more likely to abandon their chips in favor of mobile phones. In other words,

H1: Attitude towards chip technology is negatively associated with the preference for mobile payment technology.

Leveraging this same logic, a user's attitude towards mobile payment technologies should, in turn, lead to positive cardholder perceptions of solutions like Apple Pay. These positive perceptions will also push cardholders to favor mobile based payments.

H2: Attitude towards mobile payment technology is positively related to preference for mobile payment technology.

Despite internal and external forces molding the user's mindset, the user still needs to concern himself or herself with the time it will take to learn how to use the new solution and adapt his or her behaviors to become accustomed to its use. The introduction of chip cards in the U.S. is no different. As with any other new solution, mandated or otherwise, cardholders develop perceptions of how confident they will be when confronted with having to dip instead of swipe. How useful and efficient are these new cards; and, more importantly, how easy are they to use? How do the "techies" of the world feel about his or her chip card? After all, they were the first people on the to get an iPad and a new iPhone the day they are released. What has the bank done to prepare its cardholder for the transition? The impact of these thoughts all lead the cardholder down a path of wondering how easy the new card will be to use and how much time it will take him or her to get used to this new spin on an old, comfortable way of paying. Technology needs to minimize the amount of effort the user perceives will be required if he or she were to adopt it (Payne, Bettman, & Johnson, 1993; Todd & Benbasat, 1991, 1992, 1993, & 1994; Venkatesh, 2000). Those perceptions of the effort investment in using a new system has a direct impact on the user's attitude towards the specific technology in question (Venkatesh & Davis, 1996). If a cardholder develops a negative

opinion of chip cards, he or she may believe adopting a new method of payment will be an easy transition; leading to the following hypothesis:

H3: Attitude towards chip technology is positively associated with switching costs away from chip technology.

The same can be said when the cardholder begins to develop a positive opinion of the alternative payment technology such as Apple Pay. As the cardholder's attitude towards the new payment technology becomes increasingly positive, less of an adjustment period is perceived in migrating from chip to NFC. In other words,

H4: Attitude towards new payment technology is negatively associated with switching costs away from chip technology.

Although many factors lead a user to the decision to ultimately abandon a technology in favor of another, contextual factors can exacerbate this desire. As individuals, we feel we are always pressed for time. Frequent expressions such as "I wish there were more hours in the day" are said repeatedly in a variety of contexts. When seconds feel like minutes, this perception reminds us of how strapped for time we consistently feel. When a cardholder encounters a quick approval without experiencing any operator errors and successfully processes his or her chip card transaction at the point of sale, his or her attitude towards chip card will be positive. Why invest the time in learning how to use mobile payments if this new card the user has been forced to use is working fine? Cardholders have been using plastic cards to pay for goods repeatedly in their daily lives for years, making the idea of shying away from a system the user perceives to be usable combined with the perceived additional effort needed to invest in

understanding a new solution improves the perception of the existing system (Chen & Hitt, 2002; Ray, Kim, & Morris, 2012; Venkatesh & Agarwal, 2006; Whitten & Green, 2005). Therefore,

H5: The negative association between attitude toward chip technology and preference for mobile payment technology is stronger in the presence of higher perceived switching costs from chip technology.

Conversely, when standing in a long line waiting to pay at the grocery store, just to have the seconds tick by like an eternity while waiting for a chip read transaction to kick back an approval. Or the frustration that occurs when a chip card is removed from the slot a few seconds too early and the entire process needs to be repeated. This experience, leaves the cardholder feeling like the grass is greener on the mobile payments side of the fence. Therefore,

H6: The positive association between attitude towards mobile payment technology and preference for mobile payment technology is greater in the presence of lower perceived switching costs from chip technology.

These hypotheses are illustrated in both a general (Figure 5) and EMV specific (Figure 6) conceptual model below.

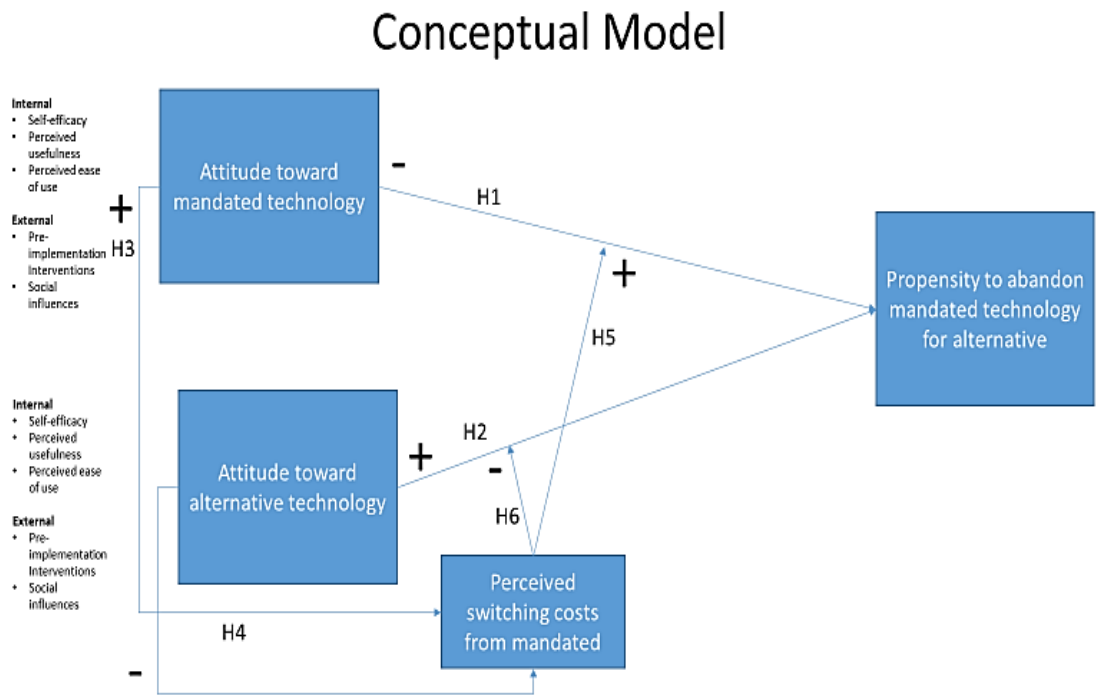

Figure 5: Conceptual Model

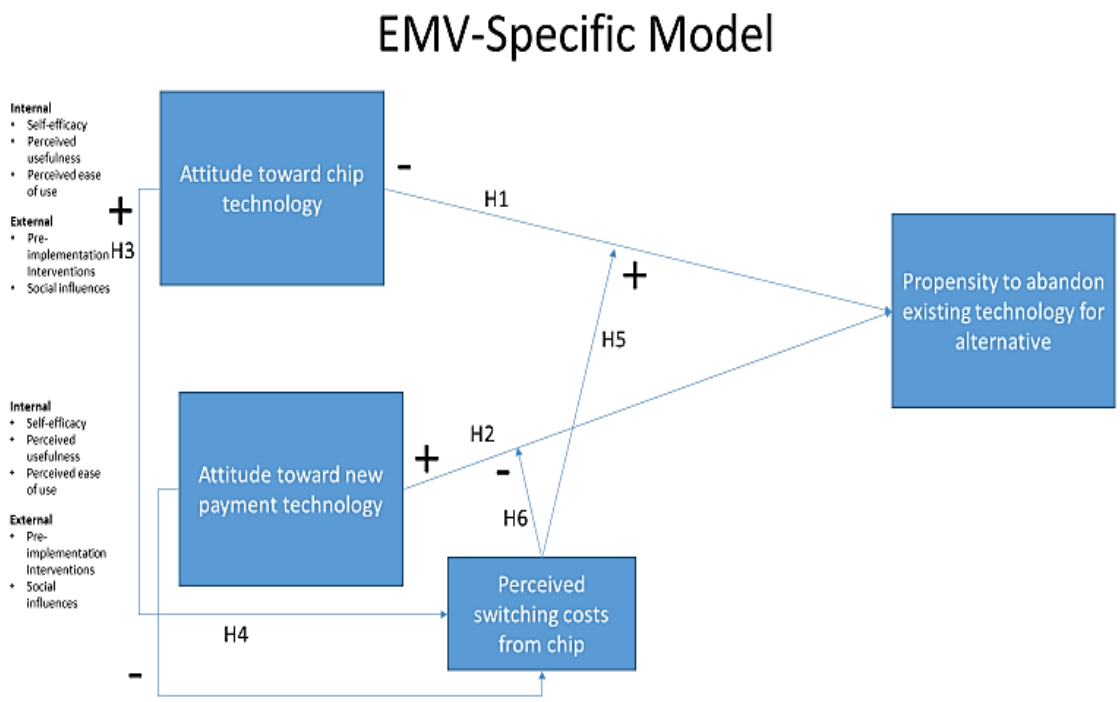

Figure 6: EMV Specific Model

Data and Analysis

To test the model outlined above, validated measurements from prior research were used, and a survey was drafted asking cardholders to provide their opinions on both chip cards and Apple Pay. The survey used adapted questions from previous TAM and switching/transaction cost research. EMV self-efficacy (ESE) was measured using three items adapted from Compeau and Higgens (1995). Perceived usefulness (PU) and perceived ease of use (PEU) were measured using survey questions adapted from Davis (1989), Davis et al. (1989), and Venkatesh and Bala (2008). Pre-Implementation Interventions and Social Influences were operationalized using questions adapted from Venkatesh and Bala (2008), while switching costs and propensity to abandon are qualified with survey items adapted from Polites and Karahanna (2012). Appendix B

outlines the items used to measure the individual constructs as well as the prior literature the questions were adapted from.

In an effort to ensure each question was clear and concise, an initial draft of the survey was provided to five individuals for feedback. The five individuals consisted of friends, family, and co-workers who were instructed to record the length of time it took to complete the survey as well as any questions that caused confusion. After feedback was reviewed, the demographic questions were moved to the end of the questionnaire to improve the overall flow of the instrument and place the focus on the subject for which data was being gathered. In addition, the verbiage specific to all six self-efficacy questions (see SE1e, SE2e, SE3e, SE1m, SE2m, and SE3m on Appendix B) was changed from "I am sure" to "I feel confident" to better align with how self-efficacy is defined in TAM literature. In addition to minor adjustments to a few of the survey questions, verbiage was added in the opening descriptions before both the EMV/chip survey questions and the Apple Pay questions to clarify that participants were to answer the questions only as they pertained to payment experiences that occurred in a face to face environment.

The final version of the survey was distributed to qualified participants via Amazon Mechanical Turk (also known as MTurk), a marketplace for work which gives requestors (a business, university, or individual who has a task or job that needs to be outsourced for completion) access to workers who have registered with the platform in an effort to earn money for posted jobs/tasks called HITs (Human Intelligence Tasks) (Amazon). To qualify for the survey, participants must reside in the United States, be 18

years of age or over, have used a chip card at least once, and have paid using Apple Pay at least one time. The survey was posted to Amazon Mechanical Turk using the title "Give us your opinion about using Apple Pay versus your chip card. Survey takes 10 minutes," and keywords of survey, payments, United States, chip cards, and Apple Pay. Only those workers who had received masters level designation by Mechanical Turk were allowed to respond, and a reward of $1 was paid to those who completed the survey. A pilot of 50 was prepaid, but only 34 responded in the two weeks the survey was open. Of the 34 responders, 31 participants successfully completed the survey with an average completion time of 14 minutes 12 seconds.

The survey data was exported from Qualtrics to SPSS version 23 for review. Prior to analysis, the questions for each construct were averaged to create an aggregate measure. For example, the responses associated with the three self-efficacy questions for EMV/chip were averaged as the variable SEeComputed.

