



# DISCUSSION PAPER

## PAYMENT CARDS CENTER

### The Electronification of Transit Fare Payments: Examining the Case for Partnerships Between Payments Firms and Transit Agencies

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***Summary:** Several of the nation's largest payment-card-issuing banks are working with public transit agencies to enable consumers to pay fares by using payment cards, and more such partnerships may be on the horizon. On April 23, 2009, the Payment Cards Center of the Federal Reserve Bank of Philadelphia hosted a workshop to discuss the potential adoption of electronic payments by transit agencies from the perspectives of several subject matter experts from J.P. Morgan Chase & Co. James Lock, vice president and senior advisor, Treasury Services Global Advisory Solutions group; Jameson Troutman, strategy manager with Chase Card Services; and Krista Gallagher, from Chase's retail banking team, attended the workshop. This paper looks at several electronic transit-fare payment models and the potential opportunities these models present to transit agencies and payments firms — such as the opportunity for transit agencies to reduce costs and to operate a more efficient payments infrastructure or the opportunity for the payments industry to increase consumers' use of contactless payment technology. This paper also identifies significant obstacles to widespread adoption of systems that allow consumers to use their credit, debit, or prepaid cards to pay fares directly.*

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## I. Introduction

At present, many of the nation's largest public transit systems allow riders to use payment cards to pay fares only as part of a two-step process. Riders can use their credit and debit cards to purchase transit-agency-issued tokens, tickets, or prepaid cards and then use the agency-issued media to pay for rides.<sup>1</sup> In comparison, a handful of agencies have begun accepting, or experimenting with systems that accept, bank-issued credit, debit, and prepaid cards, directly at fare boxes, turnstiles, or other points-of-entry or exit into systems (hereafter referred to as POE).<sup>2</sup> This reduces the fare-payment process to a single step. Moreover, by more fully integrating electronic payments into their fare-payment systems, these transit agencies are becoming increasingly like other merchants that accept payment cards at the point-of-sale.<sup>3</sup>

On April 23, 2009, the Payment Cards Center of the Federal Reserve Bank of Philadelphia held a workshop to look at how the movement by transit agencies to adopt electronic payments and to accept payment cards for POE payment of transit fares is garnering the interest of banks that issue payment cards. The workshop also looked at the ways in which banks and payments firms might partner with transit agencies and the challenges that stand in the way of consumers being able to use their bank-issued payment cards to directly pay fares. The workshop was guided by three electronic-payment specialists from J.P. Morgan Chase & Company: James Lock, vice president and senior advisor with the Treasury Services Global Advisory Solutions group, who focused on the public-sector market; Jameson Troutman, strategy manager with Chase Card Services; and Krista Gallagher from Chase's retail banking team.

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<sup>1</sup> See Philip Keitel, "The Electronification of Transit Fare Payments: A Look at the Southeastern Pennsylvania Transportation Authority's New Payment Technologies Project," Federal Reserve Bank of Philadelphia Payment Cards Center Discussion Paper (April 2009), pp. 2-4, for a look at various payment instruments and methods accepted by large transit agencies.

<sup>2</sup> This includes transit agencies in Los Angeles, New York City, Salt Lake City, and San Francisco. For more information, see Will Hernandez, "Contactless Cards Making Inroads on Transit Systems," *American Banker* (June 9, 2009), highlighting some of the programs across the country that are testing bank-issued (referred to as open-loop) payment instruments in transit systems.

<sup>3</sup> This was the subject of a 2008 PCC workshop that looked at the electronification of transit fare payment systems from the perspective of a transit agency, the Southeastern Pennsylvania Transportation Authority (SEPTA). A summary of that workshop is available at: [www.philadelphiafed.org/payment-cards-center/publications/discussion-papers/](http://www.philadelphiafed.org/payment-cards-center/publications/discussion-papers/).

This paper provides basic information on the role banks and payments firms can play in the movement to electronify transit-fare POE payment systems, an overview of transit-fare payment models, a discussion of opportunities that may arise from partnerships between banks and transit agencies, and an outline of challenges to the electronification of transit-fare payment systems and to widespread adoption of the open acceptance model (a transit-fare payment model discussed later). As mentioned previously, the views expressed here are those of the author and are not necessarily those of this Reserve Bank, the Federal Reserve System or J.P. Morgan Chase & Co. While this paper incorporates input provided by Lock, Troutman, and Gallagher, it also incorporates additional research by center staff and general information and observations obtained from other financial and transit industry sources.

Overall, as this paper highlights, the electronification of transit-fare payment systems and bank-transit agency partnerships, which are being considered by a number of banks and transit agencies around the country, offer several potential opportunities. For example, adopting electronic payment systems will allow transit agencies to reduce fare collection costs and operate a more efficient payments infrastructure. In addition, partnering with transit agencies is likely to generate a potential opportunity for payments firms to increase consumers' use of contactless payment technology and encourage transit riders' use of particular products. Yet the precise role that banks will play in the movement to electronify transit-fare payment systems largely remains undetermined. Moreover, a number of challenges remain before consumers will be able to use bank-issued credit, debit, and prepaid cards to pay for transit fares at the POE, including a lack of some common operating standards, variability in processing methods, and issues arising from low payment card penetration rates among certain consumer groups.

