

Contactless payments: the logjam and how to break it

Whitney Braunstein, Iulian Pogor, Tal Snir, Michael Plasmeier, Maya Bustan

Executive Summary

Early experimentations in payments through RFID technology yielded extremely successful results. The speed and convenience characterizing contactless payment was beneficial to both merchants and card holders and RFID technology was considered as the next milestone in the evolution of payments.

Nonetheless the contactless credit cards have yet to live up to their promise. Despite clear advantages in the form of convenience, security and improved loyalty, contactless credit cards are struggling to reach the hoped-for momentum.

On the card holders side we've identified the perceived security, perceived usefulness and consumer awareness as the main logjams standing in the way of the contactless technology. Substantial parts of the population fail to understand the benefits of this new technology. Furthermore, according to one survey by Forrester Research, 41% of credit card users are completely unaware of this technology. There is some negative awareness due to past industry security and implementation mistakes.

On the merchant's side of the network, the cost for upgrading the infrastructure with RFID terminals deters merchant adoption of contactless credit-card processing technology. Despite all major card associations launching their version of contactless cards five years ago, only 1% of merchants in the US can process contactless cards.

Our research discovered that while the contactless credit cards are yet to become a staggering success, the card associations, as well as other disruptive players, are already experimenting the next generation of payment technology.

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Introduction to the contactless technology

July 1997, Mobil's management team was preparing for the launch of Speedpass, the company innovative device for electronic payment.¹ That was the end of a two years development journey of a new contactless device for gas pumps. The journey began when one of Mobil's junior employees was inspired from the payment method of a new toll road in Dallas and realized that the same technology could be used at the gas pump.

Speedpass was a key-size transponder that was attached to the keys chain or mounted on the rear window of a vehicle. As the vehicle parked next to a gas pump in one of Mobil's gas station, the pump initiated a bits based verification and identification process over the internet and proprietary networks. By the time the driver turned off the engine and left the vehicle, the pump was already activated and ready. The driver left the station with a full tank without reaching to his wallet.

Mobil was one of the most notable early adaptors of the RFID technology; two years after launch, Speedpass had 2 million customers. Studies showed that Speedpass holders were twice as loyal as cash or credit cards payers; the average Speedpass holder made one more fill-up per month than the non-Speedpass holder.

Speedpass' success caught the attention of the MasterCard and Visa who were intrigued by that new method of payment. In 2002, MasterCard introduced *PayPass*, its own RFID based contactless card in a controlled pilot in Orlando, Florida. MasterCard partnered with Chase and Citibank for a 9 months market trial that included over 16,000 card holders and 60 merchants. The trial proved to be a great success: The transaction volume of PayPass card holders rose by 23% while the total weekly spend increased 28%.² MasterCard saw clear evidence that consumers were using their PayPass cards where they once would have used cash. In addition, PayPass customers were pulling out their PayPass cards instead of other payment cards, growing MasterCard's market share of card transactions by 12%. 80% of PayPass transactions were below

¹ <http://www.networkworld.com/news/1999/0125mobil.html>

² http://www.mastercard.com/za/merchant/en/solutions_resources/paypass

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\$25, with an average transaction around \$21. In some locations, MasterCard PayPass reduced purchase times so substantially that retailers were able to support additional transactions and thus potentially increase revenues.

Encouraged from the trial results and inspired by the potential of the contactless option MasterCard started to mass market PayPass in 2005. Soon after, all other major credit card associations introduced their own version of contactless card: Visa under the name *PayWave*, American Express *ExpressPay*. Chase, one of the banks issuing contactless cards, added its brand *Blink* to the cards. Discover recently announced its contactless cards under the name *Zip*.

However, recent numbers show relatively low adoption rate of the contactless technology. Only 80,000 merchants in the US, less than 1% of all merchants installed contactless terminals. While 25% of all issued cards are contactless, the actual share of contactless transactions is significantly lower. The complex structure of the credit card market, the six-sided network that involves banks, card associations, merchants, consumers, and terminal manufacturers and the mixed incentives that accompany that complicated network, slow the penetration rate of contactless technology.

Players and incentives

Consumers

- **Speed and convenience** – The contactless chip is not limited to the current debit or credit card form factor and can come in the form of a mobile phone sticker, as the example of Bling Nation, or as an attachment to the keys ring. The flexible form of the device allows the consumers to make their purchases quickly and conveniently without reaching out to their wallets or purses and look for the cash or card.
- **Safety and Security**
Contactless chip cards have the potential to be more secure than magnetic strip cards. When properly implemented, communication between the card and the terminal is encrypted, or at least contains a dynamic-varying number. Furthermore, due to the inherited nature of the contactless payment, the consumer never needs to let go of the card or pass it to someone else. That reduces the risk of misplacing the card or leaving it unattended.