The pilot study tested hypotheses H1, H2, H3, and H4 to do an initial test of the relationships in the model. Two regressions were performed: one for H1 and H2, and one for H3 and H4. Correlation analysis was completed on the two dependent variables (I prefer to use Apple Pay as my primary method of payment was the DV for H1 & H2, Switching Costs for EMV was the DV for H3 & H4). As illustrated in Table 1 below, the correlation between the two dependent variables was very low and not statistically significant; therefore, a multivariate regression was not necessary.

		Switching Costs (EMV)	I prefer to use Apple Pay as my primary method of payment
Switching Costs (EMV)	Pearson Correlation Sig. (2-tailed)	1	0.074 0.694
I prefer to use Apple Pay as my primary method of payment	Pearson Correlation Sig. (2-tailed)	0.074 0.694	1

Table 1: Pilot Study – Dependent Variable Correlations Table

To test H1 and H2, the individual measures of the attitude constructs were computed as mentioned above. The questions outlined in Appendix B were grouped as follows:

- Chip/EMV self-efficacy (SE1e, SE2e, and SE3e) → SEeComputed
- Mobile payment self-efficacy (SE1m, SE2m, and SE3m) → SEmComputed
- Perceived Usefulness of chip/EMV (PU1e, PU2e, and PU3e) → PUeComputed
- Perceived usefulness of mobile payments (PU1m, PU2m, and PU3m) → PUmComputed
- Perceived ease of use of chip/EMV (PEU1e, PEU2e, and PEU3e) → PEUeComputed
- Perceived ease of use of mobile payments (PEU1m, PEU2m, and PEU3m) → PEUmComputed
- Pre-Implementation Interventions of chip/EMV (PII1e, PII2e, and PII3e) → PIIeComputed
- Pre-Implementation Interventions of mobile payments (PII1m, PII2m, and PII3m) → PIImComputed

- Social influences for EMV/chip (SI1e, SI2e, and SI3e) → SIeComputed
- Social influences for mobile payments (SI1m, SI2m, and SI3m) → SImComputed

During this analysis, the computed variables for SIe (social influence – EMV/Chip) were removed as these variables were highly correlated with SIm (social influence – mobile/Apple Pay) at a correlation coefficient of .789. Table 2 outlines the descriptive statistics associated with both the independent and dependent variables that were measured to test hypotheses one and two.

	Mean	Std. Deviation	N
I prefer to use Apple Pay as my primary method of payment	3.48	1.651	31
Pre-Implementation Interventions (EMV)	5.398	1.492	31
Perceived Usefulness (EMV)	5.344	1.117	31
Perceived Ease of Use (EMV)	6.376	.806	31
Self-Efficacy (EMV)	9.462	.976	31
Pre-Implementation Interventions (Apple Pay)	5.538	1.195	31
Perceived Usefulness (Apple Pay)	5.538	1.313	31
Perceived Ease of Use (Apple Pay)	6.022	1.068	31
Self-Efficacy (Apple Pay)	8.925	1.467	31
Social Influences (Apple Pay)	3.495	1.947	31

Table 2: Pilot Study – Descriptive Statistics of H1 and H2 Analysis.

The results of the regression analysis associated with testing H1 and H2 shows promising results. Although the relationships do not display strong statistical significance (most likely due to the low sample size used in these preliminary results), the direction of

the relationships between the variables shows the potential impact attitude has on predicting a user's desire to abandon chip cards by making mobile payments the preferred way to pay at the point of sale. Consistent with H2 and outlined in the regression results in Table 3 below, most of the mobile attitude variables showed a positive relationship with a user's preference for Apple Pay, while most of the chip/EMV variables were negatively associated with a user's preference for Apple Pay, or the positive relationship was very low.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.264	3.499		-.075	.941
Pre-Implementation Interventions (EMV)	.015	.227	.013	.065	.948
Perceived Usefulness (EMV)	.026	.335	.018	.079	.938
Perceived Ease of Use (EMV)	.465	.727	.227	.640	.529
Self-Efficacy (EMV)	-.242	.588	-.143	-.412	.684
Self-Efficacy (Apple Pay)	-.231	.343	-.205	-.673	.508
Perceived Usefulness (Apple Pay)	-.089	.401	-.071	-.221	.827
Perceived Ease of Use (Apple Pay)	.493	.583	.319	.845	.407

Adjusted R Squared = .240

Table 3: Pilot Study – Regression Results for H1 and H2 (dependent variable = *I prefer to use Apple Pay as my primary method of payment*)

The R Square for the above model was .468, suggesting the model explains nearly half of the reason participants prefer to use Apple Pay as his or her primary method of payment. This preliminary review suggests that additional data points should generate more reliable results in support of the conceptual model.

To test H3 and H4, linear regression with the same computed independent variables was completed with SC1e, SC2, and SC3e (reverse coded) averaged into a new dependent variable named SCeComputed. As evident from the H3 and H4 regression results in Table 4 below, the direction of the relationships in the regression results and the strength and statistical significance of the relationship with both perceived ease of use of chip/EMV and perceived ease of use of Apple Pay suggested potential issues operationalizing switching costs in the survey instrument.

In the pilot analysis, H5 and H6 were not tested as it was determined that the questions to measure switching costs seemed to be worded too much like the questions for perceived ease of use. It was decided to reword the switching cost questions for H5 and H6 in the expanded study. This change, along with other lessons learned from the pilot study, is discussed in the next section.

Modifications for the Expanded Study

Since the preliminary results of this pilot study specific to the testing of H1 and H2 showed promise and consistency with the proposed hypotheses, the expanded study was planned to leverage the same instrument with revised questions to measure switching costs as the results of H3 and H4 indicate the need to reformulate the survey questions used to measure switching costs. Before the expanded study could commence, the

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.317	1.444		.912	.373
	Perceived Usefulness (EMV)	.351	.136	.330	2.588	.018
	Perceived Ease of Use (EMV)	.832	.297	.564	2.797	.011
	Self-Efficacy (EMV)	-.258	.248	-.212	-1.038	.312
	Pre-Implementation Interventions (EMV)	-.117	.103	-.146	-1.133	.271
	Social Influences (EMV)	-.246	.163	-.310	-1.516	.145
	Self-Efficacy (Apple Pay)	-.379	.138	-.468	-2.741	.013
	Perceived Usefulness (Apple Pay)	-.213	.162	-.236	-1.317	.203
	Perceived Ease of Use (Apple Pay)	.978	.239	.878	4.093	.001
	Pre-Implementation Interventions (Apple Pay)	.031	.129	.031	.239	.814
	Social Influences (Apple Pay)	-.057	.114	-.094	-.504	.620

Table 4: Pilot Study – Regression Results for H3 and H4 (dependent variable = SCeComp3Reversed)

instrument was tested, as it was previously, with more probing questions posed to the test sample asking for qualitative feedback on the participants' perception of what the questions are asking. After taking into account the participants' perception of what is being asked, the survey was then able to be implemented into the next study to test H1 through H6.

The revised instrument will incorporate clear and concise verbiage which more closely relates to adaptations of survey questions designed to specifically measure

learning costs, such as those used by Ray, Kim, and Morris (2012) and Polites and Karahanna (2012). Specifically, avoiding words like "easy" which tie directly to the questions in the current survey that have been validated by prior research to measure perceived ease of use. Three possible replacement questions have been drafted to measure users' perceived switching costs from chip/EMV cards to a mobile payment solution such as Apple Pay:

1. It took a lot of time to get used to using my chip card at the point of sale.
2. It would be inconvenient for me to switch from my chip card to another form of payment for point of sale transactions.
3. I feel it would require a lot of effort to switch from my chip card to another form of payment.

In addition to incorporating clearer verbiage in the survey instrument that more accurately measures perceived switching costs, a larger sample is crucial to the success of this study. A revised title with Amazon Mechanical Turk will ideally result in a more favorable sample size. The revised instrument will incorporate logic to divert iPhone users to one series of Apple Pay specific questions and Android users to the same questions, but specific to Samsung Pay/Android Pay. This will eliminate the restriction of Apple Pay users only in an effort to increase the number of responses received. In addition to leveraging Mechanical Turk, the same survey will be distributed to MBA students as well as Junior and Senior level undergraduate students in exchange for extra credit. The data from these different samples will be triangulated to ensure validity of the responses across multiple audiences.

CHAPTER 5

EXPANDED STUDY

Introduction

Building upon the pilot study and incorporating its strengths while acknowledging and addressing its limitations, the expanded study incorporates a revised survey instrument to accurately test the updated model. While not all limitations can be addressed in the expanded study (e.g., the expanded study does not validate generalizability across industries as the same mandated event is examined), issues specific to sample size and data integrity due to verbiage used have been addressed in the revised survey instrument.

Although not noted in the pilot study, one major limitation was the finality of the dependent variable of propensity to abandon the mandated technology in favor of an alternative. As is the case with many innovations in today's technologically evolving world, many users do not need to abandon one solution in favor of another. A customer's decision to use a mobile payment technology in lieu of his or her chip card is no different. An individual would have to pay with a chip card if the merchant did not have the ability to accept mobile NFC payments, but he or she may favor mobile payments over his or her chip card when such a payment method is an option. For that reason, the prior model was improved and revised to specify propensity to use alternative technology, as opposed to propensity to abandon the mandated technology.

Conceptual Model and Hypotheses Development

As evident from the pilot study and throughout the TAM literature, various internal and external factors contribute to a user's decision to adopt technology. If factors such as self-efficacy, perceived usefulness, perceived ease of use, and social influence have been shown throughout the literature to contribute to technology acceptance in general, (Davis, 1989; Venkatesh & Davis, 1996; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008) then these same influential factors will contribute to a user's propensity to accept or use an alternative technology, even if he or she is not fully abandoning the mandated solution. As noted previously, an individual may not be able to fully abandon his or her chip card, as not all retailers have the ability to accept NFC based mobile payments such as Apple Pay, Samsung Pay, and Android Pay. As a result of this finding, and drawing logical conclusions from the TAM research, the resulting action hypothesized has been changed from propensity to abandon mandated technology (in this case, chip cards) to propensity to use an alternative technology, such as Apple Pay, Samsung Pay, and/or Android Pay.

With this revision to the dependent variable in the model, switching costs appears as a logical main effect, as opposed to a moderating effect. In addition, the dimensions of attitude need to be examined individually as opposed to an aggregate measurement to determine the individual relationships of the dimensions of attitude with a user's propensity to use an alternative technology. To effectively operationalize the individual dimensions of attitude, examination of specific causal relationships were identified and needed to be eliminated, as well as variables that were highly correlated. Since perceived

ease of use was highly correlated with switching costs in the prior model, and self-efficacy has been identified as a determinant of perceived ease of use to the extent that users base these ease of use perceptions on their own self-efficacy (Venkatesh & Davis, 1996), perceived ease of use was removed from the model in this expanded study. These revisions resulted in an updated model as seen in Figure 7.