Section two of this paper looks at the dynamics of merchant adoption of electronic payments and at how obstacles that prevented certain merchants from accepting payment cards were overcome. That section highlights actions taken by banks and payment networks to enable these merchants to accept cards. Section three reviews various models of payment card acceptance currently being employed by transit systems or pilot programs around the country. Section four examines opportunities that may arise as a result of partnerships between payments firms and transit agencies. Section five discusses the

relevance of core competencies in bank-transit agency partnerships — where firms engaged in this type of trade focus on those activities at which they are most productive — and the activities that firms in bank-transit agency partnerships should focus on. Section six addresses challenges to widespread adoption (among the transit industry) of systems that would allow consumers to use credit, debit, or prepaid cards to pay fares at the POE. The final section summarizes the main conclusions: While the challenges to full and open acceptance of payment cards in the nation’s largest transit systems are significant, they are not unlike challenges overcome by banks and payment networks in the past. Moreover, there are growing indications that bank-issued payment cards will play an important role in modern transit-fare payment systems.

## **II. Lessons from Merchant Adoption of Electronic Payments**

Over time, many different types of merchants have begun accepting electronic payments. At first, in the 1950s, certain types of merchants, such as oil companies and department stores, offered proprietary charge cards to select customers.<sup>4</sup> As general-purpose, bank-issued credit cards emerged in the 1950s and 1960s,<sup>5</sup> and as the cost of accepting payment cards declined from the 1950s until the 2000s (declining particularly rapidly from 1990 to 2000), more and more merchants — such as restaurants, convenience stores, and hair salons — began putting in place the equipment necessary to accept cards.<sup>6</sup>

As this market grew, common reasons for merchants’ adoption of electronic payments emerged. Technological advancements in electronic payments processing and settlement systems made these payments quick and easy to use;<sup>7</sup> banks, payment associations (now called payment networks), and merchants found that card acceptance by merchants could increase transaction volumes and the amount of

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<sup>4</sup> Stan Sienkiewicz, “Credit Cards and Payment Efficiency,” Federal Reserve Bank of Philadelphia Payment Cards Center Discussion Paper (August 2001), pp. 3-5.

<sup>5</sup> See Sienkiewicz (August 2001), pp. 3-4.

<sup>6</sup> David Evans and Richard Schmalensee, *Paying with Plastic, Second Edition* (The MIT Press, 2005), pp. 125-26.

<sup>7</sup> See Evans and Schmalensee (2005), pp. 125-26.

the average sale;<sup>8</sup> and rapid growth in the use of payment cards by the American public made it more important for merchants to accept cards in order to satisfy consumers' payment preferences.<sup>9</sup> Nonetheless, and as recently as the 2000s, certain types of merchants did not accept cards.

In particular, grocery stores and quick service restaurants (QSRs) began adopting electronic payments and accepting payment cards only after payment associations and banks helped facilitate adoption. To provide context for the discussion of the role banks are likely to play in adoption of card payments by transit agencies at the POE, this section looks at actions taken by banks to offer incentives to grocery stores and QSRs. These merchant categories are illustrative of the economic and operational challenges that may be present when paper-based legacy payment systems must be modified to accept electronic alternatives. These examples also clearly show how banks and payment networks were able to address particular challenges through a variety of incentives.

#### **A. Grocery Stores**

In the 1980s, grocery store chains began purchasing automated teller machines (ATMs) and placing them in stores for customers' use.<sup>10</sup> Often working together with banks, grocery stores began to more widely deploy ATMs in the mid-1980s, following a U.S. Court of Appeals decision that held that these ATMs did not constitute unlawful branch banking.<sup>11</sup> The buildup of ATMs helped develop interest among many grocery store operators in accepting debit cards using a personal identification number (PIN) at the point-of-sale (POS). Although many banks were, at that time, divided over how to charge grocers for electronic transactions, by the mid-1980s a group of banks had decided to charge merchants for

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<sup>8</sup> See, for example, "Visa Payment Card Acceptance Helps the Bottom Line of Quick Service Restaurant Partners," *Business Wire*, November 12, 2002, discussing payment network research into the average sale of card-based transactions (versus cash transactions), and the speed of the average card-based sales transaction.

<sup>9</sup> As early as 2002, Americans used their credit cards to pay for as many as one-fourth of their retail purchases each year; see Ronald J. Mann, "Credit Cards and Debit Cards in the United States and Japan," *Vanderbilt Law Review* (May 2002), p. 1055. Today, consumers make approximately 60 percent of their noncash payments using a credit card, debit card, or prepaid card; see Federal Reserve System, "The 2010 Federal Reserve Payments Study: Noncash Payments Trends in the United States: 2006-2009"(December 2010), p. 5.

<sup>10</sup> Steven D. Felgran, "From ATM to POS Networks: Branching, Access, and Pricing," *New England Economic Review* (May/June 1985), pp. 44-48 and 51-55.

<sup>11</sup> See Felgran (May/June 1985), pp. 45-48.

electronic payment transactions but to subsidize adoption of electronic payments by providing grocers with free POS terminals.<sup>12</sup> In part because of this subsidization, the number of POS terminals in commercial use in grocery stores rose from 1,900 in 1984 to 7,500 in 1985 and to around 17,000 in 1986.<sup>13</sup>

While many of these terminals were also capable of accepting credit cards, by 1990, fewer than 750 supermarkets nationwide accepted credit cards.<sup>14</sup> At the time, many grocers and supermarket operators were hesitant to accept credit cards because of the price of acceptance.<sup>15</sup> Recognizing that if consumers could use their credit cards at grocery stores, they might use them more elsewhere, Visa, to induce greater credit card acceptance by certain grocery store and supermarket operators, lowered the fees charged to these merchants in late 1990.<sup>16</sup> By 1991, Visa also began offering a similar rate, effective for an extended period, to even more operators.<sup>17</sup>

The plan worked. By late 1991 a dramatic increase in the number of stores that accepted credit cards was noticeable. Around 5,700 of the 30,750 supermarkets in the U.S. accepted cards (including signature cards, both credit and debit) in all checkout lanes.<sup>18</sup> Adoption continued among grocers and supermarkets, and between 1991 and 1992, the number of grocery stores and supermarkets that accepted

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<sup>12</sup> See Felgran (May/June 1985), p. 54.