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Merchants

- **Decreased transaction time leads to lower operating costs**

Aite Group tests have shown that contactless transactions cards are 44 percent faster than cash transactions.³ Faster transactions mean shorter lines at checkout and higher customers' satisfaction is translated into loyalty. Furthermore, payment cards replace the costs associated with handling cash. A recent study done by McKinsey showed that the real cost of cash transaction is 1.3%, offsetting about half the average transaction fees paid to the issuers and card associations.

- **Increase in average spend**

American Express experiments in CVS stores showed that customers spend 20-30% more with their contactless cards than with cash.

Issuers

- **Massive growth potential**

96% of all transactions are cash-based, meaning huge growth opportunity for the issuers to gain market share from cash.

- **Top-of-wallet patterns**

The competition among issuers is fierce – with the average American holding between 3-4 cards, the market is highly saturated.⁴ Studies show that the contactless feature improves loyalty: 77% of consumers with a contactless card use it as their primary form of payment.⁵

Consumer perceptions surrounding contactless payments

One of the logjams to the success of widespread adoption of contactless payments is lack of demand on the part of the consumer. Consumers, as the potential users of the technology, are necessary to create the six-sided network. Without a strong base of consumers who want to use contactless cards as a form of payment, merchants are not incentivized to convert to the new hardware and payment systems.

³ Aite Group, LLC. "Contactless Payments and NFC in the United State: Beyond Science Fiction." January 2008.

⁴ <http://www.bos.frb.org/economic/ppdp/2009/ppdp0910.pdf>

⁵ Morea, Dom; "Contactless Payments: The 'Tipping Point' Is At Hand"; First Data; January, 2010. <http://www.firstdata.com/downloads/thought-leadership/fd-contactless-payment-wp.pdf>

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There are three main reasons why consumers have not converted to the contactless payment system.

- 1) They are concerned about the security of the data on the cards
- 2) They are unfamiliar with the contactless payment option
- 3) They do not perceive any significant benefit to using a new system

Security

At the outset, there were stumbling blocks when the technology was first launched. Visa and MasterCard did not require that individual banks implement strong security standards when the cards launched, even though the cards bore their name. Some of the first cards issued in 2005, had absolutely no security on the card itself.⁶ Researchers at the University of Massachusetts at Amherst, were able to read the cardholder's name, credit card number, and expiration date using a \$20 reader while standing next to a contactless card holder in line for the elevator. Coupled with that person's address, they were able to make purchases in that person's name at certain web retailers. The hack was featured on NBC's Today show, watched by millions of Americans, as well as hundreds of other news outlets.

Although the researchers found that some cards made a greater attempt at security; this fact was left out of the news reports. The fear is that the data will then be used either in identity theft or for financial fraud. Although, the industry has assumed liability for fraud, consumers still perceive a lot of time and stress associated with resolving identify theft or fraud. Since then, the card issuers have improved on-card security somewhat.

Familiarity

Consumers are unfamiliar with contactless payments and how they work. There is not only a perception problem; there is a much more serious awareness problem. 41% of online credit card users in the United States are completely unaware of contactless payments and, surprisingly, the number climbs to 56% when the survey population is limited to the tech-savvy

⁶ Vulnerabilities in First-Generation RFID-enabled Credit Cards.

Thomas S. Heydt-Benjamin, Dan V. Bailey, Kevin Fu, Ari Juels, and Tom OHare. In Proceedings of Eleventh International Conference on Financial Cryptography and Data Security, Lowlands, Scarborough, Trinidad/Tobago, February 2007. <http://www.cs.umass.edu/~kevinfu/papers/RFID-CC-LNCS.pdf>

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18-24 age bracket.⁷ Card companies have already issued an estimated 100 million cards with contactless chips. Because of each company uses a different brand, with the contactless logo in a discreetly position on the back of the card most people are unaware that they already have the technology in their wallets.

In addition, it is difficult to specifically sign up for a contactless card. In a test conducted by the authors, we had to visit several sites before being allowed to apply for a contactless card.⁸

One common misconception is that RFID cards can be read automatically and perfectly from across the room. This is not the case. In the real world, the tags cannot be generally read at a distance of more than one foot. In fact, as one implements more security, the effective read distance decreases. This is because tags with encryption chips require substantially more power than tags that simply return an ID, and must be closer to the readers. In order for an RFID card to be read from across the room, it requires a specialized antenna and a highly trained operator. We believe that consumers think that they can be identified or charged without their knowledge from across the room. The industry must make it clear that they will only charge people when consumers “tap” their card to a reader, not when they enter a room.