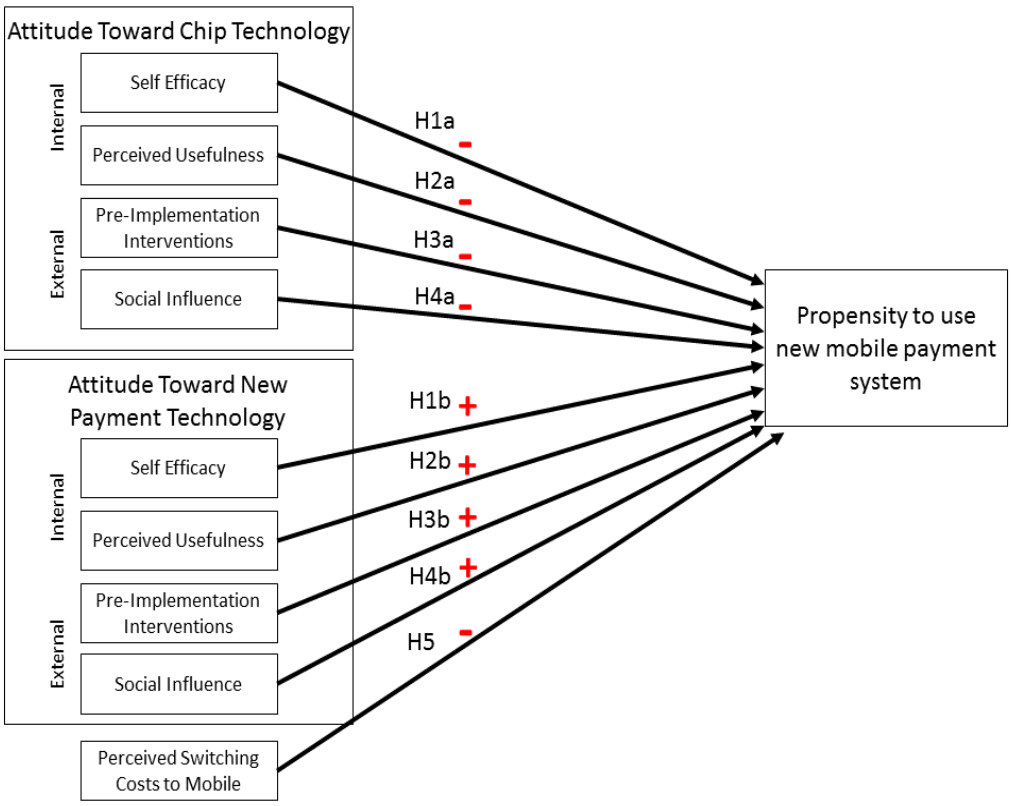

Figure 7: Model – Expanded Study

Within the individual dimensions of attitude, self-efficacy is "the degree to which an individual believes that he or she has the ability to perform a specific task/job using the [technology]" (Venkatesh & Bala, 2008, p. 279). The confidence a user has in his or her ability to use a system, has a direct impact on whether or not a user will adopt technology. If users feel a sense of inability in performing a specific task through system

use, he or she will be less likely to use the system. Venkatesh and Davis (1996) found "when users come into contact with systems that have objective usability that is 'lower' than their own…self-efficacy, the user is more likely to reject such a system" (page 473). However, if a user encompasses high levels of self-efficacy for the mandated technology, he or she will be less compelled to consider using an alternative. Therefore,

H1a: Self-efficacy for mandated technology will be negatively related to propensity to use an alternative technology.

On the other side of the efficacy spectrum, if an individual perceives his or her level of self-efficacy for the mobile payment technology to be high, he or she will be more inclined to use the NFC mobile solution to complete a payment transaction. In other words,

H1b: Self-efficacy for alternative technology will be positively related to propensity to use alternative technology.

Similar to a high level of efficacy, a high perception of usefulness in a system is an important antecedent of an individual's propensity to use a technology. According to Davis (1989), perceived usefulness reflects the degree an individual believes that using a technology will enhance his or her ability to perform a specific task or tasks. Throughout the literature, perceived usefulness has proved to be one of the most important determinants of usage intentions and behaviors (Davis, 1989; Davis, Bagozzi, and Warshaw, 1989; Hu, Chau, Sheng, and Tam, 1999; Venkatesh and Davis, 2000; Amin, 2007; Marimuthu, et al., 2011). If a chip card user perceives the new chip to be useful, he

or she will be more likely to use the card in his or her wallet, and less likely to pay with a mobile based solution. Therefore,

H2a: Perceived usefulness of mandated technology will have a negative relationship with a user's propensity to use alternative technology.

Similarly, if a cardholder believes that his or her mobile payment technology, such as Apple Pay, Samsung Pay, and/or Android Pay is a useful way to pay at the time of sale, he or she will likely be compelled to use this alternative technology. Venkatesh and Bala (2008) found that "perceived usefulness was the strongest predictor of behavioral intention" to use a technology. As a result, it is hypothesized that

H2b: Perceived usefulness of alternative technology will be positively related to propensity to use alternative technology.

While self-efficacy and perceived usefulness have been identified as important internal factors influencing a user's propensity to use a specific technology, external or outside influences also play a role in determining the likelihood of system use. As previously explained in the overview of the payments industry, one major difference in how EMV was introduced in the United States as compared to other countries was the lack of intervention by issuing banks and the government. While other countries had joint pre-implementation interventions between banks and government agencies, the United States engaged in minimal interventions prior to the EMV mandate. As defined by Venkatesh and Bala (2008), pre-implementation interventions "represent a set of organizational activities that take place during system development and deployment periods that can lead to greater acceptance of a system" (page 292). The goal of these

interventions is to prepare users in advance for the release of a new technology. Without such interventions, systems are vulnerable to user resistance. In their 2008 article on TAM3, Venkatesh and Bala further stated that "proactive implementation interventions is thus necessary to minimize such resistance" (page 294). Therefore,

H3a: Pre-implementation interventions specific to mandated technology will have a negative relationship with propensity to use alternative technology.

H3b: Pre-implementation interventions specific to alternative technology will have a positive relationship with propensity to use alternative technology.

One of the most powerful external influencers, not just in technology usage contexts, but a variety of human conditions, is that of social influence. TAM2 introduced two aspects of social influence relating to technology adoption: subjective norm, or the degree to which users perceive that most people who are important to him or her believe that he or she either should or should not use a technology, and image, or the degree to which a user believes his or her social status in his or her social environment will be enhanced through system use (Venkatesh & Davis, 2000). If a user believes that individuals who influence his or her behavior and/or are important to him or her believe he or she should use the system or that usage will improve his or her social status, he or she is likely to use the system. If a chip card or mobile payment technology is perceived to be socially significant, prestigious, or if someone near and dear to the user is recommending usage, the power of social influence will take over and usage will occur. Therefore,

H4a: Social influence of mandated technology is negatively related to propensity to use alternative technology.

H4b: Social influence of alternative technology is positively related to propensity to use alternative technology.

Although previously identified as a moderating effect, the revision to the dependent variable and dissection of the dimensions of attitude built a logical case for the examination of the direct relationship between perceived switching costs and propensity to use an alternative technology when completing a payment. Since banks issued new chip cards to cardholders to replace the now outdated magnetic stripe cards that were in circulation for decades, measuring user perceived switching costs for EMV in this model was not necessary. Although cardholders automatically received a new chip card from their issuers, the ability to use a mobile based NFC payment method was not necessarily automatically provided, despite being included as an option on mobile devices. Additional effort in the form of adding cards to the mobile solution was required before usage could occur. For this reason, only switching costs specific to mobile payment technologies were considered in the updated model.

In the case of chip/EMV cards and mobile payment technologies, a complete switch from one solution to the other is impossible, as mobile NFC payments are not available at all merchant locations. Consistent with the determinations made during the pilot study, the user related costs of time and effort to learn a mobile payment technology are considered in this expanded study. These unavoidable costs, as identified in prior research by Klemperer (1995) and Ray, Kim, and Morris (2012), may lead an individual

to "recognize that another system would be more efficient for performing a given task, but the costs of learning to use a different system are perceived as greater than potential gains" (Polites & Karahanna, 2012, p. 23). However, if a user views a system as inexpensive from the perspective of time and effort, he or she will be more likely to use the technology. Therefore,

H5: Switching costs to the alternative technology is negatively related to propensity to use the alternative technology.

Data and Analysis

To test the propositions outlined above, the same validated measurements from the pilot study were used and adapted with verbiage specific to EMV/chip cards and mobile payment technologies. To avoid correlation and operationalization issues experienced during the pilot study, special consideration was paid to how the switching costs questions were worded to ensure the construct being measured was in fact switching costs and not another determination of TAM such as perceived ease of use. Similar to the pilot study, the survey was distributed to a sample of five individuals, different from the five in the prior study, to ensure the questions were clear, concise, and measuring the intended constructs. Once completed, feedback was gathered from the five participants, and minor adjustments were made to the flow of the instrument. In an effort to increase the sample size, the revised instrument was not limited to only Apple Pay and used the general term of "mobile payment technology" to describe either Apple Pay, Samsung Pay, or Android Pay. Although this was noted early in the survey, three out of five of the initial participants noted that this term could cause confusion due to the

emergence of store-specific mobile payment technologies, such as the embedded payment function in the Starbuck's mobile application. As a result, a mobile qualifying question was added for participants to select the NFC based mobile payment technology used most often (options provided were Apple Pay, Samsung Pay, and Android Pay, and only one selection was allowed), and branch logic was leveraged in Qualtrics to direct participants to brand specific mobile payment technology questions.

The same qualifications for participation that were used in the pilot study were also used in the expanded study. To qualify, participants had to be 18 years of age or older, reside in the United States, have used a chip card at least one time to complete a face to face transaction, and have used Apple Pay, Samsung Pay, and/or Android Pay at least once to complete a face to face transaction. The survey was again posted to Amazon Mechanical Turk and all previous participants were excluded. For this expanded study, updates to how the survey was posted to Mechanical Turk were incorporated, including an updated title of "Short Survey! Give us your opinion about using mobile wallets instead of your chip card" and description of "Have you used Apple Pay, Android Pay, or Samsung Pay at least once? Give us your opinion about using these products instead of your chip card. Takes less than 10 minutes to complete." Only Mechanical Turk users who had received master's level designation were able to participate, and masters who successfully completed the survey were paid $1.

One of the primary concerns with the pilot study was the low sample size. It was determined that this low sample size was due in part to restricting participation to only Apple Pay users, but another factor potentially contributing to the low sample size was

attributed to the location of the survey within Mechanical Turk as the HIT aged. Repositioning a HIT within Mechanical Turk requires the researcher to end the HIT early, then go through the full process of posting which can be time consuming and creates a high potential for human error if all previous HITs and workers who participated are not tracked and excluded. For this reason, the expanded study leveraged TurkPrime. TurkPrime is integrated to Mechanical Turk, and a worker will not know if the HIT he or she is participating in was created directly in Mechanical Turk, or TurkPrime. Since TurkPrime offers a better GUI with improved functionality, the expanded survey was created and managed within this system. Litman, Robinson, and Abberbock (2017) identified TurkPrime as a research tool that "saves time and resources, improves data quality, and allows researchers to design and implement studies that were previously very difficult or impossible to carry out on MTurk."

Within TurkPrime, the "HyperBatch" function was used which separates the HIT into smaller HITs which are posted throughout the day. In addition, the HIT with HyperBatch enabled was reposted every 24 hours within TurkPrime while excluding all workers from both the pilot study on traditional Mechanical Turk and the prior HyperBatch HITs. TurkPrime tracks all prior workers by worker ID and automatically excludes them, reducing the likelihood that the same individual will participate more than once. The HyperBatch HIT was posted and reposted over a 30-day period, resulting in 257 unique survey completions.

Consistent with the pilot study, the survey data was exported from Qualtrics to SPSS version 23 for review. During this review, the dataset was modified to include all

mobile payment technology measurements under a single area, and answers from the Samsung Pay and Android Pay survey branches were migrated to the empty Apple Pay fields for those participants. This was done so data could be analyzed in a single model, as opposed to three product specific models. All constructs were again averaged to create an aggregate independent variable (e.g. the responses associated with the three self-efficacy questions for EMV/chip were averaged and computed into a single independent variable). In addition, all completions that took less than 180 seconds were removed from the dataset, resulting in 210 participants. Of the 210 participants, 46% were female and 54% were male with an average age of approximately 38 years old. Table 5 details the descriptive statistics and Table 6 outlines the correlations between variables.