<sup>13</sup> Steven D. Felgran, "The Evolution of Retail EFT Networks," *New England Economic Review* (July/August 1986), p. 49.

<sup>14</sup> "Visa Supermarket Interchange," *The Nilson Report*, No. 489 (December 1990), pp. 1-3.

<sup>15</sup> The price to the merchant to accept payment cards is embodied in the merchant discount — the portion of each sale that a merchant must pay in order to accept a payment card. The merchant discount is made up of several components, including interchange-related fees, costs of providing deposit credit to the merchant (prior to funds settling), and costs associated with handling and processing the transaction. See Donna L. Embry, *The Encyclopedia of Terminology for the Acquiring Industry*, Revision A (2004), p. 161, defining "merchant discount." See also Ann Kjos, "The Merchant-Acquiring Side of the Payment Card Industry: Structure, Operations, and Challenges," Federal Reserve Bank of Philadelphia Payment Cards Center Discussion Paper (October 2007), pp. 20-23, examining fees to accept payment cards that are passed on by merchant acquiring banks.

<sup>16</sup> *The Nilson Report*, No. 489 (December 1990), p. 3.

<sup>17</sup> "Supermarkets in Visa Program," *The Nilson Report*, No. 497 (April 1991), pp. 1-2.

<sup>18</sup> *The Nilson Report*, No. 497 (April 1991), pp. 1-2.

cards increased more than six-fold.<sup>19</sup> Although many grocery store and supermarket owners initially had some objections about the cost of electronic payments, once payment networks lowered the price of accepting cards and began offering temporary low interchange rates, a tipping point (a point at which a small change resulted in large incremental effects)<sup>20</sup> was reached and rapid adoption of electronic payments among this segment ensued.<sup>21</sup>

## **B. Quick Service Restaurants**

Quick service restaurants (QSRs), such as McDonald's and Burger King, are another group of merchants that were slow to adopt electronic payments but showed rapid adoption in response to incentives provided by banks and payment networks. As recently as 2001, fewer than 10 percent of QSRs accepted payment cards<sup>22</sup> for two chief reasons. First, the total cost of accepting cards, as a percentage of sales, was fairly high for QSRs because the size of the average sales transaction is small and because part of the price of accepting cards is fixed.<sup>23</sup> Second, QSR owners were concerned about the amount of time needed to complete point-of-sale payment card transactions.<sup>24</sup> Many in the industry feared that waiting for payments to be authorized and waiting for consumers to sign for purchases would hamper rapid sales transactions.

The payments industry addressed both issues. To help reduce the costs associated with accepting cards, bank card associations created special pricing for merchants with small average sales transactions,

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<sup>19</sup> George White, "More Americans Turning to Their Credit Cards to Purchase Groceries – Retailing: Consumer groups decry the trend, saying it drives up shoppers' food costs; Card issuers say the practice offers convenience," *Los Angeles Times*, August 1992.

<sup>20</sup> See Malcolm Gladwell, *The Tipping Point* (Back Bay Books/Little Brown and Company, 2002), pp. 7-9.

<sup>21</sup> Price incentives included offering grocers the lowest interchange rate available at the time. See "MasterCard Supermarket Test," *The Nilson Report*, No. 481 (August 1990), pp. 1-2.

<sup>22</sup> Lauri Giesen, "Fast Food Cooks up a Winning Card Recipe," *Digital Transactions*, May-June 2005, pp. 16, 18, 20-21.

<sup>23</sup> See Giesen (May-June 2005), pp. 16, 18, noting that the charge to a merchant for accepting a card payment is a two-part tariff consisting of a fixed charge and a percentage of the transaction value, and that for QSRs the fixed component resulted in a relatively large average cost of acceptance prior to price modification by payments firms.

<sup>24</sup> See Giesen (May-June 2005), pp. 18, 20.

such as QSRs.<sup>25</sup> Additionally, to help reduce the time required to conduct card-based transactions, the associations adjusted their rules so that QSRs could do away with signature requirements for small-dollar-value transactions (generally transactions under \$25).<sup>26</sup> QSRs' adoption of electronic payments following these changes was dramatic. Payment card acceptance at QSRs went from less than 10 percent in 2001 to 67 percent in 2005. According to Lauri Giesen, "Visa saw \$11 billion in credit-related QSR sales in 2004, up 67% from 2003," and "MasterCard saw a 60% gain in dollar transactions made on its cards in 2004 at QSR outlets."<sup>27</sup>

While many merchants that accept electronic payments are able to increase transaction volumes, increase the amount of the average sale, or give consumers the opportunity to pay with their preferred payment instrument, some merchant categories, as these examples illustrate, still face obstacles to adopting electronic payments. Several of these challenges, especially those related to the cost of accepting cards or to merchants' special requirements (such as the need to limit the time required for a payment transaction), require tailored solutions from banks and payment networks before adoption among these groups becomes commonplace.

