Contactless Payments: Delivering Merchant and Consumer Benefits

A Smart Card Alliance Report

Publication Date: April 2004

Publication Number: PT-04002

About the Smart Card Alliance

The Smart Card Alliance is the leading not-for-profit, multi-industry association of member firms working to accelerate the widespread acceptance of multiple applications for smart card technology. The Alliance membership includes leading companies in banking, financial services, computer, telecommunications, technology, health care, retail and entertainment industries, as well as a number of government agencies. Through specific projects such as education programs, market research, advocacy, industry relations and open forums, the Alliance keeps its members connected to industry leaders and innovative thought. The Alliance is the single industry voice for smart cards, leading industry discussion on the impact and value of smart cards in the U.S. For more information, visit www.smartcardalliance.org.

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Executive Summary

Consumers Benefit from Contactless Payment

Millions of U.S. consumers are already paying for purchases using contactless payment, with millions more expected this year as new financial industry-backed contactless payment initiatives are launched nationwide. Consumers love the convenience and speed of paying with a contactless card or fob—no more fumbling for cash, counting change, or worrying about whether they have enough cash for a purchase. In many cases, consumers also don't need to sign a payment card receipt or enter a personal identification number (PIN). While paying with a payment card but through a contactless interface may appear to be a minor difference, the impact on today's busy consumer is significant.

Both MasterCard International and American Express have been conducting contactless payment pilots in the United States and have reported strong consumer approval. These pilots use radio frequency (RF) communication between a contactless device and a point-of-sale (POS) terminal to transmit consumer payment information. The speed, convenience, and control of contactless payment transactions result in consumers favoring the contactless payment device and the merchants accepting contactless transactions.

Other contactless payment initiatives (for example, U.S. transit systems and ExxonMobil Speedpass) have reported similar positive consumer reactions.

Merchants Benefit from Contactless Payment

Contactless payment is particularly attractive in merchant segments where speed and convenience of payment are essential (for example, quick-service restaurants, gas stations, convenience stores, parking facilities, transit services, entertainment venues, and unstaffed vending locations).

Merchants may realize a number of benefits from contactless payment:
- Fast transaction times move customers more quickly through the payment process.
- Increased customer spending, increased frequency of purchases, and increased customer loyalty increase revenues.
- Reduced cash handling, improved payment terminal reliability, and streamlined payment processes improve operational efficiency and reduce operating costs.

The new contactless payment initiatives in the United States also offer merchants opportunities to increase differentiation and customer satisfaction in highly competitive retail markets.

Contactless Payment Delivers a Positive Business Case

Merchants can implement a contactless payment solution quickly and easily and start accepting the contactless payment cards and fobs that are now being issued. American Express, MasterCard, and Visa have standardized on a single contactless payment standard in the United States, ISO/IEC 14443, and are implementing or recommending a contactless payment approach that leverages the existing payments infrastructure. What this means is that merchants can easily add a contactless RF payment terminal to their existing POS systems and start accepting contactless payment. The business case for certain merchant segments shows significant increases in revenue with a modest investment.

Merchants who can benefit from faster transaction speeds and increased consumer convenience should assess the business case for upgrading POS systems to support contactless payment, along with traditional magnetic stripe payment. The combination of positive consumer experience, standards-based technology, use of the existing payments infrastructure, and support from major financial industry players offers compelling business drivers for contactless payment. In 2004, merchants can take advantage of the nationwide rollout of financial payments industry-backed contactless payment solutions to create a strategic competitive advantage and increase sales.

About This Report

This report was developed by the Smart Card Alliance to discuss merchant benefits and the business case for implementing contactless payment in the United States. This report provides answers to commonly asked questions about contactless payment, such as:

- What merchant segments can benefit most from contactless payment?
- What financial organizations in the United States are supporting contactless payment?
- What are the benefits and business case for adopting contactless payment?
- What does a merchant need to do to implement contactless payment at the point of sale?
- Are there issues for merchants to consider in a contactless payment implementation?

Contactless Payment: Overview

The latest buzz in retail payment applications is contactless payment. Contactless payment is already being used in Asia, Europe, and North America. Contactless payments can include account-based payment, traditional credit or debit card payment, and even stored value payment. American Express, JCB, MasterCard, and Visa have all conducted pilot programs for contactless payment. Major cities around the world already use contactless cards for transit payment, with many major cities in the United States also implementing or planning to implement contactless card-based automatic fare collection (AFC) systems.[1]

Consumers are already using a number of contactless payment options in a variety of situations. Consumers purchase gasoline, fast food, and groceries using ExxonMobil Speedpass™. They pay millions of dollars in tolls and fares using E-ZPass™ and similar transit and toll payment systems. What consumers value most about contactless payment is the speed and convenience offered by these "touch-and-go" or "pay-with-a-wave" payment devices.

American Express, MasterCard and Visa have introduced contactless payment methods that help to standardize the technology and provide a reliable solution that can be easily used by consumers and cost-effectively implemented by merchants and acquirers. Both MasterCard *PayPass*™ and American Express ExpressPay™ implementations and Visa contactless specifications rely on the existing credit/debit card infrastructure to process contactless payment transactions. These payments typically replace cash or debit transactions, although they also replace low-value credit transactions.

According to Ariana Michele-Moore of the U.S.-based research firm Celent Communications, three market segments are particularly ripe for the introduction of contactless payment: fast food restaurants, movie theaters, and video stores. These segments generated $160 billion in sales in the United States in 2002, of which almost 95% were cash sales. According to Michele-Moore, by 2007 contactless devices will account for 8% of the market represented by these three segments.[2]

Currently, contactless payment devices use multiple form factors, ranging from traditional plastic cards to key fobs, watches, and mobile phones. ExxonMobil Speedpass and American Express ExpressPay use key fobs; ExpressPay will be available in card form in the near future. MasterCard *PayPass* is available as a card and was also piloted in Nokia mobile phones in the Dallas-Fort Worth metropolitan area. JCB is currently piloting a mobile phone in Japan that can be used for purchases at vending machines, train stations, corporate cafeterias, and entertainment venues. Visa has conducted contactless payment pilots using mobile phones in Asia and mini-cards with Bank of America in the United States. MasterCard anticipates that issuing banks will choose different form factors for competitive differentiation in various markets.[3]

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[1] See Appendix A for a description of contactless payment initiatives in process at U.S. transit agencies.

[2] Don Davis, "The Rush to Contactless Payments," *Card Technology*, January 2, 2004.

[3] Interview with Betsy Foran-Owens, Vice President, Product Services, MasterCard International, February 13, 2004.

ExxonMobil Speedpass

Speedpass, introduced by ExxonMobil in 1997, was the first automated payment system to adopt radio frequency (RF) technology to help consumers make retail purchases. Today, over 6 million Speedpass customers frequent 8,500 Exxon- and Mobil-branded locations around the world. Over 92% of Speedpass users report a high level of satisfaction.[4]

ExxonMobil Speedpass resulted from a 1993 Mobil study that concluded that convenience, friendly service, and recognition of loyal customers create consumer loyalty and increase spending. The benefits of contactless payment to the consumer are straightforward: no foraging for change or bills, no handling of credit cards, no paper receipt to sign or keep track of, and no personal identification number (PIN) to enter or remember. In general, the entire transaction is faster and the customer is in control at all times.[5]

Motorists enrolled in Speedpass use a key fob, a watch, or a transponder affixed to a vehicle's rear window to communicate securely with a gas pump or point-of-sale (POS) terminal. A reader integrated into the pump or terminal sends a signal to the customer's device, which replies with a unique identification code that is linked to the customer's account. Payment is then authorized, and the pump is activated or a purchase can be made at the convenience store. Consumers do not pay for the Speedpass device, and there is no consumer service charge for using it.

Speedpass has recruited key merchants in other sectors (such as grocery stores and quick-service restaurants) to use the payment technology. For example, selected Stop & Shop supermarkets in the Boston area began using Speedpass in 2002 for payment, coupons, and a loyalty program.

In December 2002, ExxonMobil Speedpass and Timex® introduced products incorporating the Speedpass transponder into 8 different versions of Timex watches. The watches look and function like regular watches, with the added feature of allowing customers to pay at locations accepting Speedpass.[6]

Purchases of gasoline by customers at Exxon and Mobil service stations increased by 15% after customers became Speedpass users, resulting in a sales lift of 4%.[7] (Sales lift is measured by comparing total gallons sold during the 12 months before implementing Speedpass with total gallons sold during the 12 months after Speedpass was implemented at each location.) The increase represents one additional gas purchase per month per Speedpass customer.

MasterCard PayPass

MasterCard *PayPass*™ is a new contactless payment program that provides consumers with what MasterCard calls "The Simpler Way to Pay™." Consumers tap or wave a payment card or other *PayPass* device on a specially equipped merchant terminal, eliminating the need to swipe a card through a reader. The *PayPass* solution, introduced in 2002, targets quick payment environments where speed is essential, such as quick-service restaurants, gas stations, drug stores, supermarkets, and movie theaters. After

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4 *Texas Instruments RFID eNews*, Issue No. 14, November/December 2002.
5 Amy Cortese, "Toolbooth Technology Meets the Checkout Lane," *New York Times*, July 7, 2002.
6 See Speedpass Web site, www.speedpass.com.
7 Matthew Miller, "Received Wisdom," *CommVerge*, November 1, 2002.

successful pilots in Orlando, Florida, and Dallas, Texas, MasterCard is now proceeding with plans for MasterCard *PayPass* deployments in additional locations and is planning to start broader consumer deployments in several U.S. markets in 2004.[8]

MasterCard International recently concluded a *PayPass* trial in Orlando, Florida with Chase, Citibank, and MBNA, that involved more than 60 retail locations and 16,000 cardholders.[9] *PayPass* cardholders used their *PayPass* cards 23% more often than during the same period a year earlier, and the dollar value of their purchases (including purchases made using magnetic stripe technology) increased by 28%.[10] *PayPass* usage continues to expand in Orlando.