	N	Minimum	Maximum	Mean	Std. Deviation
Propensity to use mobile payment	210	1.00	5.00	3.100	.807
Self-Efficacy – chip	210	2.33	10.00	9.401	1.151
Perceived Usefulness – chip	210	1.00	7.00	5.531	1.223
Pre-Implementation Interventions – chip	210	1.00	7.00	4.947	1.516
Social Influence – chip	210	1.00	7.00	3.085	1.629
Self-Efficacy – mobile	210	3.00	10.00	8.893	1.436
Perceived Usefulness – mobile	210	1.00	7.00	5.690	1.157
Pre-Implementation Interventions – mobile	210	1.00	7.00	5.069	1.558
Social Influence – mobile	210	1.00	7.00	3.609	1.742
Switching Costs – mobile	210	1.00	7.00	4.811	1.400
Age	210	23.00	70.00	38.319	9.305
Gender	210	0.00	1.00	.466	.500

Table 5: Expanded Study – Descriptive Statistics

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Propensity to use Mobile	--	-.240***	.182**	.151*	.360***	.110	.553***	.279***	.528***	.677***	-.141*	-.009
2. Self-Efficacy Chip		--	.005	-.015	-.453***	.573***	.104	-.004	-.344***	-.050	.227***	.163**
3. Perceived Usefulness Chip			--	.209**	.368***	.131**	.359***	.318***	.284***	.186**	.068	.080
4. Pre-Implementation Interventions Chip				--	.237***	.117*	.211**	.514***	.155*	.254***	-.032	-.048
5. Social Influence Chip					--	-.152*	.168**	.266***	.738***	.238***	-.234***	-.020
6. Self-Efficacy Mobile						--	.425***	.208**	-.132*	.332***	.060	.047
7. Perceived Usefulness Mobile							--	.396***	.350***	.635***	-.055	.063
8. Pre-Implementation Interventions Mobile								--	.252***	.380***	-.081	-.038
9. Social Influence Mobile									--	.368***	-.226***	.014
10. Switching Costs Mobile										--	-.017	-.006
11. Age											--	.220**
12. Gender												--

*p < .05; **p < .01; ***p < .001

Table 6: Expanded Study – Correlations Table

To test hypotheses 1a through 5, linear regression was performed with the computed independent and dependent variables and control variables of age and gender. The model was represented by the following equation:

$$\text{Propensity to use}=\beta_0+\beta_{1a}\text{self-efficacy-chip}+\beta_{1b}\text{self-efficacy-mobile}+\beta_{2a}\text{perceivied usefulness-chip}+\beta_{2b}\text{perceived usefulness-mobile}+\beta_{3a}\text{pre-implementation interventions-chip}+\beta_{3b}\text{pre-implementation interventions-mobile}+\beta_{4a}\text{social influence-chip}+\beta_{4b}\text{social influence-mobile}+\beta_5\text{switching costs-mobile}+\beta_6\text{age}+\beta_7\text{gender}+\epsilon$$

The regression results are outlined in Table 7, and the Normality Plot in Figure 8 indicates that the condition of normally distributed residuals is satisfied.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	1.990	.423		4.703	.000		
Self-Efficacy - chip	-.112	.046	-.159	-2.417	.017	.480	2.083
Perceived Usefulness – chip	-.015	.036	-.023	-.424	.672	.699	1.430
Pre-Implementation Interventions – chip	-.017	.029	-.032	-.593	.554	.711	1.406
Social Influence – chip	-.023	.039	-.046	-.583	.561	.336	2.974
Self-Efficacy – mobile	.000	.037	.000	-.003	.998	.475	2.105
Perceived Usefulness – mobile	.141	.048	.203	2.939	.004	.439	2.277
Pre-Implementation Interventions – mobile	-.008	.030	-.015	-.258	.797	.613	1.632
Social Influence – mobile	.125	.035	.270	3.557	.000	.363	2.757
Switching Costs – mobile	.271	.037	.470	7.286	.000	.502	1.990
Age	-.003	.004	-.038	-.759	.449	.841	1.190
Gender	0.16	.077	.010	.202	.840	.913	1.095

Adjusted R Squared = .563

Table 7: Expanded Study – Regression Results (dependent variable = *Propensity to use alternative technology*)

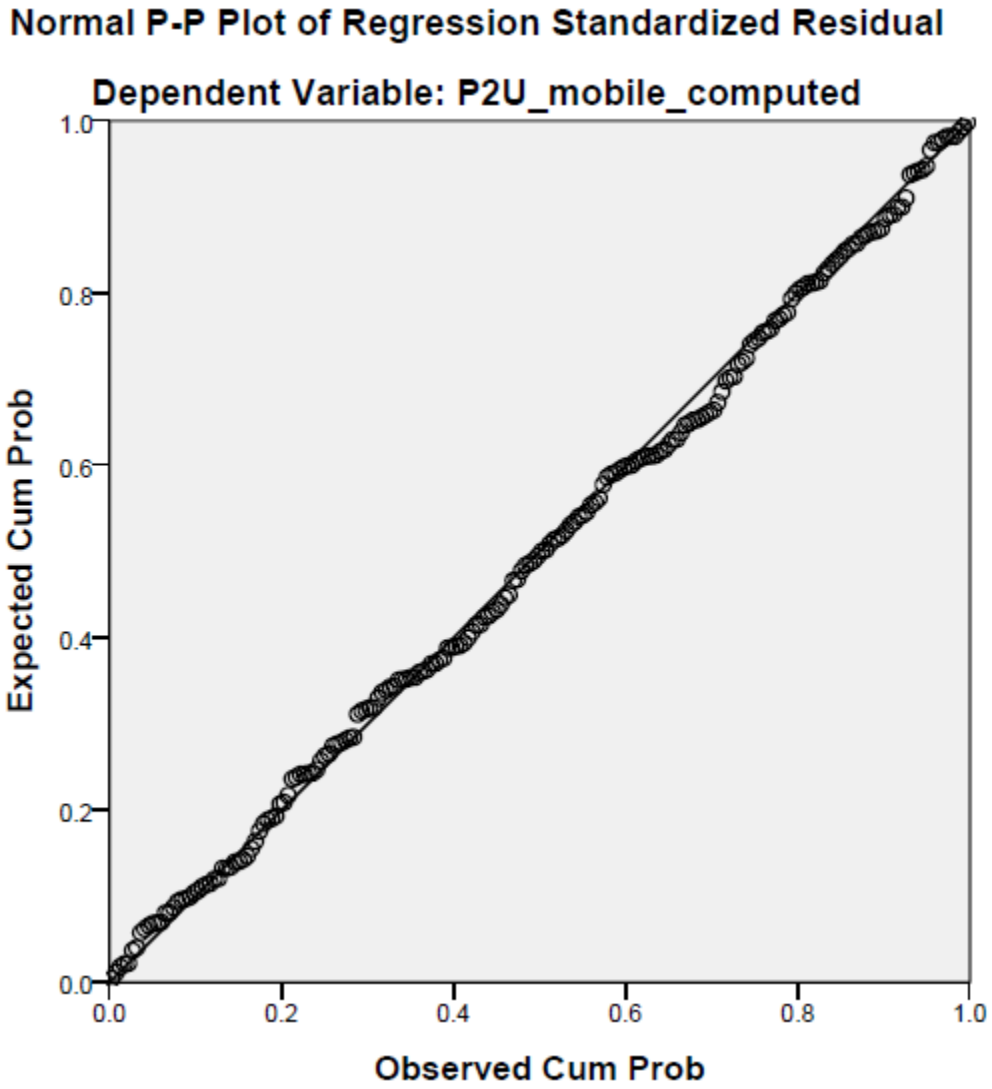

Figure 8: Expanded Study – P-Plot

Although age and gender were used as control variables, neither had an effect, despite contrary results obtained by prior surveys on EMV awareness performed by both ACI and CreditCards.com (ACI Worldwide, 2015; Mecia, 2015). Hypothesis 1a stated that high reported self-efficacy for chip cards would have a negative relationship with a user's propensity to use a mobile NFC based payment solution. The model showed support for 1a where B = -0.112 and p = 0.017, indicating a statistically significant

negative relationship. Thus, confirming that users who have a high perceived self-efficacy for chip cards are less likely to use an alternative payment technology such as Apple Pay, Samsung Pay or Android Pay. On the other hand, the results did not show support for a relationship between high self-efficacy for mobile payment technology and a user's propensity to use said technology (B = .000, p = .998). Therefore, hypothesis 1b was not supported.

It was anticipated that if users perceived chip cards to be useful, they would be unlikely to use an alternative payment technology. The results do not substantiate a negative relationship between perceived usefulness of chip cards and a user's propensity to use a mobile payment solution (B = -.015, p = .672). Thus, hypothesis 2a was not supported. However, as expected and substantiated by the model, there is a statistically significant positive relationship between perceived usefulness of mobile payment technologies and a user's propensity to use this technology (B = .141, p = .004). Therefore, if a user believes an alternative payment solution such as Apple Pay, Samsung Pay, and Android Pay is useful, he or she is likely to use this technology, and hypothesis 2b is supported.

With pre-implementation interventions, it was anticipated that a negative relationship would exist between such interventions perceived by users specific to chip cards and their propensity to use an alternative payment technology. Contrary to this expectation, the model did not reinforce this relationship (B = -.017, p = .554), and therefore, hypothesis 3a was not supported. In addition, a positive relationship was expected to exist between pre-implementation interventions and a user's propensity to use

a mobile NFC payment technology; however, the model did not show a relationship and hypothesis 3b was not supported (B = -.008, p = .797).

Contrary to expectations, the model shows that the expected negative relationship between social influence with chip cards and an individual's propensity to use an alternative payment technology does not exist (B = -.023, p = .561). Thus, hypothesis 4a was not supported. However, a positive relationship does exist between the impact of social influence on mobile payment technology and a user's likelihood to use that technology (B = .125, p = .000). Therefore, hypothesis 4b was supported. In addition, the relationship between perceived switching costs to mobile payment technologies and propensity to use the technology does exist and hypothesis 5 was also supported (B = .271, p = .000). Based on the verbiage used in the questions specific to switching costs, a positive relationship indicates low perceived switching costs specific to mobile payment technologies. The results of the hypotheses testing are summarized in Table 8.

Hypothesis	**Supported/Not Supported**
H1a: Chip self-efficacy is negatively related to propensity to use mobile	Supported
H1b: Mobile self-efficacy is positively related to propensity to use mobile	Unsupported
H2a: Perceived usefulness chip is negatively related to propensity to use mobile	Unsupported
H2b: Perceived usefulness mobile is positively related to propensity to use mobile	Supported
H3a: Chip pre-implementation interventions are negatively related to propensity to use mobile	Unsupported
H3b: Mobile pre-implementation interventions are positively related to propensity to use mobile	Unsupported
H4a: Chip social influence is negatively related to propensity to use mobile	Unsupported
H4b: Mobile social influence is positively related to propensity to use mobile	Supported
H5: Switching costs to mobile are negatively related to propensity to use mobile	Supported

Table 8: Expanded Study – Summary of Hypothesis Testing

Discussion

This study attempts to validate that an adapted TAM focused model can be supported outside of a corporate setting in a consumer context. In addition, it examines the factors managers should take into consideration when faced with an upcoming industry mandate or involuntary migration to a new technology. As expected, if a user feels confident in his or her ability to use an incumbent or mandated technology, he or she is less likely to be compelled to investigate an alternative technology. Consistent with prior research, if a user views an alternative technology as useful and is influenced by their social environment, he or she will have a high propensity to use the system. In addition, the perception of low switching costs is the biggest predictor of whether or not an individual will use the alternative technology. Based on prior research, it was expected that the strongest relationship would exist between perceived usefulness and propensity use (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh, 2000; Venkatesh & Bala, 2008); however, switching costs and social influence specific to mobile payment technologies were found to be the most statistically significant with respect to propensity to use such technologies. With the exception of social influence, these findings are not consistent with the results of the pilot study; however, this is most likely due to the large increase in sample size (pilot study n = 31 vs. expanded study n = 210).