Whether the payment industry would consider offering transit agencies solutions and incentives similar to those offered to other merchants in the past is not fully known. One reason for uncertainty is that present economic conditions have resulted in significant capital constraints for some transit agencies.<sup>28</sup> Another reason for uncertainty is that banks and payment networks are cautious about wading into technological aspects of the transit environment, making it unlikely that these firms would want to

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<sup>25</sup> See, for example, "On-line Pricing," *The Nilson Report*, No. 514 (December 1991), pp. 5-6, discussing lower fee rates on certain debit card transactions for gas stations, fast food stores (QSRs), and grocery stores, than for other stores (as classified by merchant categories).

<sup>26</sup> See Giesen (May-June 2005), p. 18. See also "Visa Programs for Low Dollar Transactions," available at: <http://usa.visa.com/download/merchants/visa-programs-low-dollar-transactions.pdf>, detailing this change in the rules.

<sup>27</sup> See Giesen (May-June 2005), p. 16.

<sup>28</sup> See, for example, Southeastern Pennsylvania Transportation Authority, "SEPTA Seeks Federal Funding For New Payment Technologies Program" (Philadelphia: SEPTA Press Release, 2010), available at: [www.septa.org/media/releases/2010/08-26.html](http://www.septa.org/media/releases/2010/08-26.html) (accessed December 20, 2010), noting that capital constraints have forced SEPTA to alter how it seeks to fund its New Payment Technologies Project.

intercede in deciding what specific kinds of computers or equipment a merchant should use.<sup>29</sup> Therefore, while it is generally informative to think about instances in which incremental changes to payments firms' policies or rules facilitated merchant adoption or electronic payments, it would be a mistake to assume that the same types of changes will automatically occur as part of the movement to modernize transit-fare payment systems nationwide.

### **III. An Overview of Electronic Transit-Fare Payment Models**

There are three predominant electronic transit-fare payment models: (1) the proprietary closed-loop model; (2) the shared-card model; and (3) the bank-issued-card-based model, known as the open acceptance model. (This model is most similar to the way that most merchants accept bank-issued payment cards at the point-of-sale.) The shared-card and open acceptance models differ in the kinds of payment applications and technology that reside on the payment cards.

This section briefly discusses how each model operates and provides an overview of how electronic transit-fare payment systems are being developed. The remainder of this paper will focus on the open acceptance model and whether it is likely to gain widespread acceptance among transit agencies nationwide.

#### **A. The Proprietary Closed-Loop Model**

Under the proprietary closed-loop model, the only payment cards consumers can use to pay for rides on transit systems are those issued by, or on behalf of, transit agencies. In other words, consumers can use cash, checks, credit cards, or debit cards to purchase transit-agency-issued fare media, but only those media can be used to pay for rides at the POE.

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<sup>29</sup> For example, when QSRs first started to adopt electronic payments, one issue that emerged was whether particular chains and franchisees should replace dial-up equipment with computer-based equipment. Generally, banks stayed out of this decision, allowing merchants to instead select the solutions that best fit their needs and corporations to pass along savings they were able to bargain for with their merchant bank to their franchisees. See Giesen (May-June 2005), pp. 18, 20-21, discussing the issue of IP adoption among QSRs.

Furthermore, prepaid cards issued by transit agencies, such as the Breeze Card in Atlanta, the Charlie Card in Boston, or the Chicago Card,<sup>30</sup> can be used to pay for rides on the systems of the issuing agency but cannot be used on another agency's systems.<sup>31</sup> In other words, prepaid cards issued by transit agencies are typically not interoperable. While these cards may someday be interoperable in a fashion similar to the popular electronic toll-payment device E-ZPass,<sup>32</sup> no prepaid cards issued by transit agencies can presently be used on another agency's system.

As James Lock observed, it seems as though practically all transit agencies in the United States presently employ some kind of proprietary closed-loop prepaid platform. Consequently, there are dozens of types of agency-issued prepaid cards across the country.<sup>33</sup> Although in some systems agency-issued prepaid cards can be loaded, reloaded, or even automatically reloaded by using credit and debit cards, these systems are generally managed by transit agencies themselves (or by agents acting on behalf of the agencies). Lock explained that, to some extent, these systems are a legacy of traditional transit-fare payment systems and that while some regional cooperation exists for sharing media (and therefore for designing systems to be at least partially interoperable), such cooperation does not seem to be widespread.

Although cooperation between firms involved in common electronic-payments-related endeavors has been shown to yield efficiencies and gains for participant firms,<sup>34</sup> determining why cooperation has not been more prevalent here is difficult — particularly in light of the significant costs associated with

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<sup>30</sup> See [www.breezecard.com/](http://www.breezecard.com/), [www.mbta.com/fares\\_and\\_passes/charlie/](http://www.mbta.com/fares_and_passes/charlie/), and [www.chicago-card.com/](http://www.chicago-card.com/), respectively, for more information on these cards.

<sup>31</sup>This is similar to the way in which many of today's large retailers sell gift cards. Consumers purchase the gift cards using cash, checks, credit cards, or debit cards, but the cards can typically be used only at a particular merchant's stores and cannot be used to purchase goods from other retailers.

<sup>32</sup> For example, a driver with an E-ZPass device can drive through multiple states, paying at different states' toll booths along the way, and the driver's home toll-setting authority will remit funds to the other states' toll-setting authorities.

<sup>33</sup> Transit agencies with this sort of technology in place include Metropolitan Atlanta Rapid Transit Authority, Boston's Massachusetts Bay Transportation Authority, the Chicago Transit Authority, the Los Angeles County Metropolitan Transportation Authority, New York's Metropolitan Transportation Authority, the San Francisco Municipal Transit Agency, and the Washington Metropolitan Area Transit Authority.