PayPass also moved customers through checkout lanes more quickly. The most significant time savings have been recognized in the drive-through environment, where *PayPass* shaved between 12 to 18 seconds off the purchase time as compared to cash. (According to former McDonald's CEO Jack Greenberg, unit sales jump 1% for every 6 seconds saved in drive-through lanes.)[11]

In Dallas, Texas, MasterCard incorporated *PayPass* into Nokia mobile phones. A contactless chip and an RF circuit were embedded into the Nokia SmartCover phone. The chip was programmed with MasterCard payment account information. Initial results from the Dallas trial reinforce the conclusion that speed and convenience are the leading consumer benefits of contactless payment.

The *PayPass* card uses an RF payment device conforming to the ISO/IEC 14443 standard to transmit payment information securely from the card to the merchant terminal. This device eliminates the need for a merchant to swipe the card through a reader, allowing the cardholder to remain in control of the card and decrease transaction time.

In North America, where the majority of transactions are authorized online, the payment application data is based on the magnetic stripe information with additional security data. In regions where EMV[12] smart cards predominate, a *PayPass* purchase can be conducted leveraging MasterCard M/Chip™, MasterCard's smart card credit and debit payment application. MasterCard has published *PayPass* M/Chip specifications that allow MasterCard smart cards to be handled across a contactless interface. These MasterCard *PayPass* cards can facilitate both contact and contactless payments from a single smart card.

Implementation of *PayPass* is straightforward. *PayPass* uses standard credit card data for the payment transaction, leveraging the existing magnetic stripe-based payments infrastructure. Using Track 1 and Track 2 data allows merchants to retrofit current magnetic stripe POS terminals cost effectively to accept *PayPass* cards.

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[8] Interview with MasterCard International, op.cit.
[9] Ibid.
[10] Don Davis, op.cit.
[11] Ibid.
[12] Europay MasterCard Visa (EMV) specifications define a set of requirements to ensure interoperability between payment chip cards and terminals.

PayPass has been used successfully at a variety of merchant locations.[13]

At the Pump. Consumers can use MasterCard *PayPass* at selected Chevron locations in Orlando, where gas dispensers are equipped with antennas and new POS terminals. The antenna powers the MasterCard *PayPass* chip, enabling the chip to transmit account information to the terminal. Transaction information is then converted into magnetic stripe format. The MasterCard *PayPass* POS application is supported without requiring significant modifications to the software at the gas dispensers.

At the Movie Theater. At the Loews Universal Cineplex in Orlando, *PayPass* customers purchase movie tickets by tapping their cards on the cashier's glass window. Behind the glass window, a *PayPass*-enabled POS terminal captures the data, converts it to magnetic stripe format, and completes the transaction using the existing payments infrastructure. The same card can be used at the theater's concession stands.

At the Drive-Through. MasterCard *PayPass* allows consumers to pay by tapping or waving the PayPass card at the menu order board at quick-service restaurant drive-through lanes rather than at the cashier window. When the customer drives to the cashier window, the cashier hands over the receipt instead of asking for payment. This eliminates the time required to deal with cash or process a magnetic stripe transaction and reduces the overall time for the customer's drive-through experience.

Inside Quick-Service Restaurants and Convenience Stores. *PayPass* is being used in select McDonald's restaurants and Chevron convenience stores in Orlando. *PayPass* helps move customers through lines more quickly in these high-traffic environments, since it offers a more convenient payment process. Customers simply tap, rather than swipe their card.

At Retail Locations. MasterCard has also deployed contactless payment solutions at general retail establishments such as Eckerd, Ritz Camera, and Boater's World. Merchants can accept *PayPass* without significantly modifying their POS hardware.

By the end of 2004, MasterCard expects there to be millions of *PayPass* cards in the United States.[14]

ExpressPay from American Express[15]

ExpressPay from American Express is a contactless payment initiative that offers a quick and convenient way to make everyday purchases. ExpressPay uses a contactless smart chip built into a key chain attachment. American Express is piloting ExpressPay in Phoenix, New York City, and Singapore.

ExpressPay is an easy-to-use alternative to cash for making purchases in merchant segments where speed and convenience are important, such as quick-service restaurants, supermarkets, drug stores, gas stations, and

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[13] MasterCard Fact Sheet, available at www.paypass.com/press.html

[14] "MasterCard Orders Pay-With-A-Wave Chips," CTWeekly, December 10, 2003.

[15] "American Express expands availability of new 'contactless' payment product designed to make everyday purchases quick and easy," American Express press release, July 16, 2003.

corporate cafeterias. To make a purchase, users simply hold the key fob next to a contactless reader. The payment information is passed from the fob to the reader in milliseconds. Payment is authorized via the existing magnetic stripe payments infrastructure, and no signature is required.

When consumers enroll in ExpressPay, they select the account to be used for transactions. Consumers have two options for funding ExpressPay:

- ExpressPay Direct Link carries a daily spending limit of $150 and links to an American Express charge or credit card for payment. Individual charges are recorded directly on the cardholder's monthly billing statement.
- ExpressPay Pre-Loaded can be prepaid up to $600 monthly, using any major credit, debit, or charge card (e.g., American Express, Visa, MasterCard, or Discover). ExpressPay can be reloaded automatically from the same payment source when the value drops below $20.

As with all American Express Card products, customers are not liable for any fraudulent ExpressPay charges.

The ExpressPay system conforms to the ISO/IEC 14443 standard, communicating the ExpressPay account information in Track 1/Track 2 magnetic stripe format and processing the purchase as a traditional credit or debit card transaction. The contactless reader can be implemented easily at merchant locations, working with a merchant's existing POS system.

Over 400 merchant locations in Phoenix and New York currently accept ExpressPay, including CVS/pharmacy, Blimpies, Baskin Robbins, Carl's Jr., Dairy Queen, Chevron, and Fry's (Kroger). Over 200 merchants in Singapore currently accept ExpressPay, including BP and Starbucks. More than 15,000 key fobs have been issued in all three locations.[16]

According to American Express, the ExpressPay pilots in progress produced the following learnings:[17]

- ExpressPay is faster than other payment methods. A time-motion study revealed that, on average, ExpressPay transactions are 53% faster than paying with payment cards with no signature, and 63% faster than cash.
- ExpressPay demonstrated spend lift. The ExpressPay pilot results show that customer spending at participating merchants increased 20 to 30% compared to cash spending.
- Consumers immediately see the value with ExpressPay. In a survey of pilot participants, 93% of ExpressPay users indicated that they would "definitely" or "probably" use ExpressPay in the future if it were widely available. Furthermore, 87% agreed that ExpressPay is better than cash, and 82% agreed that it is better than cards. The pilots also showed that consumers will use ExpressPay daily, even if it is accepted in only one location. It appears that a much smaller level of acceptance is needed to make contactless payment viable for consumers, which facilitates a gradual implementation process for merchants.
- Merchants appreciate the speed of transactions and convenience of processing ExpressPay. In a survey of participating retailers in the Singapore pilot, American Express found that merchants liked the innovative nature of ExpressPay and see the product as a value-added service to consumers in their retail environments. In addition, retailers

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[16] American Express web site (www.americanexpress.com/expresspay) and interview with David Bonalle, Vice President and General Manager of Advanced Payments Development, American Express, February 4, 2004.
[17] Interview with American Express, op.cit.

reported a high comfort level in using and processing ExpressPay transactions.

American Express has also noted that interoperability among different contactless payment methods is a must. Interoperability opens up a new area for expansion by credit card companies by eliminating the risk for merchants who adopt contactless payment.

The full ExpressPay rollout will include multiple form factors, and ExpressPay on a card form factor will be available in the near future. Consumer studies found that two-thirds of the respondents prefer the convenience of the key fob, while one-third prefer a card that can be carried in a wallet, primarily because a wallet is more "protected" than a set of keys.[18]

Visa[19]

Visa's contactless payment initiatives focus on unique local operating environments and the market demands of different regions.

In the United States, Visa USA, in partnership with Bank of America, conducted an RFID-based contactless payment pilot, QuickWave, in Charlotte, North Carolina, with Bank of America employees. Launched in October 2002, the 6-month QuickWave pilot used a keychain mini-card that linked QuickWave account information to a credit or debit card account for processing through the traditional bankcard infrastructure. Bank of America issued 2,000 contactless payment devices, and about 30 different merchant locations participated (primarily in the quick-service restaurant segment). The QuickWave pilot also included a robust loyalty program and application that was linked to the merchant POS. The pilot ended successfully, with consumers valuing the speed, convenience, and ease of use, and merchants valuing the increased speed of the transaction. Bank of America is currently evaluating the case for broader deployment of contactless payment alongside traditional magnetic stripe payment.[20] The preferred Visa contactless transaction model for the United States uses the ISO/IEC 14443 standard to transmit Track 1 and Track 2 information, leverages existing merchant and acquirer infrastructure, and follows traditional credit, debit, and prepaid payment models. The contactless payment transaction is processed by the existing bankcard infrastructure, and the authorization and settlement processes are the same as for a magnetic stripe card.