Surprisingly, there is no relationship between perceived usefulness, pre-implementation interventions, or social influence for chip technology and a user's propensity to use an alternative technology. Negative relationships between these constructs and propensity to use were expected, as was a positive relationship between self-efficacy and pre-

implementation interventions for mobile payment technologies and an individual's propensity to use this technology. The lack of relationship within these constructs is surprising and may indicate that TAM does not fully translate to consumer usage behaviors.

The Adjusted R Square for the expanded study is .563, indicating the model explains 56% of the variance in the dependent variable; that is, why individuals choose to use or not use mobile payment technology. In addition, the model shows little multicollinearity with the VIF scores between 1.4 and 2.9, well within the acceptable range of less than 10 (Hocking, 2013, p. 158). The regression results outlined in table 7 are consistent with the linear relationships observed between all variables.

Venkatesh (2000) suggests that "future research should examine mandatory usage contexts." In addition, Venkatesh and Davis (2000) encouraged future research to expand TAM to examine choice in alternative technologies. Both noted limitations within the TAM literature are addressed in this study and could provide another explanation for the aforementioned absence of relationships that were anticipated but not supported in hypotheses 1b, 2a, 3a, 3b, and 4a. Further refinement of TAM may be needed to test this theory in a consumer environment. In addition, the expected relationships that were not supported by this model may exist in the presence of one event, but not both (i.e. these relationships may be present in during a mandated event where choice sets of alternative technologies are not available).

From a practitioner standpoint, this research provides valuable insight for organizations and managers, specifically which dimensions of a consumer's attitude may

compel them to be more likely to adopt an alternative technology, especially during times of mandated change. As more industries are subject to regulatory events, this could make markets vulnerable, resulting in fewer barriers to entry. By understanding the value of perceived usefulness, switching costs, and social influence, managers can have a better understanding of where to focus their efforts when releasing a new technology to the market, or where incumbent technologies should focus to retain market share during times of instability brought on by regulatory or mandated events.

In the payments industry specifically, this research provides valuable insight on key drivers that motivate cardholders to adopt alternative payment technologies. Mobile wallet providers such as Apple Pay, Samsung Pay, and Android Pay should be cognizant of the power of social influence when marketing their solutions. The same is true for new mobile payment technology providers. Understanding what influences cardholder usage behavior is crucial for the success of existing and new technology providers. In addition, should the payments industry face additional mandated or regulatory events, this research shows what constructs most influence consumer usage behaviors in this context. When such events occur, incumbent technologies should pay special attention to the self-efficacy within the user base. Challenging firms with alternative technologies should be aware of the influence of incumbent technology self-efficacy while focusing on the user perceptions of usefulness, social influence, and switching costs of the alternative technology.

CHAPTER 6

CONCLUSIONS

This study makes numerous contributions to both theory and practice. Theoretical implications include the translation of the dimensions of self-efficacy, social influence, and perceived usefulness in a consumer context. In addition, this research addresses two limitations proposed in prior TAM literature, testing the dimensions when both a mandated event and alternative technologies are present. Despite these contributions, this study is not without limitations. One major limitation of this study is the title associated with this survey on Amazon Mechanical Turk. The HIT title may have created selection bias as the verbiage used could be perceived to favor mobile payment technologies. If a similar instrument is used in future research, an unbiased title should be used and attention checks should be leveraged at various points in the survey.

Another limitation of both the pilot and expanded studies is the fact that this research examines only one mandated event in a single industry. Future research implications should focus on further adaption of TAM and switching cost theory in a consumer context and generalizability across other industries and other mandated events. In addition, the absence of a regulatory or mandated event should also be examined to validate the relationships that are present in this model are not influenced by these factors.

Future research should focus on additional ways to leverage the existing data collected in the expanded study. Specifically, using age as an interaction instead of a control variable to identify whether the supported hypotheses become more or less

statistically significant based on age group. Although age was a factor in prior EMV awareness surveys completed by ACI Worldwide and CreditCards.com, awareness does not always translate to understanding, so interactions between age and/or gender should be examined. Additionally, some of the unsupported hypotheses are supported in certain age groups, but not others. Potential U-shaped relationships may also exist, especially with TAM usage determinants such as pre-implementation interventions where effectiveness may determine on the level of intervention. The dataset should also be analyzed by individual solution (i.e., Apple Pay, Android Pay, and Samsung Pay) to determine if the same hypotheses are supported or unsupported. For example, social influence may be especially strong with Apple Pay, but not as significant with Android Pay or Samsung Pay. This would further assist managers within these firms by providing solution specific usage propensity models.

Throughout history, one thing has remained constant…change. As the world advances through innovation, new issues arise, and from those new issues, regulation is born. This paper shows that in times of turmoil brought on by industry mandates, new technologies can emerge and exist side by side with incumbent technology if the climate is right and specific dimensions of attitude are acknowledged. Even in industries where innovation has stalled throughout the years, shifts can make way for new technologies to rise and succeed.

REFERENCES

ACI Worldwide. (2015). *6 out of 10 U.S. consumers with credit cards are not ready for EMV.* Retrieved December 15, 2015, from ACI Worldwide: http://www.aciworldwide.com/news-and-events/press-releases/6-out-of-10-us-consumers-with-credit-cards-are-not-ready-for-emv.aspx

Amazon. (n.d.). *About Amazon Mechanical Turk*. Retrieved from Amazon Mechanical Turk: https//www.mturk.com/worker/help

Amin, H. (2007). An analysis of mobile credit card usage intentions. *Journal of Information Management & Computer Security, 15*, 262.

Apple, Inc. (2014). *Apple announces Apple Pay: Transforming mobile payments with an easy, secure, and private way to pay.* Retrieved December 10, 2015, from Apple Press Info: https://www.apple.com/pr/library/2014/09/09Apple-Announces-Apple-Pay.html

Armerding, T. (2015). *Why have most merchants missed the EMV deadline?* Retrieved December 17, 2015, from CSO Online: http://www.csoonline.com/article/2990207/data-protection/why-have-most-merchants-missed-the-emv-deadline.html

Atsea. (2014, July 3). *The 'knuckle buster' makes a comeback.* Retrieved December 7, 2015, from PYMNTS.com: http://www.pymnts.com/news/acquiring/2014/the-knuckle-buster-makes-a-comeback/

Black, T. (2012). *EMV Migration: Canada.* GFH Group, Inc.

Bose, N. (2015). *Costly shift to new credit cards won't fix security issues.* Retrieved December 7, 2015, from Reuters.com: http://www.reuters.com/article/us-usa-cybersecurity-retail-insight-idUSKBN0LZ0GC20150303

Chen, B. X. (2016, May 4). Why Apple Pay and Other Mobile Wallets Beat Chip Cards. *The New York Times*. Retrieved from https://www.nytimes.com/2016/05/05/technology/personaltech/in-the-race-to-pay-mobile-wallets-win.html

Chen, P. Y., & Hitt, L. M. (2002). Measuring switching costs and the determinants of customer retention in Internet-enabled businesses: A study of the online brokerage industry. *Information Systems Research, 13*(3), 255-274.

Cohorst, T. (2015). *Banks are falling to educate consumers about EMV.* Retrieved December 7, 2015, from PaymentsSource: http://www.paymentssource.com/news/paythink/banks-are-failing-to-educate-consumers-about-emv-3022565-1.html

Compeau, D. R., & Higgins, C. A. (1995). Application of social cognitive theory to training for computer skills. *Information Systems Research, 6*, 118-143.

Coppin, L. (n.d.). *From barriers to benefits: Exploring EMV adoption in the U.S.* Retrieved December 7, 2015, from GBG Resources: http://www.gbgplc.com/uk/resources/

Daly, J. (2015, October 21). *House panel hears how EMV rings up a big tab for some small businesses.* Retrieved from Digital Transactions: http://digitaltransactions.net/news/story/House-Panel-Hears-How-EMV-Rings-Up-a-Big-Tab-for-Some-Small-Businesses

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*, 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*, 982-1003.

Dwyer, B. (2015). *Credit card processing: How it works.* Retrieved December 10, 2015, from CardFellow: http://www.cardfellow.com/how-credit-card-processing-works/#card_associations

EMVCo. (2014). *A guide to EMV chip technology: Version 2.0.* EMVCo, LLC.

Fintech, D. (2015). *As evidenced in Australia, EMV in the US could be displaced by contactless payments.* Retrieved December 7, 2015, from Bank Innovation: http://bankinnovation.net/2015/10/how-the-us-can-learn-about-emv-adoption-from-australia/

Frellick, M. (2011, June 4). *The rise and fall of the credit card magnetic stripe.* Retrieved December 7, 2015, from CreditCards.com: http://www.creditcards.com/credit-card-news/history-credit-card-magnetic-stripe-1273.php

Gaudin, S. (2009). *Government informant is called kingpin of largest U.S. data breaches.* Retrieved December 7, 2015, from Computerworld: http://www.computerworld.com/article/2527161/government-it/government-informant-is-called-kingpin-of-largest-u-s--data-breaches.html

Hocking, R. R. (2013). *Methods and applications of linear models: Regression and the analysis of variance.* Somerset: Wiley.

Hu, P. J., Chau, P. Y., Sheng, O. R., & Tam, K. Y. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems, 16*(2), 91-112.

Klemperer, P. (1995). Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade. *The Review of Economic Studies, 62*(4), 515-539.

Kohler, C. (2015). *U.S. EMV Chip Implementation Update.* Foster City: Visa, Inc.

Liébana-Cabanillas, F., Ramos de Luna, I., & Montoro-Ríos, F. J. (2015). User behaviour in QR mobile payment system: The QR payment acceptance model. *Technology Analysis & Strategic Management, 27*(9), 1031-1049.

Litman, L., Robinson, J., & Abberbock, T. (2017). TurkPrime.com: A versatile crowdsourcing data acquisition platform for the behavioral sciences. *Behavior Research Methods, 49*, 433-442. doi:10.3758/s13428-016-0727-z

Liu, J., Kauffman, R. J., & Ma, D. (2015). Competition, Cooperation, and regulation: Understanding the evolution of the mobile payments technology ecosystem. *Electronic Commerce Research and Applications*. Retrieved from http://dx.doi.org/10.1016/j.elerap.2015.03.003

Manasso, J. (2015). The latest research and data from EMV early adopters point to problems ahead for U.S. migration. *Transaction Trends, 20*(1), 10-14.

Marimuthu, M., Arokiasamy, L., Samad, M. F., Moorthy, M. K., & Kok, N. K. (2011). Cashless society and the determinants: An empirical investigation. *International Journal of Academic Research, 3*(3), 673-682.

Masunaga, S. (2015). *Longer waits at the checkout counter? Blame chip technology.* Retrieved December 10, 2015, from Albuquerque Journal: http://www.abqjournal.com/683380/biz/biz-most-recent/longer-waits-at-the-checkout-counter-blame-chip-technology.html

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research, 2*, 173-191.