<sup>34</sup> See, generally, Evans and Schmalensee (2005), pp. 159-84, looking at cooperation and competition in building and operating payment networks.

operating and maintaining these systems.<sup>35</sup> It could be that various factors make coordination impossible, that various transit agencies' strategic objectives are not sufficiently aligned, or that the scale is too small to be efficient.

## **B. The Shared-Card Model**

Under the shared-card model, bank-issued payment cards can be branded with both the bank's and the transit agency's logos. Unlike other credit or debit cards issued by the bank, shared cards carry two payments-related applications: an application related to a proprietary transit-fare payment system and a bank application that allows the card to function like any other credit or debit card. Basically, under this model, banks add a transit-specific payments application (usually in the form of a chip) to their existing card products. From the transit agency's side, existing equipment for electronic fare payments remains in place. The Barclay Card OnePulse card, a product that combines Transport for London's proprietary "Oyster" card and a credit card, is an example of this type of product.<sup>36</sup>

Although this model has proved popular in other countries, few transit agencies in the United States have experimented with the shared-card model. One such experiment, however, came about as part of a partnership between Citibank (Citi) and the Washington Metropolitan Area Transit Authority (WMATA). Under the arrangement, Citi issued the Citi SmarTrip card. The Citi SmarTrip card was a Citi credit card with a WMATA chip on it that allowed the cardholder to pay for rides on WMATA's systems without having to buy WMATA-issued fare-payment media. While jointly branded, dual-application products such as this might pose unique value propositions for both transit agencies and banks, ultimately they are most likely just an interim step to open acceptance because costs associated with the agency's

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<sup>35</sup> See also Jim Daly, "A Green Light for Open-Fare Payments?" *Digital Transactions* (December 2010), pp. 12, 14, 16-17, noting that costs to operate and maintain legacy fare-payment systems can be significant and burdensome.

<sup>36</sup> For more information on the OnePulse card and how it works, go to: [www.barclaycard-onepulse.co.uk/cardDetail.html](http://www.barclaycard-onepulse.co.uk/cardDetail.html) (accessed December 10, 2010).

proprietary transit-fare payment system continue to be borne under the shared-card model (and eliminating these costs is a chief goal of many transit agencies around the country).<sup>37</sup>

### **C. Open Acceptance Model**

Under the open acceptance model, riders can use bank-issued credit, debit, and prepaid cards to pay for transit rides at the POE.<sup>38</sup> As a result, transit agencies can reduce costs, such as the costs associated with issuing and maintaining proprietary fare media (the potential opportunity for transit agencies to reduce costs and operate a more efficient infrastructure is discussed in more detail below). Nonetheless, it is important to recognize that some quantity of closed-loop fare media will be necessary for those who do not have or do not wish to use their bank-issued credit, debit, or prepaid card to ride the transit system.<sup>39</sup>

In February 2009, the Utah Transit Authority (UTA) became the first transit agency in the country to accept bank-issued payment cards directly at the POE.<sup>40</sup> Elsewhere around the country, numerous pilot programs are underway to test the viability of this model. Among the most prominent of these pilot programs are one in New York City between the Metropolitan Transportation Authority, MasterCard, and Citibank, and another in Los Angeles between the Los Angeles County Metropolitan Transit Authority, Visa, and Ready Credit Corp.<sup>41</sup> Other transit agencies, such as the Chicago Transit Authority, Philadelphia's Southeastern Pennsylvania Transportation Authority, and the Washington

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<sup>37</sup> See Daly (December 2010), p. 12.

<sup>38</sup> See "San Francisco Tests Mobile Payments For Transit and Food," *Cardline*, February 1, 2008, discussing a pilot in which mobile phones could be used by riders to pay for rides on Bay Area Rapid Transit trains.

<sup>39</sup> This issue is examined further in section VI below.

<sup>40</sup> See Hernandez (June 9, 2009), p. 1.

<sup>41</sup> See MasterCard Worldwide, "Case Study: Teaming up to Put NYC Subway Riders on the Fast Track" (New York City: MasterCard Press Release, 2008), p. 6; Dan Balaban, "Open-Loop Transit Payment Starts to Pick Up Speed," *Cards & Payments* (January 2009), p. 1.

Metropolitan Area Transit Authority, are considering open acceptance type systems or are taking initial steps toward developing systems that will accept bank-issued cards.<sup>42</sup>

Despite significant activity to modernize transit-fare payment systems at home<sup>43</sup> and abroad,<sup>44</sup> a number of challenges must be resolved before the open acceptance model becomes widespread. These challenges are highlighted in section six.

#### **IV. Potential Opportunities**

The electronification of transit-fare payment systems presents several potential opportunities to transit agencies and payments firms.<sup>45</sup> As this section highlights, the movement to modernize transit-fare payment systems: (A) offers transit agencies the potential opportunity to reduce costs and operate a more efficient payments infrastructure; (B) allows transit agencies the ability to accommodate consumers' payment preferences and to target distribution of certain payment products at certain riders; and (C) presents the potential opportunity for payments firms to increase adoption and awareness of electronic payment technology and contactless payment technology in particular.

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<sup>42</sup> See "Chicago Transit Authority Plans to Accept Contactless Cards," *Cardline*, November 21, 2008; Chicago Transit Authority, "CTA Outlines Next Generation Fare Collection Project," (Chicago: CTA Press Release, August 2009), available at: [www.transitchicago.com/news/default.aspx?ArticleId=2431](http://www.transitchicago.com/news/default.aspx?ArticleId=2431) (accessed December 10, 2009); and "Contactless Cards Making Inroads on Transit Systems," p. 1.