Regular Use

Once consumers realized that contactless does exist and that they do have access to the technology, they need to overcome their apprehensions about using it. Consumers are unsure of how to begin using the contactless payment system. They are less likely to try the technology because they don't know if there is a set-up process before they can begin to use it, and what specifically they must do. Some card issuing companies are addressing the latter problem by concentrating their distribution of contactless-enabled cards to areas where there is already a public transit system that uses contactless payments, believing that those populations will already be comfortable using a tap-and-go system.

⁷ Kountz, Edward; “Driving A Contactless Network Effect In The US”; Forrester Research, Inc; October, 2009

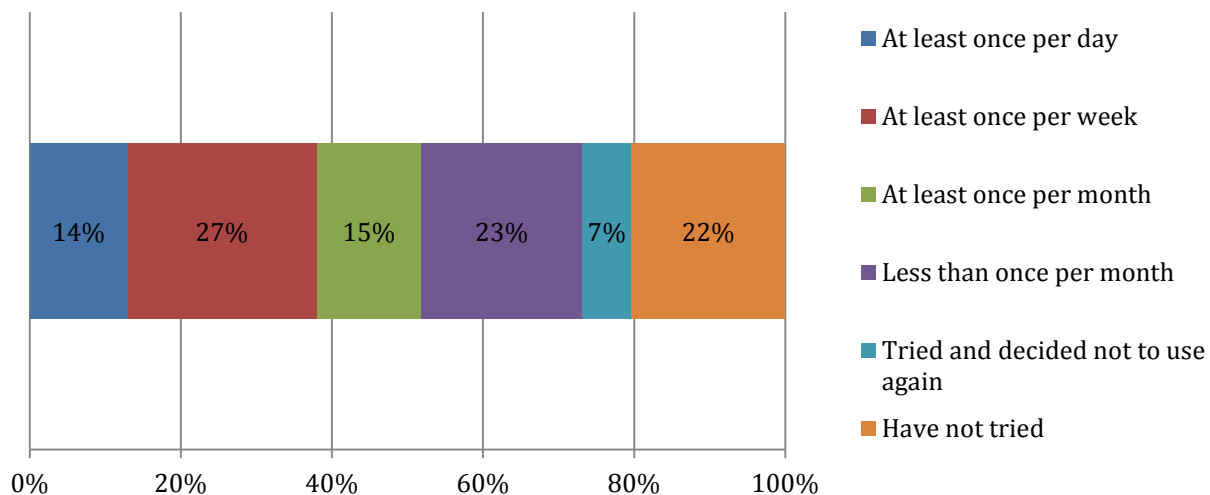
⁸ <http://www.economicsofinformation.com/2010/12/whither-contactless-payment.html>

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In a Forrester study of online shoppers who were aware that they had received a contactless credit card, 22% had never tried to make a contactless payment. 7% had tried and decided not to use the process again.⁹

67% of online shoppers who are aware they have received a contactless card are either low frequency users or have not even tried to make a contactless payment.



Kountz, Edward; [Driving A Contactless Network Effect In The US](#); Forrester Research, Inc.; October, 2009

Merchants and Infrastructure

Merchants perceive a high cost of installing and using the system. A constantly growing list of major US retailers, which include McDonald's, CVS, BP America, and 7-Eleven have deployed contactless readers at some or all of their locations. However, they represent only a very small percentage of merchants. Small businesses run on margins that often do not allow for large capital outlays or additional transaction fees. Merchants are also unsure of the potential benefits of providing contactless payments. If the system does replace cash, then the volume/value of sales would have to increase enough to cover the cost of installation and training as well as the fees levied by the card issuers.