Mecia, T. (2015). *Poll: Most cardholders lack smart-chip cards, despite deadline.* Retrieved December 15, 2015, from CreditCards.com: http://www.creditcards.com/credit-card-news/emv-chip-card-survey.php

Michigan Retailers Association. (n.d.). *What is credit card truncation?* Retrieved December 7, 2015, from www.retailers.com: http://www.retailers.com/FAQRetrieve.aspx?ID=51560

National Retail Federation. (2015). *Statement of Keith Lipert of the Keith Lipert Gallery for the Committee on Small Business of the United States House of Representatives hearing on "The EMV deadline and what it means for small businesses: Part II."*Retrieved December 10, 2015, from Small Business Committee: http://smbiz.house.gov/uploadedfiles/10-21-2015_lipert_testimony.pdf

NFC. (n.d.). *How NFC works.* Retrieved December 10, 2015, from NearFieldCommunication.org: http://www.nearfieldcommunication.org/how-it-works.html

Nik Hashim, N. H., Alam, S. S., Pandit, A., & Manan, R. A. (2015). WHY RESIST? EXAMINING THE IMPACT OF TECHNOLOGICAL ADVANCEMENT AND

PERCEIVED USEFULNESS ON MALAYSIANS' SWITCHING INTENTIONS: THE MODERATORS. *Journal Of Developing Areas, 49*(3), 65-80.

Payne, J. W., Bettman, J., & Johnson, E. J. (1993). *The Adaptive Decision-Maker*. New York: Cambridge University Press.

Polites, G. L., & Karahanna, E. (2012). Shackled to the status quo: The inhibiting effects of incumbent system habit, switching costs, and inertia on new system acceptance. *MIS Quarterly, 36*(1), 21-42.

pymnts. (2014). *How much will EMV really cost issuers?* Retrieved December 7, 2015, from PYMNTS.com: http://www.pymnts.com/news/2014/how-much-will-emv-really-cost-issuers/

Ray, S., Kim, S. S., & Morris, J. G. (2012). Research Note - Online users' switching costs: Their nature and formation. *Information Systems Research, 23*(1), 197-213.

Sussman, H. E., Meal, D. H., DeGraw, J. S., Harrington, S. C., McIntosh, D. M., & Szpak, M. P. (2015). *State Attorneys General fire shots across the bow at major payment card brands over "chip and PIN" technology.* Retrieved December 7, 2015, from Lexology: http://www.lexology.com/library/detail.aspx?g=94349e7b-379d-4d7a-b0db-539bbe0daf23

The National Association of Convenience Stores. (2015). *Testimony of Jared Scheeler Managing Director The Hub Convenience Stores, Inc. on Behalf of the National Association of Convenience Stores for the hearing of the House Small Business Committee "The EMV deadline and what it means for small businesses".* Retrieved December 10, 2015, from

Small Business Committee: http://smbiz.house.gov/uploadedfiles/10-21-2015_scheeler_testimony.pdf

Todd, P., & Benbasat, I. (1991). An experimental investigation of the impact of computer-based decision aids on the decision making process. *Information Systems Research, 2*(2), 87-115.

Todd, P., & Benbasat, I. (1992). An experimental investigation of the impact of computer-based DSS on processing effort. *MIS Quarterly, 16*(3), 373-393.

Todd, P., & Benbasat, I. (1993). Decision-makers, DSS, and decision making effort: An experimental investigation. *INFOR, 31*(2), 1-21.

U.S. Payments Forum. (2017). *Optimizing Transaction Speed at the POS.* Princeton Junction: U.S. Payments Forum. Retrieved from http://www.uspaymentsforum.org/wp-content/uploads/2016/09/Optimizing-Txn-Speed-WP-FINALV3-October-2017.pdf

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11*(4), 342-365.

Venkatesh, V., & Agarwal, R. (2006). Turning visitors into customers: A usability-centric perspective on purchase behavior in electronic channels. *Management Science, 52*(3), 367-382.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273-315.

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences, 27*(3), 451-481.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Verini, J. (2010). *The great cyberheist.* Retrieved December 7, 2015, from The New York Times Magazine: http://www.nytimes.com/2010/11/14/magazine/14Hacker-t.html?_r=0

Visa. (n.d.). *EMV liabilty Shift: Why it pays to adopt new technology.* Retrieved from www.visa.com: https://www.visa.com/chip/merchants/grow-your-business/payment-technologies/credit-card-chip/liability-shift.jsp

Wizbowski, R. (2015, October 8). *Britain provides clues for the U.S.'s EMV future.* Retrieved from PaymentsSource: https://www.paymentssource.com/opinion/britain-provides-clues-for-the-uss-emv-future

APPENDICES

APPENDIX A: TAM INTERNAL/EXTERNAL INFLUENCES LITERATURE REVIEW

Internal Factors		
Factor	**Description**	**Source(s)**
Self-efficacy	The belief in one's ability to be successful in a specific task. In TAM, the belief that one can successfully use a new technology.	Compeau, D. R., & Higgins, C. A. (1995) Davis, F. D. (1989) Venkatesh, V. (2000) Venkatesh, V., & Agarwal, R. (2006) Venkatesh, V., & Bala, H. (2008) Venkatesh, V., & Davis, F. D. (1996) Venkatesh, V., & Davis, F. D. (2000)
Perceived Usefulness	A user's subjective probability that using a specific system will increase his or her performance.	Davis, F. D. (1989) Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989) Liébana-Cabanillas, F., Ramos de Luna, I., & Montoro-Ríos, F. J. (2015) Mathieson, K. (1991) Venkatesh, V. (2000) Venkatesh, V., & Agarwal, R. (2006) Venkatesh, V., & Bala, H. (2008) Venkatesh, V., & Davis, F. D. (1996) Venkatesh, V., & Davis, F. D. (2000)
Perceived Ease of Use	The degree to which a user expects a system to be free of effort.	Davis, F. D. (1989) Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989) Liébana-Cabanillas, F., Ramos de Luna, I., & Montoro-Ríos, F. J. (2015) Mathieson, K. (1991) Venkatesh, V. (2000) Venkatesh, V., & Agarwal, R. (2006) Venkatesh, V., & Bala, H. (2008) Venkatesh, V., & Davis, F. D. (1996) Venkatesh, V., & Davis, F. D. (2000)
External Factors		
Pre-Implementation Interventions	The stages leading to the actual rollout of a system.	Venkatesh, V., & Bala, H. (2008) Venkatesh, V., & Davis, F. D. (2000)
Social Influences/ Subjective Norms	The degree to which an individual perceives that most people who are important to him or her believe he or she should or should not use the system.	Liébana-Cabanillas, F., Ramos de Luna, I., & Montoro-Ríos, F. J. (2015) Mathieson, K. (1991) Venkatesh, V., & Agarwal, R. (2006) Venkatesh, V., & Bala, H. (2008) Venkatesh, V., & Davis, F. D. (2000)

APPENDIX B: ITEMS FOR CONSTRUCT MEASUREMENT

Control Variables:

Age

Gender

Income

Participant Requirements:

Reside in the U.S. and be at least 18 years of age or older

Used an EMV/chip card to complete a face to face transaction

Used Apple Pay to complete a face to face transaction

Considerations:

EMV question block: When answering the following questions, please think about your recent experiences when completing in store or face to face transactions using the chip in your credit/debit card by "dipping" or inserting your card into the credit card terminal.

Apple Pay question block: When answering the following questions, please think about your recent experiences when completing in store or face to face transactions using Apple Pay.

Constructs		Item	Source
Self-Efficacy Gutman Scale (10 pt)	SE1e	I am confident I can complete a transaction using my chip card on my own.	(Venkatesh & Bala, 2008) (Venkatesh & Davis, 1996) (Venkatesh & Davis, 2000)
	SE2e	I am confident I can complete a transaction using my chip card if a cashier assists me.	
	SE3e	I feel confident in my ability to complete a transaction with my chip card.	
	SE1m	I am confident I can complete a transaction using Apple Pay on my own.	
	SE2m	I am confident I can complete a transaction using Apple Pay if a cashier assists me.	
	SE3m	I feel confident in my ability to complete a transaction with Apple Pay.	
Perceived Usefulness Likert (7 pt)	PU1e	My chip card improves my overall payment experience.	(Venkatesh & Bala, 2008)
	PU2e	My chip card is an efficient way to pay.	
	PU3e	My chip card is a useful way to pay.	
	PU1m	Apple Pay improves my overall payment experience	
	PU2m	Apple Pay is an efficient way to pay.	
	PU3m	Apple Pay is a useful way to pay.	
Perceived Ease of Use Likert (7 pt)	PEU1e	It is easy to understand how to pay with my chip card.	(Venkatesh & Bala, 2008)
	PEU2e	Completing a transaction with my chip card requires minimal effort	
	PEU3e	It is easy to complete a transaction using my chip card.	
	PEU1m	It is easy to understand how to pay with Apple Pay.	
	PEU2m	Completing a transaction with Apple Pay requires minimal effort.	
	PEU3m	It is easy to complete a transaction using Apple Pay.	
Pre-Imp. Interventions Likert (7 pt)	PII1e	My bank/card issuer provided instructions outlining how to pay using my chip card.	Not measured in TAM 3. See (Venkatesh & Bala, 2008)
	PII2e	My bank/card issuer explained the benefits of paying with my chip card.	
	PII3e	My bank/card issuer prepared me to pay with my chip card.	
	PII1m	Apple and/or my mobile provider gave me instructions outlining how to pay using Apple Pay.	
	PII2m	Apple and/or my mobile provider explained the benefits of using Apple Pay.	
	PII3m	Apple and/or my mobile provider prepared me to use Apple Pay.	
Social Influences Likert (7 pt)	SI1e	I feel people who use chip cards have more prestige than those who use other forms of payment.	(Venkatesh & Bala, 2008) To adapt this to a consumer scenario, questions are modeled from two constructs: subjective norm & image. Consistent w/ (Venkatesh & Davis, 2000) removing voluntariness.
	SI2e	Using a chip card is a status symbol.	
	SI3e	People who influence my behavior feel I should use my chip card over other forms of payment.	
	SI1m	I feel people who use Apple Pay have more prestige than those who use other forms of payment.	
	SI2m	Using Apple Pay is a status symbol.	
	SI3m	People who influence my behavior feel I should use Apple Pay over other forms of payment.	
Switching Costs Likert (7 pt)	SC1e	Learning how to use my chip card came easy to me.	(Polites & Karahanna, 2012)
	SC2e	I did not spend much time learning how to use my chip card.	
	SC3e	It took a lot of time to get used to paying with my chip card.	
	SC1m	Learning how to use Apple Pay came easy to me.	
	SC2m	I did not spend much time learning how to use Apple Pay.	
	SC3m	It took a lot of time to get used to paying with Apple Pay.	
Propensity to Use Likert (7 pt)	PA1e	I prefer to use my chip card as my primary method of payment.	(Polites & Karahanna, 2012)
	PA1m	I prefer to use Apple Pay as my primary method of payment.	
Frequency Open numeric text box	Frqnc-e	In an average week, please estimate how many times you complete a face to face purchase using your chip card.	
	Frqnc-m	In an average week, please estimate how many times you complete a face to face purchase using Apple Pay.	

APPENDIX C: PILOT STUDY SURVEY INSTRUMENT

Start of Block: Intro Block

Intro: To be eligible to participate in this survey, you should have made at least one in-store purchase using a chip card and one in-store purchase using Apple Pay. If you have not, please do not continue.

Think about the last experience you had in a store using your chip card and the last experience you had in a store using Apple Pay. Don't consider online or over-the-phone purchases.

Now answer the following questions about your experiences. The survey should only take about 10 to 15 minutes to complete.

End of Block: Intro Block

Start of Block: Screening Question Block

S1. I am 18 years of age or older

- ❍ Yes (1)
- ❍ No (2)

Skip To: End of Survey If S1 = No (2)

S2. I have used a chip card to complete a face to face transaction

- ❍ Yes (1)
- ❍ No (2)

Skip To: End of Survey If S2 = No (2)

S3. I have used Apple Pay to complete a face to face transaction.