Visa International has also made significant progress in implementing contactless payment pilot programs using various technologies. Pilots in Japan, South Korea and Finland have used both RF and infrared technology for contactless payment.

In September 2003, Visa released a new specification for contactless payment based on the ISO/IEC 14443 standard combined with the EMV credit/debit standard. The new specification allows a dual-interface chip to carry a smart Visa debit/credit EMV application for use in both contact and contactless environments. It also outlines requirements for a magnetic stripe-based contactless solution.

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[18] Interview with American Express, op.cit.
[19] Interview with Pam Skonicki, Director, Product Innovation and Coordination, Visa USA, February 26, 2004.
[20] Interview with Kelly Kruse, VP, Strategic Planning, Bob Maloney, VP, Debit/Emerging Payments, and Ellen Endicott, Senior VP, Government Card Services, Bank of America, February 10, 2004.

Summary of Contactless Payment Initiatives

Table 1 summarizes the status of the key U.S. contactless payment initiatives. American Express, MasterCard and Visa have all standardized on using the ISO/IEC 14443 standard for RF communication between the contactless payment device and reader and are using the existing magnetic stripe payments infrastructure to authorize and settle the transaction.

Table 1: Summary of U.S. Contactless Payment Initiatives

Parameter	Speedpass	MasterCard *PayPass*	American Express ExpressPay	Bank of America QuickWave
Region	US, nationwide	Orlando, Dallas, New York	Phoenix, New York, Singapore	Charlotte, NC
Number of devices issued	>6 million	>16,000	>15,000	<2,000
Merchant locations	7,500+	60+	600+	30
Marquee merchants	ExxonMobil, Stop & Shop	Boater's World, Chevron, City of Orlando Parking, Eckerd, Loews Universal Cineplex, McDonald's, Ritz Camera, Wolf Camera	CVS/pharmacy, Blimpies, Baskin Robbins, Carl's Jr., Dairy Queen, Chevron, Fry's (Kroger), BP, Starbucks	Chick-Fil-A, Java Joe's, Just Fresh Bakery, McDonald's
Form factor	Key fob, watch, transponder	Card, phone Others planned	Key fob Card, others planned	Mini-card
Technology	134 kHz proprietary	ISO/IEC 14443	ISO/IEC 14443	ISO/IEC 14443
Status	Production	Pilot complete, with rollout planned in 2004	Pilots in progress	Pilot complete

Contactless Payment: Consumer Benefits

To be adopted by consumers, a new payment product must represent something different. Just being new or incorporating advanced technology does not assure adoption of a product, even though such products will always appeal to consumers who like to have the most current products or technologies.

Contactless payment, now being introduced in the United States, has received so much attention because it does offer consumers something they have not had since card payment was originally introduced—more speed and convenience. This conclusion is supported by consumer feedback obtained from the pilots conducted by American Express and MasterCard International. While contactless payment has other benefits, speed and convenience are the principal consumer advantages. Contactless payment schemes are now progressing from closed to open schemes, supporting wider consumer use and having greater consumer appeal.

Speed

The consumer initiates a contactless payment transaction with a tap or a "wave and go." As a result, the transaction is very fast, compared to inserting a card in a reader and waiting to sign an authorization receipt. Such a transaction is also faster and less trouble than a cash transaction, as the consumer avoids having to search for cash.

Contactless payment pilots have reported remarkable results in decreasing transaction time:

- American Express reported that ExpressPay transactions took 12.5 seconds, as opposed to 33.7 seconds for cash transactions and 26.7 seconds for a credit card transaction with no signature.[21]
- MasterCard reported that the most significant time savings from its *PayPass* pilots have been recognized in the drive-through environment, where *PayPass* shaved between 12 to 18 seconds off the purchase time as compared to cash.[22]
- Bank of America reported transaction times 62% faster than cash from their QuickWave pilot.[23]

Convenience

The increased speed of contactless payment transactions increases their convenience for consumers. In addition, contactless payment devices are not tied to a particular form factor, such as a card. Options such as key fobs and mini-cards are available, and ongoing trials are testing the use of mobile phones. Consumers can choose the form factor that is most convenient for them.

Most consumers use contactless payment to replace cash. According to a recent MasterCard consumer payment survey, nearly half (49 percent) of consumers surveyed carry $20 or less in their wallet and 86 percent of consumers reported that they want to use cash less often than they currently do.[24]

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[21] Interview with American Express, op.cit.

[22] "MasterCard *PayPass* Trials and Survey Demonstrate Momentum of Contactless Payments," MasterCard PayPass press release, November 17, 2003.

[23] Interview with Bank of America, op.cit.

[24] Interview with MasterCard, op.cit.

Ease of Use

Ease of use is a major benefit of contactless payment. Some consumers are already familiar with contactless payment from Speedpass and other transit-related contactless payment initiatives. The contactless payment products being introduced by American Express, MasterCard and Visa are extensions of current products with which consumers are already familiar, but without a PIN to remember and without paper authorizations to sign and collect for most low-value transactions.[25] That the technology underlying contactless payment is different is transparent to the consumer, who in any case may have little interest in knowing how contactless payment devices work, providing that they deliver value.

Consumer Experience

Consumers seem to enjoy using contactless payment, even when they use it in only one location, such as a cafeteria or coffee shop. Moreover, it appears from studies so far that consumers will use new contactless payment devices when there are a much smaller number of merchant acceptance locations.[26]

Unlike cash, contactless payment allows consumers to track spending on low-value transactions. Pilots have also found that consumers find it more acceptable to use a contactless credit or debit card for low-value or convenience purchases than using a traditional magnetic stripe credit or debit card. However, consumers are finding that contactless payment capability encourages them to spend more, since the consumer is no longer constrained by the amount of cash on hand or the need to "reserve some cash" for incidentals such as parking.

Merchants participating in the American Express ExpressPay pilot have seen customer spending increase by 20 to 30% compared to cash spending, while customer checkout time has been reduced by 53 to 63%.[27] American Express has also reported focus group results showing that consumers like the new contactless payment device and are excited about how easy it is to use.[28]

- 93% of users indicated that they would "definitely" or "probably" use ExpressPay in the future if it were widely available.
- 87% agreed that ExpressPay is better than cash, and 82% agreed that it is better than cards.

MasterCard consumer research reveals the following reactions to *PayPass*.[29]

- 63% of consumers surveyed said that they would "definitely" or "probably" use MasterCard *PayPass* if their bank offered it to them.
- Consumers who said that they would definitely use *PayPass* indicated that it will replace cash in more than half (53%) of their transactions.

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[25] American Express, MasterCard and Visa have programs for specific merchant segments to make signatures optional for transactions under a certain value. American Express does not require a signature for any ExpressPay transaction. MasterCard does not require signatures on transactions less than $25 at quick-service merchants who qualify for the MasterCard Quick Payment Service Program. Visa USA does not require signatures for transactions less than $15 in specific merchant segments.

[26] Interview with American Express, op.cit.

[27] Ibid.

[28] Ibid.

[29] "New MasterCard *PayPass* Utilizes Contactless Payment Technology," MasterCard press release, December 12, 2002.

- *PayPass* is perceived as "innovative" and "fun to use," as well as an enhancement that "would make shopping less of a hassle."

After testing *PayPass* in Orlando (see "MasterCard *PayPass*" on p. 7), MasterCard concluded that the *PayPass* program makes a card more attractive to consumers. As evidence, Art Kranzley, Chief e-Business Officer at MasterCard, points out that MasterCard cardholders holding *PayPass* cards used their MasterCard cards 23% more often than during the same period a year earlier and that the dollar value of their purchases increased by 28%.[30]

The choice of a form factor (card, fob or mobile phone) seems to be driven by personal preference. Some consumers like the convenience and speed of having something easily accessible on key chain, while others prefer a card product that is perceived to be more secure and less likely to be mislaid.

Security and Privacy

A key advantage of contactless payment for consumers is that they control both the transaction and the card throughout the transaction. Most consumers in the pilots felt a greater sense of security using contactless payment cards than other cards. They do not have to surrender either a card or their account information to a third party.

Initial consumer concerns centered on the absence of a signature requirement or on the possibility that someone might walk past a reader and be charged for someone else's purchase. The lack of a signature concern is addressed by consumer education and experience (as has been the case for Internet purchases). An understanding of how close the card or fob has to be to the reader to make a payment also contributes to consumer comfort. In addition, American Express, MasterCard and Visa have extended their zero liability policies to their contactless payment initiatives, providing further assurance to the consumer that any issues with transactions will be resolved satisfactorily.

American Express, MasterCard and Visa contactless payment solutions use the current magnetic stripe payment data and infrastructure. However, the implementations do differ. For example, each incorporates additional unique security features in the contactless solution to counter contactless-specific risks. These new security features provide enhanced security in comparison to conventional magnetic stripe credit/debit card payments.

Consumer Loyalty

The ease, speed, and convenience to consumers of paying at a merchant location accepting contactless payment make consumers more likely to return to that merchant. When payment is linked to a loyalty program, the consumer's loyalty is strengthened even further.
- ExxonMobil's implementation of Speedpass resulted in the purchase of one additional tank of gas per month by the average Speedpass customer, resulting in a transaction lift for the dealers.
- MasterCard has reported an 18% activation rate from *Paypass* cardholders on formerly inactive MasterCard accounts and a 12% increase in MasterCard transaction volumes at *PayPass* merchants.