<sup>43</sup> See "Ticketless, Please," *Cards & Payments* (December 2007), pp. 27-31; Ben Jackson, "Accepting Contactless Cards for Fares Is the Wave of the Future for Transit," *Prepaid Trends* (December 2008), pp. 3 and 9; "Contactless Cards Making Inroads on Transit Systems," p. 1; and Balaban (January 2009), p. 1.

<sup>44</sup> See Daniel Wolfe, "Citi's Transit Plan Turns Riders into Customers," *American Banker* (September 23, 2008), pp. 12-13; Dan Balaban, "London Sets a Course For Bankcard Fare Payment," *Cards & Payments* (October 2009), pp. 32-36; and Thad Reuter, "Liverpool Contactless Trial Has An Open-Loop Twist," *Cards & Payments* (December 2009), pp. 15-17.

<sup>45</sup> For a discussion of how transit agencies alone might benefit from modernizing their fare-payment systems and accepting bank-issued payment cards, see Nasreen Quibria, "The Contactless Wave: A Case Study in Transit Payments," Federal Reserve Bank of Boston Emerging Payments Industry Briefing (June 2008), p. 4; and Keitel (April 2009), pp. 13-19. In addition, an earlier PCC workshop covered the potential gains for one transit agency from making improvements. For more information on this workshop and the potential opportunities mentioned, see Keitel (April 2009), pp. 13-19.

### **A. Reducing Transit Agencies' Costs and Making Fare-Payment Collection Efficient**

It is relatively expensive today for transit agencies to operate their own payments systems.<sup>46</sup> Costs of doing so include operational, maintenance, collections, personnel, commissions, and other costs, but also costs associated with distributing fare payment instruments to consumers — a cost that would be quickly and greatly reduced if bank cards that are already in customers' wallets could work on transit systems. In a 2010 review of the costs to collect fare payments made using different payment methods, Metropolitan Transportation Authority (MTA) staff found that depending on how a payment was made, the cost of collecting a dollar of revenue varied.<sup>47</sup> For MetroCard, the MTA's self-issued prepaid card, collection operating costs were 4 cents per dollar of revenue collected when MetroCards were sold at automated vending machines and 34 cents per dollar of revenue when cards were sold at booths in stations. In comparison, the collection operating costs were 4 cents for every dollar of revenue collected for payments made using bank-issued credit cards and 3 cents for fare payments made using bank-issued debit cards.

### **B. Accommodating Consumers' Payment Preferences**

The second potential opportunity is related to underlying changes in consumers' payment preferences. In general, electronic payments are increasing. The 2010 Federal Reserve payments study shows that from 2006 to 2009 noncash electronic payments grew, overall.<sup>48</sup> In particular, growth of prepaid-card-based payments outpaced all other noncash payment methods, growing at a compound annual rate of 21.5 percent. Debit card use grew at a compound annual rate of 14.8 percent. Credit card use declined slightly. Taken as a whole, today, electronic payments make up more than two-thirds of all noncash consumer payments.<sup>49</sup> While the study confirmed earlier observed trends about the rapid growth

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<sup>46</sup> These costs are more fully examined in earlier PCC work. See Keitel (April 2009), pp. 16-19.

<sup>47</sup> Metropolitan Transportation Authority, New York City Transit, "MTA/NYCT Phase II Pilot," presentation given by Steve Frazzini at the Smart Card Alliance 2010 Payments Summit (February 23-25, 2010).

<sup>48</sup> See Federal Reserve System (December 2010), pp. 4-6. The 2010 study is the Fed's most recent analysis of noncash payment trends in the United States.

<sup>49</sup> See Federal Reserve System (December 2010), p. 5.

in electronic payments, some of this growth is due to electronic payment instruments displacing other forms of payment. In general, consumers' payment preferences will be better accommodated by the transit industry's movement toward accepting electronic payments at the POE

While many users of public transportation systems prefer using payment cards for everyday purchases, not all riders may be accustomed to using payment cards. For example, many unbanked and underbanked riders are not likely to possess or otherwise qualify for a credit or debit card. For these individuals, a transit-agency-sponsored, open-loop prepaid card (a product being tested in a handful of pilots around the country)<sup>50</sup> can provide access to electronic transit-fare payment systems while allowing transit agencies to discontinue issuance of proprietary fare media. Essentially, prepaid cards, a frequently used tool by employers and government to distribute wages and make disbursements, can also be used for mass transit rides.

### **C. Increasing Consumers' Use of Contactless Payment Technology**

The third potential opportunity concerns how acceptance of contactless payment cards by transit agencies might influence the development of the contactless consumer payments market as a whole. Contactless payment cards — cards equipped with short-range wireless devices capable of communicating consumers' payment information to point-of-sale terminals<sup>51</sup> — are already in the hands of millions Americans.<sup>52</sup> However, fewer than 2 percent of merchants presently accept contactless payment cards.<sup>53</sup> In addition, many Americans, even those who possess cards with this technology, remain unaware of how to use them.

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<sup>50</sup> See, for example, Steve Bills, "Visa to Test General/Transit Payment Card for Underbanked," *American Banker* (November 11, 2008), and Rich Cholodofsky, "Transit Authority: Prepaid Cards to be Used Across W. Pa.," *Pittsburgh Tribune-Review* (September 20, 2010), discussing the use of prepaid cards in transit-fare payment systems.