- ❍ Yes (1)
- ❍ No (2)

Skip To: End of Survey If S3 = No (2)

End of Block: Screening Question Block

Start of Block: Chip Question Block

EMV Intro:

When answering the following questions, please think about your recent experiences when completing in-store or face to face transactions using the chip in your credit/debit card by "dipping" or inserting your card into the credit card terminal.

SE1e

I am confident I can complete a transaction using my chip card on my own

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE2e

I am confident I can complete a transaction using my chip card if a cashier assists me

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE3e

I feel confident in my ability to complete transaction with my chip card

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

PU1e

My chip card improves my overall payment experience

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU2e

My chip card is an efficient way to pay

- ❍ 1. Strongly Disagree (1)
- ❍ 2. Moderately Disagree (2)
- ❍ 3. Somewhat Disagree (3)
- ❍ 4. Neutral (4)
- ❍ 5. Somewhat Agree (5)
- ❍ 6. Moderately Agree (6)
- ❍ 7. Strongly Agree (7)

PU3e

My chip card is a useful way to pay

- ❍ 1. Strongly Disagree (1)
- ❍ 2. Moderately Disagree (2)
- ❍ 3. Somewhat Disagree (3)
- ❍ 4. Neutral (4)
- ❍ 5. Somewhat Agree (5)
- ❍ 6. Moderately Agree (6)
- ❍ 7. Strongly Agree (7)

PEU1e

It is easy to understand how to pay with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PEU2e

Completing a transaction with my chip card requires minimal effort

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PEU3e

It is easy to complete a transaction using my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII1e

My bank/card issuer provided instructions outlining how to pay using my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII2e

My bank/card issuer explained the benefits of paying with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII3e

My bank/card issuer prepared me to pay with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI1e

I feel people who use chip cards have more prestige than those who use other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI2e

Using a chip card is a status symbol

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI3e

People who influence my behavior feel I should use my chip card over other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC2e

Learning how to use my chip card came easy to me

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SCe1

I did not spend much time learning how to use my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC3e

It took a lot of time to get used to paying with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PA1e I prefer to use my chip card as my primary method of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

Frqncy-e

In an average week, please estimate how many times you complete a face to face purchase using your chip card.

- (19) _____

End of Block: Chip Question Block

Start of Block: MPT & Ranking Question Block

MPT Intro:

When answering the following questions, please think about your recent experiences when completing in-store or face to face transactions using Apple Pay.

SE1m

I am confident I can complete a transaction using Apple Pay on my own

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE2m

I am confident I can complete a transaction using Apple Pay if a cashier assists me

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE3m

I feel confident in my ability to complete a transaction with Apple Pay

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

PU1m

Apple Pay improves my overall payment experience

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU2m

Apple Pay is an efficient way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU3m

Apple Pay is a useful way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PEU1m

It is easy to understand how to pay with Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PEU2m

Completing a transaction with Apple Pay requires minimal effort

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PEU3m It is easy to complete a transaction using Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII1m

Apple and/or my mobile provider gave me instructions outlining how to pay using Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII2m

Apple and/or my mobile provider explained the benefits of using Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII3m

Apple and/or my mobile provider prepared me to use Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI1m

I feel people who use Apple Pay have more prestige than those who use other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI2m

Using Apple Pay is a status symbol

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI3m

People who influence my behavior feel I should use Apple Pay over other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC2m

Learning how to use Apple Pay came easy to me

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC1m

I did not spend much time learning how to use Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC3m

It took a lot of time to get used to paying with Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PA1m I prefer to use Apple Pay as my primary method of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

Frqncy-m

In an average week, please estimate how many times you complete a face to face purchase using Apple Pay.

- (19) _____

Rank - S

Please rank the following payment methods for speed with one being the slowest, most time consuming way to pay, and five being the fastest, least time consuming way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Apple Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

Rank - C

Please rank the following payment methods for convenience with one being the least convenient way to pay, and five being the most convenient way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Apple Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

Rank - EU

Please rank the following payment methods for ease of use with one being the most difficult way to pay, and five being the easiest way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Apple Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

End of Block: MPT & Ranking Question Block

Start of Block: Demographic Question Block

*

Dem1 What year were you born?

_____

*

Dem2 What is your five digit zip code?

_____

Dem3 What is your gender?

- ❍ Male (1)
- ❍ Female (2)

Dem4 What is your approximate annual income?

- ❍ Less than $10,000 (1)
- ❍ $10,000 - $19,999 (2)
- ❍ $20,000 - $29,999 (3)
- ❍ $30,000 - $39,999 (4)
- ❍ $40,000 - $49,999 (5)
- ❍ $50,000 - $59,999 (6)
- ❍ $60,000 - $69,999 (7)
- ❍ $70,000 - $79,999 (8)
- ❍ $80,000 - $89,999 (9)
- ❍ $90,000 - $99,999 (10)
- ❍ $100,000 - $149,999 (11)
- ❍ More than $150,000 (12)

Dem5

What is the highest level of education you have completed or the highest degree you have received?

- ❍ Less than high school (1)
- ❍ High school graduate (2)
- ❍ Some college (3)
- ❍ 2 year degree (4)
- ❍ 4 year degree (5)
- ❍ Professional degree (6)
- ❍ Doctorate (7)

End of Block: Demographic Question Block

Start of Block: Block 5

Q54

To receive credit for this survey, please return to Mechanical Turk and enter the following code:

First initial, last initial, 2017

(for example, if your name is Albert Brown, enter AB2017)

End of Block: Block 5

APPENDIX D: EXPANDED STUDY SURVEY INSTRUMENT

Survey Flow:

Standard: Intro Block (1 Question)
Standard: Screening Question Block (3 Questions)
Block: Chip Question Block (14 Questions)
Standard: MPT Survey Logic Qualification (1 Question)
Standard: Apple Pay & Ranking Question Block (22 Questions)
Standard: Samsung Pay & Ranking Question Block (22 Questions)
Standard: Android Pay & Ranking Question Block (22 Questions)
Standard: Demographic Question Block (5 Questions)
Standard: Verification Block (1 Question)

Start of Block: Intro Block

Intro To be eligible to participate in this survey, you should have made at least one in-store purchase using a chip card and one in-store purchase using Apple Pay, Samsung Pay, and/or Android Pay. If you have not, please do not continue.

Think about the last experience you had in a store using your chip card and the last experience you had in a store using Apple Pay, Samsung Pay, and/or Android Pay. Don't consider online or over-the-phone purchases.

Now answer the following questions about your experiences. The survey should only take about 10 minutes to complete.

End of Block: Intro Block

Start of Block: Screening Question Block

S1 I am 18 years of age or older

- ❍ Yes (1)
- ❍ No (2)

Skip To: End of Survey If S1 = 2

S2 I have used a chip card to complete a face to face transaction

- ❍ Yes (1)
- ❍ No (2)

Skip To: End of Survey If S2 = 2

S3 I have used Apple Pay, Samsung Pay, and/or Android Pay to complete a face to face transaction.

- ❍ Yes (1)
- ❍ No (2)

Skip To: End of Survey If S3 = 2

End of Block: Screening Question Block

Start of Block: Chip Question Block

EMV Intro When answering the following questions, please think about your recent experiences when completing in-store or face to face transactions using the chip in your credit/debit card by "dipping" or inserting your card into the credit card terminal.

SE1e

I am confident I can complete a transaction using my chip card on my own

- ❍ 1. Not at all confident (1)
- ❍ 2 (2)
- ❍ 3 (3)
- ❍ 4 (4)
- ❍ 5 (5)
- ❍ 6 (6)
- ❍ 7 (7)
- ❍ 8 (8)
- ❍ 9 (9)
- ❍ 10. Totally confident (10)

SE2e

I am confident I can complete a transaction using my chip card if a cashier assists me

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE3e

I feel confident in my ability to complete transaction with my chip card

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

PU1e

My chip card improves my overall payment experience

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU2e

My chip card is an efficient way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU3e

My chip card is a useful way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII1e

My bank/card issuer provided instructions outlining how to pay using my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII2e

My bank/card issuer explained the benefits of paying with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII3e

My bank/card issuer prepared me to pay with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI1e

I feel people who use chip cards have more prestige than those who use other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI2e

Using a chip card is a status symbol

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI3e

People who influence my behavior feel I should use my chip card over other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

Frqncy-e In an average week, please estimate how many times you complete a face to face purchase using your chip card.

- Click to write Form field 1 (21)

_____

End of Block: Chip Question Block

Start of Block: MPT Survey Logic Qualification

MPT Logic When paying with my phone, I most often use

- Apple Pay (4)
- Android Pay (5)
- Samsung Pay (6)

End of Block: MPT Survey Logic Qualification

Branch: New Branch
If
If When paying with my phone, I most often use Samsung Pay Is Selected

Block: Samsung Pay & Ranking Question Block (22 Questions)
Block: Demographic Question Block (5 Questions)
Block: Verification Block (1 Question)

EndSurvey:

Branch: New Branch
If
If When paying with my phone, I most often use Android Pay Is Selected

Block: Android Pay & Ranking Question Block (22 Questions)
Block: Demographic Question Block (5 Questions)
Block: Verification Block (1 Question)

EndSurvey:

Branch: New Branch
If
If When paying with my phone, I most often use Apple Pay Is Selected

Block: Apple Pay & Ranking Question Block (22 Questions)
Block: Demographic Question Block (5 Questions)
Block: Verification Block (1 Question)

EndSurvey:

Start of Block: Samsung Pay & Ranking Question Block

SP Intro When answering the following questions, please think about your recent experiences when completing in-store or face to face transactions using Samsung Pay.

SE1sp I am confident I can complete a transaction using Samsung Pay on my own

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE2sp

I am confident I can complete a transaction using Samsung Pay if a cashier assists me

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE3sp

I feel confident in my ability to complete a transaction with Samsung Pay

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

PU1sp

Samsung Pay improves my overall payment experience

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU2sp

Samsung Pay is an efficient way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU3sp Samsung Pay is a useful way to pay

- 1. Strongly Agree (1)
- 2. Moderately Agree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII1sp

Samsung and/or my mobile provider gave me instructions outlining how to pay using Samsung Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII2sp

Samsung and/or my mobile provider explained the benefits of using Samsung Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII3sp

Samsung and/or my mobile provider prepared me to use Samsung Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI1sp

I feel people who use Samsung Pay have more prestige than those who use other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI2sp

Using Samsung Pay is a status symbol

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI3sp

People who influence my behavior feel I should use Samsung Pay over other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC1sp Paying with Samsung Pay takes less effort than paying with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC2sp

Paying with Samsung Pay is more convenient than my chip card.

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC3sp

It did not take long for me to get used to paying with Samsung Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

P2U1sp I am likely to use Samsung Pay as an alternative to my chip card

- Never (1)
- Almost Never (2)
- Occasionally/Sometimes (3)
- Almost Every Time (4)
- Every Time (5)

P2U2sp When given the choice, I use Samsung Pay instead of my chip card

- Never (1)
- Almost Never (2)
- Occasionally/Sometimes (3)
- Almost Every Time (4)
- Every Time (5)

Frqncy SP In an average week, please estimate how many times you complete a face to face purchase using Samsung Pay.

- (19) _____

---

rank speed SP Please rank the following payment methods for speed with one being the slowest, most time consuming way to pay, and five being the fastest, least time consuming way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Samsung Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

rank c SP Please rank the following payment methods for convenience with one being the least convenient way to pay, and five being the most convenient way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Samsung Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

rank EU SP Please rank the following payment methods for ease of use with one being the most difficult way to pay, and five being the easiest way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Samsung Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

End of Block: Samsung Pay & Ranking Question Block

Start of Block: Android Pay & Ranking Question Block

AP Intro When answering the following questions, please think about your recent experiences when completing in-store or face to face transactions using Android Pay.