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[30] Don Davis, op. cit.

- American Express reports that consumers have been found to use ExpressPay daily, even when there is only one merchant acceptance location.[31]
- Bank of America's QuickWave pilot also benefited from a loyalty program linked to QuickWave. The loyalty program sent email messages to participants informing them of special promotions and was regarded as a success in stimulating use of the card.[32]

While both prepaid cards and loyalty cards are most often implemented as magnetic stripe cards, RF-based contactless payment cards can offer increased convenience to consumers:

- Transaction time is reduced.
- Multiple loyalty programs or multiple merchant prepaid/gift programs can be implemented on a single card.
- Transaction security is improved.[33]

Consumer Benefits Summary

The benefits of contactless payment to the consumer can be summarized as follows:

- Faster check-out times
- Easier to use—no slips to sign, no PIN to remember, no fumbling for exact change, and no need to check for correct change from the merchant
- Choice of form factors
- More available cash in the wallet for essential incidentals
- More purchasing ability, not limited to available cash
- Ability to track low-value transactions
- Option to pay for low-value transactions using a credit card
- Improved security—consumer control of the card throughout the transaction, no card and account details revealed to a third party and new security functions
- Fun to use

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[31] Interview with American Express, op.cit.
[32] Interview with Bank of America, op.cit.
[33] "RF-Based Contactless Payment: A More Convenient Way To Pay," ViVOtech white paper, April, 2003, www.vivotech.com.

Contactless Payments: Merchant Benefits

Contactless payment systems offer significant advantages to merchants. Contactless pilots and deployments around the world indicate that contactless payment increases transaction speed, average ticket size (as compared to cash), customer satisfaction, and the potential for gaining loyal customers.

Contactless payment applications bring value to any retail segment where speed and convenience are mandatory. The segments that may benefit most from contactless payments include traditional "cash-only" environments, such as:

- Quick-service restaurants
- Convenience stores
- Gas stations
- Parking facilities
- Transit services
- Movie theatres and similar entertainment venues
- Amusement parks
- Video rental stores
- Drug stores
- Unstaffed vending locations and ticket kiosks

Although the business drivers and business models are different for each merchant segment, the merchants who participated in the different contactless initiatives saw positive results and valued the increased transaction speed, increased sales volume, and the efficiency of eliminating cash payments.

Increased Throughput

Contactless payments move customers through the transaction process more quickly. Contactless payment has been shown to be faster than both cash and traditional magnetic stripe credit and debit payment transactions. Consumers do not have to fumble for cash or cards (when using a new non-card form factor) and merchants do not have to make change or swipe a card. When there is no requirement for a signature, the process is even faster. For example:

- American Express reported that ExpressPay transactions took 12.5 seconds as opposed to 33.7 seconds for cash or 26.7 seconds for a credit card with no signature requirement.[34]
- Bank of America reported that QuickWave transaction times were 62% faster than cash transaction times.[35]
- MasterCard reported that *PayPass* pilot transactions for drive-through merchants were 12 to 18 seconds faster than cash transactions.[36]

For many merchants, increased throughput translates directly to increased revenue.

Increased Revenue

As with traditional credit/debit cards, when consumers pay using contactless payment instead of cash, they tend to spend more and spend more frequently. In addition, the merchant supporting contactless payment tends

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[34] Interview with American Express, op. cit.
[35] Interview with Bank of America, op. cit.
[36] Interview with MasterCard, op. cit.

to become the customer's preferred merchant. Increased spending per transaction, increased frequency of purchase, and increased loyalty translates directly into increased revenue. For example:

- ExxonMobil has stated that Speedpass produced a 4% increase in sales.[37]
- MasterCard reported that the transaction volumes of MasterCard *PayPass* cardholders at the *PayPass* trial merchants increased 12% over the prior year's volume of MasterCard transactions.[38]
- Bank of America reported an average lift per transaction of 20%.[39]
- American Express reported a 17 to 33% lift over cash in average purchase size in their employee pilot. American Express also reported that customers who had ExpressPay used it at every available opportunity, even if only one merchant accepted it.[40]

Focus groups indicate that consumers regard using credit for small dollar-amount transactions as more acceptable when using contactless payments.

Improved Operational Efficiency and Customer Satisfaction

As with other card payments, merchants using contactless payment may require fewer personnel on site. Consumers control transactions with little or no intervention required from merchant staff. The requirement to handle cash, which is expensive and can result in possible pilferage, is also reduced. Reduced overhead and resource requirements at merchant locations, reduced cash handling and pilferage costs, and improved reliability of payment terminals lead to improved operational efficiency and lower operating costs.

In addition, because merchant personnel are not tied up in transaction processing (swiping cards or making change), they can concentrate on consumer needs, leading to increased customer satisfaction.

Better Customer Information

Unlike cash-based transactions which provide no consumer data, contactless payment can provide merchants with customer information. Consumer information is critical for merchants who want to understand customer behavior better and institute sales strategies that can win customer loyalty and repeat business. Because each contactless payment device has a unique identification number, the devices can also support innovative loyalty schemes.

Payment Device Branding or Co-Branding

Major merchants can benefit from relationships with issuers, adding the merchant brand to the payment device and achieving increased visibility with consumers. This in turn leads to brand recognition, which can attract new customers and strengthen the loyalty of current customers.

Competitive Differentiation

Competitive differentiation is a cornerstone of any retail strategy. Contactless payments offer differentiation by providing a "wow" or "cool" factor that can attract new customers. Contactless payments also support differentiation by providing more convenient consumer payment methods.

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[37] Matthew Miller, op. cit.
[38] Interview with MasterCard International, op.cit.
[39] Interview with Bank of America, op. cit.
[40] Interview with American Express, op.cit.

For example, MasterCard is working with Nokia to incorporate MasterCard *PayPass* into mobile phones. Not only is the average *PayPass* payment made using a mobile phone faster than one made using a magnetic stripe card, but merchants also have the potential to use messaging to advertise to consumers (providing a consumer "opts-in" to this feature), creating immediate consumer interest.

Driving the Value Chain

The benefits to the consumer of using contactless payment result in increased sales for the merchant—sometimes as high as 33%, according to David Bonalle, Vice President and General Manager of Advanced Payments Development at American Express. American Express has also reported that ExpressPay doubled American Express purchases at American Express cafeterias.[41] This uplift results in more transactions for merchants and acquirers, as most of the uplift comes when contactless payment transactions replace cash.

The ease-of-use experienced by the consumer is leading contactless payment cards to emerge at the "top of the wallet," according to MasterCard. During the *PayPass* pilot, transaction volume increased 23% over the same period in 2002.[42]

Financial Payments Industry Backing

When financial payments companies such as MasterCard, Visa, and American Express support contactless payments, merchants benefit. These payment cards are widely held, and adopting contactless payment causes minimal impact on the back-end infrastructure. Some solutions (such as the MasterCard *PayPass* card) also include a magnetic stripe, allowing consumers to use the card at any merchant location.

Merchant Benefits Summary

The benefits of contactless payment to the merchant can be summarized as follows:
- Faster throughput, speeding consumers through the checkout process
- Increased revenue from increased consumer spending
- Improved operational efficiency—less cash handling and reduced pilferage, fewer personnel on site, improved payment terminal reliability
- Increased customer satisfaction—more efficient purchases
- Improved information about customers
- Potential to co-brand payment devices
- Opportunities for competitive differentiation

Sample Business Case

Tables 2 and 3 present a sample business case to illustrate the impact of adopting contactless payment at a quick-service restaurant. The restaurant has four traditional POS cash registers and completes an average of 60 transactions per hour, with an average value of $5 per transaction. The transaction mix is 60% cash and 40% credit or debit card. The restaurant is open 10 hours per day, 365 days per year, and employs 4 employees on 2 shifts.

This business case is simplified to illustrate example costs and benefits. The business case assumes that less than 15% of transactions will be

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[41] Interview with American Express, op. cit.
[42] Interview with MasterCard International, op.cit.

contactless. Intangibles such as customer repeat business, loyalty, and decrease in the number of employees are not quantified.

As shown in Tables 2 and 3, the example merchant used for the business case gains significant incremental revenue from implementing contactless payment, while only needing a modest investment. Merchants should estimate expected usage of contactless payment devices for their retail segment and develop their own payment profiles and business models to develop an actual business case.

Table 2: Costs of Adopting Contactless Payment

Item	Cost
Upgrade infrastructure	
Per POS terminal	$100.00
# of POS terminals	4
Total POS upgrade cost	$400.00
Train personnel	
Hours per employee	1
# of employees	8
Wages per hour	$10.00
Total wages for employees	$80.00
Hours per trainer (training in 2 shifts)	2
Wages per hour	$20.00
Total wages for trainer	$40.00
Total training costs	$120.00
Total one-time cost to merchant	**$520.00**
Extra maintenance (yearly) for POS terminals	$120.00
Yearly training cost to account for personnel churn	$360.00
Additional Cost Year 1	**$480.00**

Table 3: Benefits of Adopting Contactless Payment

Current Situation		With Contactless Payment	
Item	Amount	Item	Amount
Credit transactions/hr (40%)	24	Credit transactions/hr	22
Cash transactions/hr (60%)	36	Cash transactions/hr	33
No. of transactions in 1 hr	60	Contactless transactions from credit	3
		Contactless transactions from cash	4
		Extra transactions	2
		No. of transactions in 1 hr	62
Average spend	$5.00	Average spend	$5.75
Revenue/hr	$300.00	Revenue/hr	$315.25
Wages/hr	$80.00	Wages/hr	$80.00
Total fees on plastic (6%)	$7.20	Fees on plastic (6%)	$6.60
		Contactless fees (6%)	$1.04
		Total fees on plastic	$7.64
Total revenue/hr	$300.00	Total revenue/hr	$315.25
Total expenses/hr	$87.20	Total expenses/hr	$87.64
Net revenue/hr	$212.80	Net revenue/hr	$227.62
Net revenue/yr	**$776,720.00**	**Net revenue/yr**	**$830,794.75**
		Incremental benefit	**$54,074.75**

Implementation Impact and Best Practices for Merchants

Merchants can implement contactless payment solutions quickly and easily and immediately begin accepting the contactless payment devices now being issued by the financial industry. Immediate implementation is possible both because the payment approach uses the existing magnetic stripe payments infrastructure and because products are offered that allow merchants to adapt their existing POS systems to accept contactless payment.