<sup>51</sup> For more information on how contactless payment devices work, see the Near Field Communications Forum's website: [www.nfc-forum.org/aboutnfc/](http://www.nfc-forum.org/aboutnfc/) (accessed December 10, 2010).

<sup>52</sup> John Stewart, "Can Contactless Stay in Touch?," *Digital Transactions* (December 2008), pp. 24-27 and 30.

<sup>53</sup> Benjamin Brown and Brent Samuels, "Contactless Payments: An Acceptance Gap for Next-Generation Electronic Payments," *First Annapolis Navigator* (April 2010), p. 1.

Although the future of contactless payments is an area of significant debate in the payments industry,<sup>54</sup> Krista Gallagher noted that, at a basic level, frequent and repeated use of contactless cards to pay transit fares has the power to influence the development of the contactless payments market. Gallagher explained that because “contactless payment technology usage is likely driven by consumer demand,”<sup>55</sup> ensuring that consumers have the opportunity to use contactless cards and understand how to use them is of particular importance to banks that are focusing on developing consumer demand for contactless payment technology.<sup>56</sup> Essentially, acceptance of contactless cards by transit authorities gives consumers the opportunity to learn about contactless payment technology by using it. In general, learning about a payment technology through use enables consumers to make judgments about the utility of electronic payments technology.<sup>57</sup> For example, a consumer may make an assessment about a product’s convenience or ease of use and then decide to use that product more in the future. Because consumers often discount the benefits of a new payment technology, finding ways to give consumers incentives to try new payment technologies sooner than they otherwise might helps move the adoption curve closer to

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<sup>54</sup> There is much ongoing debate about the development of the contactless payments market. Some have argued that contactless payments will never catch on with consumers. Others have argued that more incentives are necessary. Compare, for example, Glen Fest, “Fractured World of Contactless Cards,” *Bank Technology News* (June 2008), discussing the development of the contactless payment market and mentioning transit-based initiatives, and “Surge in Contactless Cards Expected,” *Cardline* (December 2009), predicting that there will be a drastic increase in the number of contactless cards in the hands of consumers, with Will Hernandez, “Incentives Said to Be Needed for Contactless Debit Growth,” *ATM & Debit News* (January 2009), reporting that many payment industry experts feel that merchants need more incentives before use of contactless payment cards grows.

<sup>55</sup> Gallagher’s position is echoed by Wall Street analysts who recently argued during an *American Banker* roundtable that contactless payments, specifically mobile-phone-based payments, will increase only if consumer demand picks up and if banks focus on influencing consumer demand. See Will Wade, “Mobile Payments Have a Consumer Demand Problem,” *American Banker* (May 2010), p. 1.

<sup>56</sup> See Daniel Wolfe, “Test Could Put Contactless on Express Track,” *American Banker* (June 1, 2010), discussing the potential impact that the use of contactless technology in transit-fare payments may have on the market.

<sup>57</sup> This notion is more fully explored through the concept of “experience goods,” as it is used by former Payment Cards Center Industry Specialist James C. McGrath in a 2006 Discussion Paper entitled “Micropayments: The Final Frontier for Electronic Consumer Payments” (June 2006). In addition, the concept of learning about mobile-phone-based payment technology by experiencing it was recently explored in a paper by Senior Industry Specialist Julia Cheney: “An Examination of Mobile Banking and Mobile Payments: Building Adoption as Experience Goods?” Federal Reserve Bank of Philadelphia Discussion Paper (June 2008).

the present. In the case of transit, there is a classic complementarity.<sup>58</sup> Transit agencies want consumer adoption of contactless payments because it can solve several problems faced by the agencies. And payments firms want transit agencies to adopt contactless electronic payments because it accelerates consumer learning.

## **V. The Importance of Core Competencies**

Lock noted that, when working together, payments firms and transit agencies have the opportunity to focus on those aspects of constructing and operating electronic transit-fare payment systems that are most related to their respective business activities and experiences. He argued that both parties will benefit because total output of payment services and transit services will be highest when transit agencies are able to specialize in providing transit services — by reducing their role in providing payment services — and the financial processing is shifted to payments firms that issue electronic payment cards and provide a variety of cash management services. Basically, if payments firms and transit agencies are able to focus on aspects of electronic transit-fare payment systems with which they have greater relative expertise, the overall outcome will be better than it otherwise might be because the parties will leverage their core competencies. And in cases where neither party possesses relatively greater knowledge or expertise, the participation of a third party may be beneficial or even required.

Lock observed that many costs associated with operating an electronic fare-payment system can be reduced and that, in general, “open architecture can allow payments firms to become the low-cost provider for certain components of fare collection.” For example, payments firms are better positioned to provide card distribution, authorization, clearing, and settlement for transactions — important components to an open payment infrastructure. Lock noted that payments firms have significant

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<sup>58</sup> Complementarity refers to a situation in which two or more parties’ objectives complement one another and can be concurrently beneficial. For an example of complementarity in payments, see Nicholas Economides, “Nonbanks in the Payments System: Vertical Integration Issues,” NET Institute Working Paper 07-06 (August 2007), pp. 3-4, looking at complementarities between payments firms and merchants in the marketplace.

experience with both getting cards into the hands of consumers and processing electronic transactions. Payments firms are less well equipped, Lock observed, to provide fare-payment-related customer services, particularly in situations where complex fare schedules, or traditional transit technology, such as fare boxes and turnstiles, may be involved. Moreover, the design and construction of hardware and infrastructure, such as fare boxes and turnstiles, have little connection to a bank's core strengths. Lock argued that transit agencies have much greater relevant expertise in both of these areas, especially when compared with banks.