SE1ap I am confident I can complete a transaction using Android Pay on my own

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE2ap

I am confident I can complete a transaction using Android Pay if a cashier assists me

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE3ap

I feel confident in my ability to complete a transaction with Android Pay

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

PU1ap

Android Pay improves my overall payment experience

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU2ap

Android Pay is an efficient way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU3ap Android Pay is a useful way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII1ap

Android and/or my mobile provider gave me instructions outlining how to pay using Android Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII2ap

Android and/or my mobile provider explained the benefits of using Android Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII3ap

Android and/or my mobile provider prepared me to use Android Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI1ap

I feel people who use Android Pay have more prestige than those who use other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI2ap

Using Android Pay is a status symbol

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI3ap

People who influence my behavior feel I should use Android Pay over other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC1ap Paying with Android Pay takes less effort than paying with my chip card

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC2ap

Paying with Android Pay is more convenient than my chip card.

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC3ap

It did not take long for me to get used to paying with Android Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

P2U1ap I am likely to use Android Pay as an alternative to my chip card

- Never (1)
- Almost Never (2)
- Occasionally/Sometimes (3)
- Almost Every Time (4)
- Every Time (5)

P2U2ap When given the choice, I use Android Pay instead of my chip card

- Never (1)
- Almost Never (2)
- Occasionally/Sometimes (3)
- Almost Every Time (4)
- Every Time (5)

Frqncy AP In an average week, please estimate how many times you complete a face to face purchase using Android Pay.

- (19) _____

Rank Speed AP Please rank the following payment methods for speed with one being the slowest, most time consuming way to pay, and five being the fastest, least time consuming way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Android Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

Rank C AP Please rank the following payment methods for convenience with one being the least convenient way to pay, and five being the most convenient way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Android Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

Rank EU AP Please rank the following payment methods for ease of use with one being the most difficult way to pay, and five being the easiest way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Android Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

End of Block: Android Pay & Ranking Question Block

Start of Block: Apple Pay & Ranking Question Block

Apple Pay Intro When answering the following questions, please think about your recent experiences when completing in-store or face to face transactions using Apple Pay.

SE1apple

I am confident I can complete a transaction using Apple Pay on my own

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE2apple

I am confident I can complete a transaction using Apple Pay if a cashier assists me

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

SE3apple

I feel confident in my ability to complete a transaction with Apple Pay

- 1. Not at all confident (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10. Totally confident (10)

PU1apple

Apple Pay improves my overall payment experience

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU2apple

Apple Pay is an efficient way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PU3apple

Apple Pay is a useful way to pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII1apple

Apple and/or my mobile provider gave me instructions outlining how to pay using Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII2apple

Apple and/or my mobile provider explained the benefits of using Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

PII3apple

Apple and/or my mobile provider prepared me to use Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI1apple

I feel people who use Apple Pay have more prestige than those who use other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI2apple

Using Apple Pay is a status symbol

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SI3apple

People who influence my behavior feel I should use Apple Pay over other forms of payment

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC1apple Paying with Apple Pay takes less effort than paying with my chip card.

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC2apple

Paying with Apple Pay is more convenient than my chip card.

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

SC3apple

It did not take long for me to get used to paying with Apple Pay

- 1. Strongly Disagree (1)
- 2. Moderately Disagree (2)
- 3. Somewhat Disagree (3)
- 4. Neutral (4)
- 5. Somewhat Agree (5)
- 6. Moderately Agree (6)
- 7. Strongly Agree (7)

P2U1apple I am likely to use Apple Pay as an alternative to my chip card

- Never (1)
- Almost Never (2)
- Occasionally/Sometimes (3)
- Almost Every Time (4)
- Every Time (5)

P2U2apple When given the choice, I use Apple Pay instead of my chip card

- Never (1)
- Almost Never (2)
- Occasionally/Sometimes (3)
- Almost Every Time (4)
- Every Time (5)

Frqncy-apple In an average week, please estimate how many times you complete a face to face purchase using Apple Pay.

- (19) _____

Rank speed apple Please rank the following payment methods for speed with one being the slowest, most time consuming way to pay, and five being the fastest, least time consuming way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Apple Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

Rank - C apple Please rank the following payment methods for convenience with one being the least convenient way to pay, and five being the most convenient way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Apple Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

Rank - EU apple Please rank the following payment methods for ease of use with one being the most difficult way to pay, and five being the easiest way to pay.

_____ Cash (1)

_____ Check (2)

_____ Swiped Credit/Debit Card (without chip) (3)

_____ Apple Pay (4)

_____ Dipped Credit/Debit Card (with chip) (5)

End of Block: Apple Pay & Ranking Question Block

Start of Block: Demographic Question Block

*

Dem1 What year were you born?

_____

*

Dem2 What is your five digit zip code?

_____

Dem3 What is your gender?

- Male (1)
- Female (2)

Dem4 What is your approximate annual income?

- Less than $10,000 (1)
- $10,000 - $19,999 (2)
- $20,000 - $29,999 (3)
- $30,000 - $39,999 (4)
- $40,000 - $49,999 (5)
- $50,000 - $59,999 (6)
- $60,000 - $69,999 (7)
- $70,000 - $79,999 (8)
- $80,000 - $89,999 (9)
- $90,000 - $99,999 (10)
- $100,000 - $149,999 (11)
- More than $150,000 (12)

Dem5

What is the highest level of education you have completed or the highest degree you have received?

- Less than high school (1)
- High school graduate (2)
- Some college (3)
- 2 year degree (4)
- 4 year degree (5)
- Professional degree (6)
- Doctorate (7)

End of Block: Demographic Question Block

Start of Block: Verification Block

Q54

To receive credit for this survey, please return to Mechanical Turk and enter the following code:

First initial, last initial, 2017

(for example, if your name is Albert Brown, enter AB2017)

End of Block: Verification Block

APPENDIX E: IRB SUBMISSION

Protocol for Study: The Unintended Consequences of Industry Mandates: How EMV is Changing the U.S. Payments Landscape

1) Abstract of the study

The migration to the newly mandated EMV payment technology in the U.S. has been a point of contention for most payments industry stakeholders including cardholders, merchants, point of sale vendors, and payment processors. Because of this contention, there has been a rise in the use of mobile payment technologies. The goal of this study is to identify the key factors of the migration that are driving this increase in an effort to identify certain market conditions that lead to the abandonment of the mainstream technology and the acceptance of an alternative.

2) Protocol Title

The Unintended Consequences of Industry Mandates: How EMV is Changing the U.S. Payments Landscape.

3) Investigators

David Schuff, Department of Management Information Systems, Fox School of Business

Jessica Thrasher, DBA Student, Fox School of Business

4) Objectives

Goal:

- Understand what factors influence a cardholder to abandon chip technology.
- Understand what factors influence a cardholder to accept mobile payment technologies in favor of chip cards.

Example of Propositions:

P1. Attitude towards chip technology is positively associated with switching costs away from chip technology. When a cardholder's attitude toward chip technology is negative, his or her perceived switching costs are lower.

P2. Attitude towards new payment technology is negatively associated with switching costs away from chip technology. When a cardholder's attitude toward mobile payment technology is positive, his or her perceived switching costs are lower.

P3. Attitude towards chip technology is negatively associated with propensity to abandon. When a cardholder has a negative perception of chip cards, the individual is more likely to abandon

this existing technology for an alternative mobile payment technology.

5) Rationale and Significance

For as long as U.S. cardholders can remember, they have been swiping their cards. Security concerns and the payment industry's request for a global standard led to the migration to chip cards. The U.S. is one of the last countries to adopt the global standard due to its unique banking industry. Unlike other countries, the U.S. did not engage in government sponsored campaigns to educate cardholders about why and how to use the new cards. In addition, card accepting merchants were equally in the dark, creating a vulnerable payments market. As a result, technology giants such as Apple, Google, and Samsung decided to enter the payments space with alternative technologies that changed the way consumers can pay for goods by replacing the need for a physical card with a mobile phone.

This research leverages the existing TAM (technology acceptance model) and switching cost theories to identify the conditions in which the abandonment of an existing technology is likely and when an alternative technology is most likely to be adopted. Although there is a wealth of prior research available on

technology acceptance, technology abandonment has received little attention.

This research has multiple practical and theoretical implications. From a practitioner standpoint, we investigate how a disruption can create opportunities for alternative technologies to gain market share. In addition, we explore factors of which practitioners should be mindful when introducing mandated technologies.

6) Resources and Setting

The two investigators involved with this study actively participated in the design of this protocol. They are familiar with the instruments and the experimental procedure.

Participation in the study requires completing a short online questionnaire regarding their experience using both chip cards and mobile payment technologies.

7) Prior Approvals

N/A

8) Study Design

a) Recruitment Methods

We estimate 2,000 participants will be needed. Subjects will be recruited using Amazon Mechanical Turk (AMT).

AMT is a platform for matching workers with small, discrete tasks. Since no specific skills are required for this task and the task is simple and non-invasive, AMT is an appropriate source for this study.

b) Inclusion and Exclusion Criteria

This study is limited to residents of the United States who are fluent in English. We plan to enforce a threshold level of previous successful participation on AMT (i.e. 50 previously completed tasks with a 99% approval rate). In addition, participants must have experience paying with both a chip card and a mobile payment technology such as Apple Pay, Android Pay, and/or Samsung Pay.

c) Study Timelines

- We estimate the entire survey will require approximately 15 minute to complete.
- Participation is open to anyone that meets the AMT threshold, but participants are limited to completing the survey one time.
- The entire study is expected to be completed by the end of February, 2017. The first round of data collection will be completed by the end of January, 2017.

d) Study Procedures and Data Analysis

Subjects will complete the online questionnaire through AMT, and the entire procedure should take approximately 15 minutes.

Subjects will also be asked for some basic demographic information, including age and gender. Subjects will not be asked for their name, although the AMT service records this for the payment process. Their information will be anonymously recorded (by a unique identifier) in a secure database. Their name will NOT be stored in the database.

e) Withdrawal of Subjects

Subjects may withdraw from the study simply by ending the task early. No contact with the investigator is required.

There are no circumstances where a participant will be removed from the study without his or her consent.

f) Privacy & Confidentiality

- The study will not use or disclose subjects' personal health information (PHI).
- The data will be stored on a password-protected computer, and there will be no personally-identifiable information in the data set.
- The study results will be presented in aggregate form in working and completed research papers. The results will not be able to be traced back to individual responses.

- We will make sure the subjects are aware that we will anonymize the data so that individual responses cannot be linked back to their name.
- We will explain this during recruitment, on the consent form, and on the instrument.

9) Risks to Subjects

There are no risks to subjects in this study.

10) Potential Benefits to Subjects

Aside from the payment participants will receive for completing the survey, there is no direct benefit.

11) Costs to Subjects

None

12) Informed Consent

The informed consent will be obtained via qualification through Amazon Mechanical Turk. Qualification is an Amazon Mechanical Turk feature that enforces a requirement that a worker has to meet in order to be assigned the task. Consent will take place as qualification before they can complete the task.

- It will be made clear during the consent process (before a subject signs the consent form) that participation is optional and they can leave at any time.
- The study will be explained during the consent process (before they acknowledge their consent through the online form). Participants will be told that they will be answering questions regarding their opinions of two face to face payment solutions: chip cards and mobile payment technologies.

13) Vulnerable Populations

N/A. This research will not include any of the following

populations:

- Adults unable to consent
- Individuals who are not yet adults (infants, children, teenagers)
- Pregnant women
- Prisoners