A few contactless RF terminals are already available that can easily be added to current POS systems. In addition, POS terminal and system vendors are releasing new products with integrated support for contactless payment.

Leverage of Existing Payments Infrastructure

The contactless payment implementations being offered in the United States by American Express, MasterCard and Visa leverage the existing magnetic stripe payments infrastructure. These new payment schemes store a secured version of Track 1 and Track 2 financial data on the contactless card chip. The card then uses RF to communicate Track 1 and Track 2 payment information to the terminal. The merchant and the acquiring processor see little change to the payment data, so major changes to POS systems or the processing infrastructure are not necessary. This is quite different from some payment technologies (for example, EMV contact smart cards), where significant investment is required by both merchants and payment processors and where market deployment must allow time to upgrade the infrastructure.

By basing contactless payment on the magnetic stripe payments infrastructure, American Express, MasterCard and Visa can launch programs with the potential to drive rapid acceptance of contactless payment cards by merchants, similar to the rapid growth seen by gift card programs that use the existing infrastructure. This approach and the innovative products being offered by terminal vendors allow merchants to realize the significant benefits of accepting contactless payment cards with minimal investment.

Changes to the POS System

To accommodate contactless payment, merchants must add intelligent contactless RF terminals to their POS payment systems. The new contactless RF terminals support the contactless card applications specified by the payments companies and communicate with the contactless payment cards or fobs to receive Track 1 and Track 2 financial data. The terminals then pass the data to the attached POS payment system. These terminals are tested and certified by the payments companies before being installed in the field.[43]

Since cardholders tap or wave the contactless cards or fobs at the terminals, the terminals must face the cardholders instead of the sales clerks. (This is similar to the approach currently used by multi-lane retailers in the United States.) In table-service restaurants, waiters can carry portable contactless terminals to allow cardholders to make contactless payments at the table.[44]

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[43] ViVOtech white paper, op.cit.
[44] "Diners Make Contactless Payment 'at the table' in Dallas, TX," *ContactlessNews.com*, August, 2003.

POS Solution Options

Merchants can add contactless RF terminals to their current POS systems quickly. Terminals that work with existing POS systems are already available. POS terminal vendors are expected to integrate contactless readers into new POS terminals in the near future.

Three different interfaces can connect a contactless RF terminal with an existing POS system:
- Serial cable interface
- Smart cable interface
- Magnetic stripe adapter

Serial Cable Interface

A serial cable interface is implemented as a serial cable that connects the serial port on a POS terminal to the serial port on a contactless RF terminal. The interface provides bidirectional communication between the POS terminal and the contactless terminal.

This approach requires a change in the POS system software to allow the POS terminal to communicate through its serial port. The change also allows the POS system to recognize that the Track 1 and Track 2 data is coming from a contactless payment device rather than from a magnetic stripe card and to send this information to the payment processor with the transaction data.

Some of the payments companies are requiring the POS system to report whether the card data was read from a magnetic stripe card or from a contactless card or fob. For this reason, use of a serial cable interface is a stable long-term solution.

Using a serial cable interface has the following advantages:
- Implementing this interface is a stable long-term solution.
- The interface is reliable and easy to maintain.
- The interface provides bidirectional communication.

Using a serial cable interface has the following disadvantages:
- An extra serial port (e.g., RS-232) must be available on the existing POS system.
- Time is required to change the existing POS software, certify the system, and upgrade all POS terminals in the field.

Smart Cable Interface

The smart cable interface is implemented as a wedge cable that connects to either a PS/2 port or a serial communication port. The interface is unidirectional and works with many existing POS electronic cash register (ECR) systems that have available PS/2 ports.

This solution requires no software change; many of the POS systems already receive Track 1 and Track 2 data through the PS/2 port.

Using a smart cable interface has the following advantages:
- The interface is easy to implement and provides a short-term solution, allowing the merchant to test the market with minimal investment.
- The interface is reliable and easy to maintain.

Using a smart cable interface has the following disadvantage:

- The interface cannot recognize whether the data is coming from a magnetic stripe reader or from a contactless RF card/fob reader. This limitation could make it a short-term solution.

Magnetic Stripe Adapter

The magnetic stripe adapter interface is implemented by installing a simple insert in a POS terminal's magnetic stripe slot. The data from the contactless terminal is transmitted through this insert, simulating a magnetic card swipe. This adapter is a quick and easy solution for any POS system that includes a magnetic card swipe reader.

This solution is straightforward and inexpensive for merchants to implement. It requires no software changes and allows merchants to upgrade POS systems easily while retaining existing functionality. When the POS software is to be upgraded, merchants can replace the adapters with a serial or integrated solution.

Using a magnetic stripe adapter has the following advantages:
- The adapter is a quick and simple short-term solution. A merchant location can be enabled in few hours.
- No software changes are required.
- The merchant can test the market with minimal investment.

Using a magnetic stripe adapter has the following disadvantages:
- The reliability of this solution as a multi-year solution still remains to be proved.
- The adapter does not identify the source of the data to the POS system (a contactless reader or a magnetic stripe reader). This limitation could make it a short-term solution.

Merchant Investment

The merchant investment required to upgrade a physical terminal at the point of sale is modest. It is expected that the incremental cost of purchasing a POS terminal with an integrated RF terminal will be $100 or less.[45] For contactless reader retrofits, merchants may pay $200 to $300 per RF terminal including installation,[46] or less than $200 if they install the terminals themselves.

Interoperability

The major payment card companies have agreed to ISO/IEC 14443 Type A and B as the contactless RF payment standard. This decision is the key to future interoperability. Any contactless device that complies with ISO/IEC 14443 Type A or B will be able to communicate with new contactless payment terminals.

American Express, MasterCard and Visa have also developed their own unique specifications for contactless payments. These specifications reflect each company's specific application requirements and security needs. However, the payments companies have ensured that the specifications can coexist in a single RF terminal.

Contactless RF terminal vendors are expected to provide interoperability among the different contactless payment systems. The objective will be to offer a single contactless RF terminal that supports multiple contactless applications and accepts a variety of contactless cards and fobs from the

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[45] Various industry sources.
[46] Don Davis, op. cit.

major payments companies. The development and certification of such interoperable solutions are currently in process and are expected to reach the market starting in mid-2004.

POS, Store Controller, and Acquirer Software

The card issuers will need to know whether a transaction is initiated by a contactless payment device or a magnetic stripe card.

MasterCard International is adding new values to the current data fields of ISO/IEC 8583 messages. This requirement will require software changes at the POS system level, possibly at the store controller level. The acquirer will need to carry the required new field through the financial network to a card issuer authorization system. MasterCard International has already communicated this requirement to its member acquirers. Merchants should contact their acquirers to find out when such changes will be available on their system.

Visa will also be implementing system changes using the ISO/IEC 8583 message format to indicate to issuers whether the transaction was made with a magnetic stripe or initiated over a contactless interface. This enhancement will be available in October 2004.

Short-Term and Long-Term Rollout Strategy

In 2004, MasterCard International and American Express are rolling out contactless payment programs into specific geographic markets. The American Express ExpressPay pilot is in Phoenix, Arizona, and MasterCard *PayPass* pilots are in Dallas, Texas, and Orlando, Florida.

Both organizations plan to expand the rollout of their contactless payment programs to other cities in the United States. MasterCard has stated that they will have wider deployment starting in the summer of 2004, with millions of MasterCard *PayPass* cards expected to be in circulation by the end of the year.[47]

These programs primarily target the following:
- High traffic merchants (quick-service restaurants, convenience stores)
- Unattended point-of-service locations (gas pumps, vending machines)
- Transit applications

Short-Term Strategy

Merchants, independent sales organizations (ISOs), and acquirers doing business with American Express and MasterCard in the targeted areas can participate in the rollout of both the ExpressPay and *PayPass* programs.

The advantage of getting started now is to leverage the resources that both MasterCard and American Express are dedicating to contactless payment and gain a competitive advantage in these areas. Success depends on achieving a critical mass, enrolling enough merchants to accept contactless payments and issuing enough *PayPass* and ExpressPay payment devices to allow merchants to start accepting contactless transactions daily.

Visa USA is committed and able to support contactless deployments and is primarily targeting contactless chip payment programs in environments where magnetic stripe use is challenging today. Visa USA remains committed to supporting members in their efforts to evaluate the value proposition and business case for emerging technologies against standard

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[47] Ibid.

magnetic stripe card acceptance. Visa's priority is to support programs that will deliver the highest value to payment stakeholders - issuers, consumers, and merchants alike.