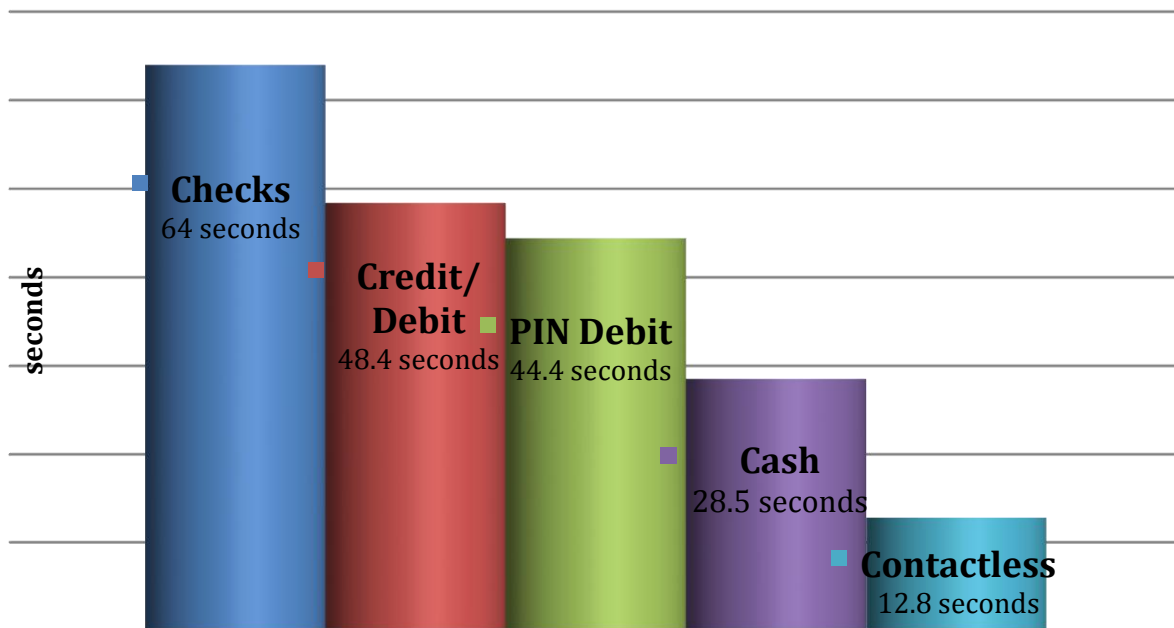
⁹ Kountz, Edward; [Driving A Contactless Network Effect In The US](#); Forrester Research, Inc.; October, 2009

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Businesses that would benefit the most from tap-and-go technology are those that have peak loads when reducing queue time is essential to customer satisfaction and increasing throughput, especially if the sales are predominantly under the validation threshold. According to Aite Group, “Contactless payments are measurably faster than other forms of payment transactions; on average twice as fast as cash transactions.” Aite Group’s researchers analyzed the average tender times (from point of “cashier total” to point of completion), in seconds, for different payment media. The results [in seconds per transaction time]¹⁰:

Average transaction time by category



One reason why merchants can expect an uptick in sales dollars are based on the shift away from cash. Although providing tap-and-go payment will distinguish them from their competitors, the deeper reason merchants will see more frequent purchases is because using this new payment system creates a mental barrier between the customer and the dollars they spend.¹¹ By distancing

¹⁰ Aite Group, LLC. “Contactless Payments and NFC in the United State: Beyond Science Fiction.” January 2008.

¹¹ Soman, Dilip; “The Effect of Payment Transparency on Consumption: Quasi-Experiments from the Field”; Marketing Letters; October, 2003

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consumers from cash, the card issuers are reducing the pain felt by customers at each transaction. Contactless encourages this shift from cash to non-cash payment methods. Also, the merchant can use the data obtained from the sales to make better decisions about inventory management, customer loyalty programs, and marketing devices.

Although merchants can upgrade their existing point of sale infrastructure (POS) to accept contactless payments, the requirements are sufficiently complex that many merchants choose to wait to install contactless readers and related devices till their next regularly scheduled POS refresh. This delays the roll-out process.

The future of RFID payments

Although the credit card form factor has not taken hold in the industry, other form factors still hold promise. Currently, several vendors, including Visa, and startup Bing Nation, have introduced contactless payment stickers. These stickers can add payment capabilities to a mobile device or any other object the user choose. Stickers issued by credit card companies, use the same merchant infrastructure as credit-card sized tags.

In addition, many phone manufactures are building RFID into cell phones, under the name NFC (Near Field Communication). Nokia has had prototype phones with NFC for several years, and has repeatedly promised that all future phones will come with NFC.¹² Google has recently announced that Android 2.3 and the Nexus S will enable NFC.¹³ Apple has filed for patents surrounding NFC and mobile payments.¹⁴

¹² <http://www.nearfieldcommunicationsworld.com/2010/06/17/33966/all-new-nokia-smartphones-to-come-with-nfc-from-2011/>

¹³ <http://www.readwriteweb.com/mobile/2010/12/nexus-s-can-support-mobile-payments-with-nfc-android-soon.php>

¹⁴ http://www.readwriteweb.com/archives/apple_hires_nfc_expert_mobile_payments_coming_to_iphone.php