Long Term Strategy

Merchants, ISOs, and acquirers who participate in the initial rollout can decide whether it makes sense to expand contactless payment support to other cities and, eventually, nationwide. Initial market data shows that merchants from the primary target industries should see increased revenue, increased efficiency, and enhanced customer loyalty.

What's Next?

To connect with the payments companies who are currently driving the contactless card/fob payment programs in the United States, visit the Smart Card Alliance Web site, at www.smartcardalliance.org. The web site contains links to the latest information on major contactless payment initiatives in the United States.

Key Consumer and Merchant Issues

The contactless payment process involves multiple participants – consumer, merchant, acquirer, processor and issuer. While the issues are different for each participant, they are most critical for the merchant. The merchant has more at risk, more infrastructure requirements, more customer relationship questions, and more potential costs than the other participants.

Consumer Issues

Research, focus groups, and actual pilot implementations have shown that consumers typically have two types of issues with new payment technologies: ease-of-use issues and security issues.

Ease-of-use has not been a major issue with contactless payment cards. Signs and cardholder education can address how the card operates. Security concerns can also be addressed through education. Issuers should present a trust statement as a matter of policy and as part of the customer education process.

The current pilots in the United States have consistently proven that the convenience and speed offered by contactless payment vastly outweigh any other real or perceived disadvantages with consumers.

Merchant Issues

In the retail process, the payment transaction is a critical moment of truth. For a merchant to change a working POS infrastructure, adding both cost and risk, is no small challenge. However, by understanding the key issues, merchants can start preparing for the addition of contactless payments in such a way as to enjoy the benefits and minimize the risks.

Infrastructure Costs. Infrastructure costs include IT costs and training costs. However, once a critical mass of customers using contactless payment has been achieved, such costs will be minimal.
- Current pilots have demonstrated that existing magnetic stripe terminals can be converted easily (for example, attaching low-cost RF terminals to the existing POS terminal).
- A new tender type will have to be added to the till accounting software so that cashiers will not have to balance the till for contactless payments.
- Most POS manufacturers will integrate ISO/IEC 14443 capabilities into new models so that terminals with integrated contactless capabilities can be acquired as the POS system is upgraded.

Security. Security has not been an issue in the current pilot programs in the United States. Security features being incorporated into the contactless payment devices, terminals, and authorization infrastructure recognize contactless payments and manage any transaction risk.

Control of Customer Information. One key issue for merchants is whether changes to their POS system and payment gateways will cause them to lose control of what they perceive as their customer information. However, when significant cash sales are replaced with contactless credit/debit card sales, better customer information becomes available.

Privacy. Cardholders are concerned about how merchants treat their purchasing information. Merchants have an unwritten charter to protect cardholder trust and should understand that contactless payment enhances privacy and security. Customer education can address this issue.

Throughput and Backup at POS. Merchants demand speed of service at checkout. Contactless payments in many venues (such as quick-service restaurants) make checkout faster and consequently increase sales.

However, merchants must have backup systems in the event that power or the authorization network fails. Merchant policies and procedures typically accommodate traditional magnetic stripe credit and debit transactions. With contactless key fobs or other form factors without a visible account number, it may be necessary to require an alternate payment type (cash or check) to complete the transaction.

Auditability. Customer returns, till accounting, and tracking transactions all require audit trails. Integrating contactless payments into the POS system as a new tender type may be a simple software upgrade. If not, the merchant will have to rely upon a manual process to implement complete accountability.

Government Regulations. For the most part, contactless payments will be regulated by the same laws that govern the type of payment account being used (e.g., credit, debit, stored value).

Branding. Merchants with their own payment products or co-branded payment products will want to keep their brand visible to the consumer. Depending on the form factor, branding may be difficult. Acceptance device manufacturers may incorporate customer-facing screens or voice synthesizers to present the payment brand.

Perceived Value. Any merchant who encourages customers to adopt a new technology or service is concerned with how customers perceive value. Merchants with a strong customer service philosophy will require customer endorsement of contactless payments. For example, innovative retail programs such as express lanes, discounts, and rewards have proved popular and have delivered real value to consumers.

Transaction Processing Costs. Transaction processing costs can be a critical issue for merchants. Most merchants who will be early adopters already have very thin margins on cash sales. Merchants will look for reduced merchant fees or other financial incentives to make the investment in contactless payments.

Liability. Merchant liability is also a key issue. Merchants who issue contactless payment cards should have a process that allows customers to register their cards. This registration, in combination with audit trails, should enable a lost or stolen card to be reissued without loss of funds to the cardholder.

Interoperability. Certain merchants require that all brands and types of payment cards be interoperable. The adoption of ISO/IEC 14443 by the financial payments industry as the contactless payment standard supports interoperability. Contactless payment terminals that interrogate the card in a way that is transparent to the clerk and the customer will resolve this issue.

EMV Compliance. Currently, U.S. contactless programs are not EMV compliant. If and when the U.S. payments industry sees a liability shift for fraudulent transactions, the financial payments industry will implement EMV over several years. Contactless cards may need to be reissued with more robust security (keys), but the merchant's contactless payment infrastructure is expected to primarily need software upgrades.

Merchant issues can be addressed, usually with education. The contactless payment pilots conducted in the U.S. have already proven that the

cardholder readily embraces contactless payment. It is important to take a merchant-centric view to resolve potential market issues. It is in the checkout lane where the acceptance of contactless payments will be determined.

Conclusion

An increasing number of U.S. consumers are paying for purchases with contactless payment devices. Consumers are using Speedpass fobs, MasterCard *PayPass* cards, and American Express ExpressPay key fobs to speed through payment transactions at gas stations, quick-service restaurants, theaters, and other merchants across the United States. Transit systems are also adopting contactless payment devices to improve consumer convenience, increase throughput, and reduce operating costs in major U.S. metropolitan areas.

For merchants, the launch of new contactless payment methods represents an opportunity to attract customers and increase revenues, especially in retail segments where speed and convenience are mandatory. The benefits of contactless payment for the consumer and the merchant have been proven in numerous implementations. Increased convenience for the consumer has resulted in increased sales and faster transaction times for the merchant. Merchants also enjoy lower costs due to fewer requirements to handle cash, improved operational efficiencies, and lower maintenance costs, resulting from improved reliability of contactless readers.

American Express, MasterCard, and Visa have standardized on a single contactless payment standard in the United States, ISO/IEC 14443, and are implementing or recommending a contactless payment approach that leverages the existing payments infrastructure. What this means for merchants is that no major changes are required to POS systems. Vendors are offering cost-effective contactless RF terminals that can be installed with existing POS systems quickly and easily, either as a retrofit or as an integrated RF and magnetic stripe terminal. The business case for some retail segments yields significant increases in revenue for a modest investment.

The Smart Card Alliance urges merchants who would benefit from faster transaction speed and increased consumer convenience to evaluate the benefits and assess the business case for upgrading POS systems for contactless payment. Merchants can take advantage of the nationwide rollout of financial industry-backed contactless payment initiatives in 2004 to create a strategic competitive advantage and increase sales.

For more information about smart cards and the role that they play in retail payment and other applications, please visit the Smart Card Alliance web site at www.smartcardalliance.org or contact the Smart Card Alliance directly at 1-800-556-6828.

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Publication Acknowledgements

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Appendix A: Transit Contactless Payment[48]

The face of public transportation in the United States is changing dramatically. Transit operators throughout the United States are implementing RF-based contactless fare collection systems. Transit agencies in Boston, New York/New Jersey, Baltimore, Washington, D.C., Atlanta, Chicago, Minneapolis/Saint Paul, Los Angeles, San Diego, Seattle, Houston, San Francisco and other urban areas are investing hundreds of millions of dollars in a "once in a generation" effort to replace aging automatic fare collection (AFC) systems. First installed in the late 1970s and early 1980s, these systems are now at the end of their useful life. Contactless payment technology has become the standard for new AFC systems, because it meets customer requirements for quick entry and exit, ease of use, and convenience, and because it delivers many operational advantages.

The American Public Transportation Association (APTA) reports that ridership on U.S. public transportation is on the rise, increasing 22% in the last 6 years and making public transportation the fastest growing transportation sector. APTA estimates that 14 million Americans move through public transportation systems daily and that they took 9.4 billion trips in 2002, just slightly down from levels in 2001 that were the highest levels of use in 40 years. Investment is up too, with federal, state, and local expenditures on public transit systems totaling $15.4 billion each year for the past 4 years.[49]

One of the principal areas of capital investment is the fare collection system. Transit operators are currently switching from single-purpose dedicated fare collection systems to state-of-the-art contactless payment systems and networks. More progressive transit systems are laying the groundwork required to shift from their traditional role as card-issuing agencies to a new role, as card-accepting systems. In other words, such systems are moving to become retailers of transit services that accept a non-transit-issued payment card.

Today, virtually all new transit fare payment systems either in delivery or procurement involve the use of RF-based contactless payment cards as the primary ticket medium. Table 4 summarizes some current and planned U.S. implementations of contactless cards for transit payment.

Table 4: Current and Planned U.S. Transit Contactless Payment Programs

Location/Lead Agency (Program Name)	Type of Program	Integrator/ Vendor	Status
Los Angeles/LACMTA (UFS)	Regional farecard	Cubic	Contract awarded; rollout planned in 2004-2005
San Diego/MTDB	Regional farecard	Cubic	Contract awarded; rollout planned in 2005
San Francisco/MTC (TransLink)	Regional farecard	ERG	Pilot completed mid-2002; additional cards/equipment ordered mid-2003 for mid-2004 deployment

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[48] For additional information about the use of contactless payment cards for transit payment, see the Smart Card Alliance report, "Transit and Retail Payment: Opportunities for Collaboration and Convergence," available at www.smartcardalliance.org.

[49] For additional information on the U.S. public transportation industry, see the APTA web site, www.apta.com.

Location/Lead Agency (Program Name)	Type of Program	Integrator/ Vendor	Status
Ventura County/VCTC	Regional farecard	ERG	Implemented 2002
Washington-Maryland-Virginia/WMATA (SmarTrip)	Regional farecard	Cubic/GFI/ ERG	In use on MetroRail; contract awarded for rest of region
Miami-Ft. Lauderdale-Palm Beach/MDTA-Tri Rail (UAFC)	Regional farecard	Cubic (planned)	Board approval 2002; contract being negotiated
Orlando/Lynx (ORANGES)	Multimodal integration	TTI, Ascom, Efkon	In test phase
Atlanta/MARTA	Regional farecard	Cubic	Contract awarded in 2003; in design phase
Chicago/CTA (Chicago Card)	AFC option (also regional)	Cubic	100,000-card rollout in process
Boston/MBTA	Regional farecard	Scheidt & Bachmann	Contract awarded 2003; in design phase
Las Vegas/Monorail	New fare system	ERG	Contract awarded 2002; transit service to open 2004
Minneapolis–St. Paul/Metro Transit	New fare system	Cubic	Contract awarded; rollout planned 2004
Newark/PANYNJ & NJT (SmartLink)	AFC option	Ascom/ASK	Pilot implemented 2001
NJ/PATH	AFC option	Cubic	Contract awarded 2002; in installation phase
Philadelphia/PATCO	New fare system	TBD	Under development
Houston/METRO	AFC upgrade	Cubic	Contract awarded 2002; planned operations in 2004
Seattle-Puget Sound/KC Metro	Regional farecard	ERG	Contract awarded; rollout planned 2005

Source: TranSystems Corp. (formerly Multisystems), *Fare Policies, Structures and Technologies (Update) – Final Report,* Transportation Cooperative Research Program Project A-25, March 2003, with Smart Card Alliance member updates.

Benefits of Contactless Payment for Transit

As they do for traditional merchants, contactless payment cards offer numerous benefits for transit fare payment transactions.

Increased Customer Convenience. Contactless payment cards are easy to use. The traveler simply taps the card on the gate reader, with no specific card orientation required. Convenience helps generate ridership growth, enhances the cost-recovery ratio, and improves the transit agency's bottom line.

Efficient and Convenient Substitute for Cash. A contactless stored value payment system provides an easy-to-use alternative to cash. Consumers can conveniently load and replenish value for transit payment. The card also provides an opportunity for transit agencies to partner with the financial industry or with merchants to allow payment for non-transit purchases (e.g., at quick-service restaurants or other locations that value fast and convenient consumer payment).

Lower Operating Costs. Contactless card readers are more reliable and require less maintenance than electromechanical readers. Contactless transit payment cards are more secure, have a longer life than magnetic stripe cards, and require fewer replacements during their life cycle. Contactless payment cards can also increase security and reduce fraud, reduce handling costs for fare media and/or cash, and provide cash flow advantages by shifting riders to prepaid fares.

Improved Customer Relationship Management. Contactless card-based fare collection systems provide transit operators with information about customer activities. Operators can use this data to understand customer behavior and serve customers more effectively.

Increased Product Differentiation. Contactless payment cards can help transit operators differentiate their service offerings and offer innovative features to customers. Moving to contactless payment cards can encourage innovative strategic thinking, such as linking transit operators with non-transit partners, resulting in deployment of multi-application payment cards.

Transit-Retail Collaboration Opportunities

Significant opportunities exist for transit operators and merchants to collaborate and capitalize on a very large customer base carrying value on a transit card, rather than as cash.

A significant portion of transit fare media is purchased from merchants located around major transportation hubs. Merchants can work with transit operators to earn commissions for selling or reloading transit cards. With increased transit customer traffic, merchants also have the potential for sales of other products.

Transit customers also want to purchase their morning coffee and newspaper with the speed and convenience they experience when boarding the bus or train. Merchants who accept the transit fare card for payment handle less cash, service customers more quickly, and increase the average ticket amount.

The widespread deployment of contactless transit cards therefore offers some compelling business benefits. Millions of transit customers will be using and carrying contactless transit cards. The card is "top of wallet," especially in the immediate vicinity of transit stations. Consumers love the convenience of the new transit cards and sign up for cards with little to no transit agency marketing. Pilot projects in the United States and implementations of similar programs elsewhere indicate that consumers welcome multi-application payment cards, perceiving them as convenient and cost-effective.

Appendix B: Contactless Payment Technologies[50]

Contactless payment requires a wireless information exchange between a consumer's payment token and a payment terminal or infrastructure device. Contactless payment can be enabled using a variety of technologies and tokens.

Within the United States, radio frequency (RF) technology has been used for the primary contactless payment initiatives (ExpressPay from American Express, MasterCard *PayPass*, ExxonMobil Speedpass, and various transit payment systems). These systems use high-frequency 13.56 MHz solutions, low-frequency proprietary RF solutions, and ultra-high-frequency RF solutions. This appendix provides a basic overview of these different RF technologies.[51]

ISO/IEC 14443-Compliant High-Frequency 13.56 MHz Technology

ISO/IEC 14443 is a contactless smart card technology standard operating at 13.56 MHz. This standard specifies the characteristics of RF devices with an operational range of up to 4 inches (10 centimeters). The technology was originally designed for electronic ticketing and electronic cash applications. For these applications, short operational ranges and fast transaction speeds are critical. These same market requirements led ISO/IEC 14443 to be adopted for transit, off-line purchase, vending, and physical access control applications.

ISO/IEC 14443 was initiated in 1994 to standardize contactless payment cards and finalized in 2001. To date, approximately 250 to 300 million contactless cards that are based on the ISO/IEC 14443 standard have been shipped.[52] The majority of these cards are used in transportation applications for automatic fare collection, with the largest installations in Asia. ISO/IEC 14443 cards are supplied by the largest base of semiconductor suppliers and card manufacturers.

A number of different ISO/IEC 14443-compliant products are available, offering a range of characteristics at a number of price points. These characteristics include compliance with different levels of the standards, differing encryption and authentication schemes, and differences in processing power and chip resources. ISO/IEC 14443-compliant readers are available from multiple vendors, with readers that can interoperate with the range of available products, allowing an issuer to provide a choice of solutions and a migration path to more powerful devices if required.

The financial industry is supporting contactless payment solutions based on ISO/IEC 14443. American Express ExpressPay and MasterCard *PayPass* use ISO/IEC 14443 in their contactless payment implementations in the United States. Visa International has also endorsed a global payment

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[50] The Smart Card Alliance has used best efforts to ensure, but cannot guarantee, that the information described in this section concerning contactless technologies and the status of their deployment is accurate as of the date of this report.

[51] For information on other non-RF contactless technologies (e.g., infrared, Bluetooth), see the Smart Card Alliance report, "Contactless Payment and the Retail Point of Sale: Applications, Technologies and Transaction Models," published in March, 2003 and available at www.smartcardalliance.org.

[52] "Contactless Smart Card Technology for Physical Access Control," Avisian, Inc., April 1, 2002 and Philips Semiconductors.

specification for contactless cards based on ISO/IEC 14443, and a number of trials in Asia are underway or planned.[53]

The adoption of ISO/IEC 14443-based contactless solutions by the financial industry, the security features of the technology, and its widespread use in payment applications make ISO/IEC 14443-compliant contactless technology well suited for any open or closed payment application.

Proprietary High-Frequency 13.56 MHz Contactless Technology

Proprietary 13.56 MHz RF devices and readers are currently available and are used extensively for transit applications in Asia Pacific markets (such as Hong Kong and Japan) and, to a more limited extent, in the United States. The most prominent examples of this technology are the FeliCa card, developed and promoted by Sony, and the GO CARD®, developed by Cubic Transportation Systems, Inc.

FeliCa Card. The FeliCa card is used by the Hong Kong Octopus card transit system, the New Delhi Metro, the Singapore Land Transit Authority, and by the majority of Japanese transit agencies. The FeliCa card uses the same frequency and form factor as ISO/IEC 14443-compliant cards but differs in some technical specifications. In Hong Kong, the FeliCa card is increasingly being used for non-transit payment applications as well (for example, quick-service retail and vending applications). Sony is promoting FeliCa with an electronic purse in Japan and other countries. Several vendors are licensed to produce FeliCa-compliant cards and readers.

Cubic GO CARD. The Cubic GO CARD is used by a number of large transit operators and has been used in several North American pilot transit projects. GO CARD technology uses the same frequency, modulation scheme, bit coding, and form factor as ISO/IEC 14443 Type B-compliant cards but differs in other technical specifications. The technology's functional capabilities are tailored for high-speed, tear-proof transit applications and large storage requirements. Cards are available from a variety of card manufacturers licensed by Cubic, and Cubic's Tri-Reader® supports communication with ISO/IEC 14443 Type A and B cards and the GO CARD.

The primary advantage of proprietary 13.56 MHz technology is the installed card base and reader infrastructure within specific geographic regions. Merchants in cities that are implementing contactless payment cards for transit payment could consider teaming with their local transit authority to offer contactless payment and take advantage of the wide-spread issuance of cards to local consumers (although the harmonization of application requirements and impact on business cases need to be examined carefully). The installation of readers that handle multiple card types provides issuers with additional flexibility, allowing multiple card types to be used with a common infrastructure.

The primary disadvantage of this technology is the lack of standards, which leads to interoperability issues among implementations. This may not be a disadvantage to a local transit agency, but it should be considered by issuers and merchants evaluating contactless technology.

Proprietary 13.56 MHz technologies tend to be suitable for use in specific geographic locations where interoperability with the existing infrastructure is important. Proprietary technologies can also be used successfully in areas where global contactless payment is not a requirement (e.g., within countries

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[53] John Frank, "Visa selects ISO 14443 as its standard for global contactless payments," *ContactlessNews*, December 2002.

or among cardholders where travel beyond a single city, region, or country is infrequent). However, the lack of standards compliance and operator-specific implementations suggests that adoption for use in more open systems or global payment environments may be limited.

It is important to note that while different transit operators in North America have historically used different technologies and systems, there is currently a strong effort within the transit industry to standardize payment so that new automatic fare collection systems can be used by multiple operators within a region or corridor. The American Public Transportation Association (APTA) is working on interoperability specifications for transit applications in North America. Although the APTA standards effort is not complete, the transit industry is already moving toward ISO/IEC 14443 Type A or B for new implementations[54] and is working closely with the financial sector to ensure compatible payment approaches.

Proprietary Low-Frequency 125 to 134 KHz RF Technology

Low-frequency RF technologies operate at less than 300 KHz. These technologies typically use a unique ID within an application and therefore are most often referred to as RFID technology. Such technologies have been used extensively for security applications such as automobile immobilizers and for access control.

Speedpass is an example of the use of low-frequency RFID technology for payment in North America. The Speedpass technology operates at 134 KHz and can achieve ranges up to 10 centimeters but with relatively low data-transfer rates.

Low-frequency RFID technologies have no established communications standards at present, and the RF tag has very limited processing power. These technologies can also support longer read ranges, although this potential liability is often addressed through the design of the antenna (to limit range). For these reasons, this technology may be perceived to have a potential security risk unless the risk is specifically addressed for a given application.[55]

The most predominant form factor used for low-frequency RFID payment is the key fob, but both automobile-mounted tags and tags embedded in watches are also commercially available. The auto tags are active tags, requiring a battery that must be replaced every 3 to 4 years.

There are no global standards for low-frequency RFID technology, although one standard (ISO/IEC 18000-2) is currently being defined. Solutions are typically available only from limited sources.

The use of low-frequency RFID technology for contactless payments appears to be best suited for closed-system applications. A merchant selecting this technology could implement a unique solution or partner with a contactless payment service provider (such as Speedpass). Electing to join an existing network has the advantage of acquiring an installed base of users and an infrastructure and fulfillment system. Implementing a merchant-specific solution has advantages in terms of brand differentiation, promotion, and overall control, and disadvantages in terms of interoperability and added implementation and promotion costs. Given the lack of standards, lack of endorsement by the financial industry, and perceived security risks, this

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[54] For example, the San Francisco Bay Area, Ventura County, Minneapolis/St. Paul, and Boston AFC systems will use contactless cards based on ISO/IEC 14443.
[55] Proprietary vendor-specific low-frequency RF security features are available.

technology does not appear to be appropriate for high-value payment or more general retail applications.

Proprietary Ultra-High-Frequency RF Technology

Systems based on ultra-high-frequency RF typically operate in the ISM band (902 to 928 MHz in the United States) and have an operational range of anywhere from 3 meters to more than 10 meters. These technologies generally use a unique ID within the application, so they are also referred to as RFID technology. The best example of the use of ultra-high-frequency RF technology that is applicable to payment applications is the use of RF transponders to pay highway tolls, such as the E-ZPass[SM] system (used in the northeastern United States), TollTag™ (used in the Dallas metropolitan area), and FasTrak™ (used in California).

This technology could be used for some forms of retail payment in conjunction with its use for paying highway tolls. For example, one McDonald's franchisee is participating in a trial using TollTag technology at five drive-through McDonald's restaurants in the Dallas area, and a Long Island McDonald's is using E-ZPass. The consumer benefits from being able to access additional hands-free services without having to acquire an additional token. The toll operators will presumably increase revenue from the services provided to the merchants.

Security for high-frequency RFID systems is limited or nonexistent. The transponders for the systems used in toll applications are typically active devices, though passive transponders could be used for consumer payment applications requiring limited read range. The ultra-high-frequency and low power requirements translate into very small, efficient devices with high bandwidth between transponder and reader. Some devices may be capable of limited channel encryption or device authentication, but in general, security is an issue since most of these devices have not been developed for consumer payment applications. The long read ranges and limited security also contribute to the perception that a consumer could be charged inadvertently for fuel or services or maliciously defrauded.

The transponder devices can be very inexpensive, but the readers are typically more expensive than the readers required by other RF technologies. The lack of a suitable ISM band at these frequencies also limits the use of this technology for global applications. Because there are no global standards for this technology, solutions are typically available from only a single source. Progress is being made on an open 5.9 GHz standard for toll and other vehicle-oriented payment applications; this standard is targeted as an ISO/IEC substandard for global use.

The use of ultra-high-frequency RF tags for contactless payments appears to be best suited for closed-system payment applications like tolls and, potentially, for retail or payment operations linked to the toll system. The ability of the technology to operate at long ranges supports a positive user experience in executing drive-through transactions. However, given the lack of standards, lack of ISM band for global use, lack of endorsement by the financial industry, and potential security issues, this technology does not appear to be appropriate for high-value payment or more general retail applications. The required form factor and requirement to (typically) mount the tag semi-permanently also limit the general usefulness of this technology for payment.

Summary

Tables 5 and 6 summarize the key technical and business issues in selecting an RF contactless technology for a payment system.

Table 5: Contactless Technology Comparison: Technical Features

	ISO/IEC 14443	Proprietary 13.56 MHz	Low-frequency RF	Ultra-high-frequency RF
Operational range	<10 cm	<10 cm	<20-60 cm	3.5 to 10+ m
Operational orientation	Within RF range, depending on antenna	Within RF range, depending on antenna	Within RF range, depending on antenna	Within restricted antenna beam
Data rates	106-424 Kbps	FeliCa: 211 Kbps GO CARD: 115-460 Kbps	<10 Kbps	20-100 Kbps
Carrier frequency	13.56 MHz	13.56 MHz	100-300 KHz	902-928 MHz
Standards-based communications link	ISO/IEC 14443 Types A/B	No	No	Most are proprietary; no single global standard
Standards-based payment protocol	American Express, JCB, MasterCard, Visa	FeliCa: JCB GO CARD: None	No	No
Availability of POS terminals	Multiple vendors	FeliCa: Multiple vendors GO CARD: Cubic	Multiple vendors	Available for trials
Security	Perceived security advantage due to intentionality of payment due to short range; more capable, crypto-enabled processors; wired logic security services	Perceived security advantage due to intentionality of payment due to short range; more capable processors or wired logic security services	Typically transactions are short range; less capable processors and low data rates	Perceived security threat due to longer range; much less capable processors
Available form factors	Plastic card Key fob Watch Mobile phone	Plastic card	Plastic card Key fob Watch Car tag Mobile phone	Car tag

Table 6: Contactless Technology Comparison: Business Issues

	ISO/IEC 14443	Proprietary 13.56MHz[56]	Low- frequency RF	Ultra-high-frequency RF
Availability in card form factor	Yes	Yes	Yes	No
Financial industry support for payment	American Express, JCB, MasterCard, Visa	FeliCa: JCB GO CARD: None	No	No
Current market deployment for retail payment applications	Extensive worldwide, with over 200 million cards used in transit AFC; pilots in the U.S.	FeliCa: Extensive worldwide for AFC; 25 million shipped worldwide GO CARD: Selected in major cities in North America for AFC	Over 6 million Speedpass activated fobs, plus several other trials in the U.S.	Trials in the U.S. for retail payment
Availability of cards/tokens and readers	Many vendors	FeliCa: Multiple vendors for cards and readers GO CARD: Multiple vendors licensed by Cubic for cards; Cubic for readers	Typically single source per proprietary implementation, though multiple vendors provide technology	Few vendors
Integration with payment processing services	MasterCard and American Express pilots in the U.S.; Visa pilots in Asia that link to existing credit networks; AFC	JCB in Japan	Typically pre-authorized account-based proprietary infrastructure connecting to existing financial networks (e.g., Speedpass)	Typically pre-authorized account-based proprietary infrastructure connecting to existing financial networks
Inter-operability	Potentially strong; based on standards, with the payments industry endorsing it as the contactless pay-ment standard	Non-standard technology; like technologies are interoperable.[57]	Weak; based on proprietary systems	Weak; based on proprietary systems
Ease of use by consumer	Strong. Variety of form factors, but shorter operational range	Strong. Variety of form factors, but shorter operational range	Strong. Variety of form factors, with longer potential operational range	Strong. Variety of form factors, with longer operational range
Ease of integration with mer-chant POS terminals	Easy, with addition of adapter	Easy, with addition of adapter	Easy, with addition of adapter	More difficult due to antenna size

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[56] Data shown is for Sony FeliCa technology and Cubic GO CARD technology.
[57] In North America, APTA is working on interoperability specifications for transit applications.