## **VI. Challenges to Widespread Adoption of the Open Acceptance Model**

Despite numerous factors motivating transit operators to modernize their fare-payment systems,<sup>59</sup> widespread adoption of the open acceptance model entails a number of challenges, including (A) the ongoing refinement of operating standards and the heterogeneity of transit agencies; (B) variability in processing methods; (C) low payment card penetration rates among certain consumer groups; and (D) the need to resolve issues related to disclosure of important information and customer service.

### **A. Operating Standards and Heterogeneity among Transit Agencies**

Consensus is developing among payments firms, transit agencies, and standard-setting organizations about how electronic transit-fare payment technology should operate. In particular, operating standards — standards that dictate how integral components of these payment systems should function — are gaining recognition and being actively employed. One such standard is the International Organization for Standardization/International Electrotechnical Commission 14443 standard. This standard, which defines the physical characteristics of proximity integrated circuit cards (a type of card frequently used in modern transit-fare payment systems), establishes protocols for communication

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<sup>59</sup> For more information on benefits that transit operators may derive from modernizing and electrifying transit-fare payment systems, see Keitel (April 2009), pp. 13-19.

between cards and readers.<sup>60</sup> As standards like this one gain acceptance, models for modernizing outdated transit-fare payment systems become clearer and more easily replicated, and the business case for modernizing fare-payment systems becomes apparent. However, transit agencies can differ substantially in the types of vehicles they operate, in the physical characteristics of stations and vehicles, in the makeup of their ridership, and in how their riders behave, resulting in the need for some degree of customization regarding electronic transit-fare payment systems.

## **B. Variability in Processing Methods**

No standard transaction-processing method has emerged yet. For example, under the model used by the Metropolitan Transportation Authority, Citi, and MasterCard for trials in New York City, prepayment plays an important role. With prepayment, before riders can use their bank-issued cards to pay for transit fares, the transit operator seeks prepayment from the card-issuing bank for a dollar amount equal to the cost of several transit rides.<sup>61</sup> Cardholders can then use their credit or debit cards until they exhaust their prepaid amounts (at which point another prepayment takes place), or if they have not prepaid and have instead signed up for the “pay-as-you-go” option, the agency will seek payment in a fashion similar to regular merchants. In contrast, under the model presently employed by the Utah Transit Authority, prepayment plays a lesser role, as transactions are submitted in a fashion similar to that used by a typical credit- or debit-card-accepting merchant. Troutman argued that with different models being used and being made available to transit agencies, transit agencies must evaluate models based on the agency’s system requirements and needs.

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<sup>60</sup> The International Organization for Standardization is a nongovernmental organization, made up of standard-setting bodies in 163 countries, that develops and publishes international standards to help establish a consensus about technology. Similarly, the International Electrotechnical Commission is a global organization that “prepares and publishes international standards for all electrical, electronic and related technologies.” See [www.iso.org/iso/home.html](http://www.iso.org/iso/home.html) and [www.iec.ch/index.html](http://www.iec.ch/index.html) for more information (accessed December 10, 2010). Although ISO/IEC 14443 refers to “identification” cards, a number of consumer payments applications have been built using these specifications. ISO/IEC 14443-compliant devices are often linked to an online account that can be funded via transfers from a consumer’s account or line of credit. See, for example, the Massachusetts Bay Transportation Authority’s Charlie Card Program, which uses MIFARE technology (technology produced by NXP semiconductors that is based closely on ISO/IEC 14443). Information on the Charlie Card is available at: [www.mbta.com/fares\\_and\\_passes/charlie/](http://www.mbta.com/fares_and_passes/charlie/).

<sup>61</sup> See MasterCard Press Release (2008), pp. 8-9, discussing how this model operates.

**C. Low Payment Card Penetration Rates Among Certain Consumer Groups and Related Concerns**

Lock noted that while a significant portion of transit riders in most metropolitan cities are likely to possess either a credit or a debit card, a significant number of riders are likely to possess neither. From a logistical perspective, this population requires that an option not tied to a bank account or a line of credit be made available to them as part of any electronic fare-payment system based on the open acceptance model. Generally, as Lock pointed out, this solution could most likely come in the form of a general-purpose prepaid card that can operate over the same infrastructure as credit and debit cards do today.

**D. Disclosure and Customer Service-Related Issues**

Last, Lock observed the mere fact that consumers who do not possess a debit or credit card might be required to acquire a payment card to ride public transportation raises concerns about disclosure and customer service. First, those consumers who are unfamiliar with payment cards must be given clear explanations of how to use the cards and systems and must also be given clear and succinct disclosures of terms and conditions, such as fees and expirations (such disclosures are required by state and federal laws and banking regulations). Ideally, such disclosures should be written for consumers who may not have had any previous experience with a bank or payment card. Second, low card penetration rates among some transit-riding groups will likely result in many riders needing to learn about new systems and technologies. This makes it more likely that consumers will have questions, concerns, and misunderstandings. As a result, at least initially, customer service representatives should expect more calls and requests for help. As Lock pointed out, this is an area where payments firms and transit agencies must work together so that there is little confusion over who is responsible for answering consumers' questions. Lock explained that many consumers' questions are likely to concern the operation of the transit fare scheme and the bank may or may not be in a position to answer these questions depending on their involvement with the particular solution deployed.

## **VII. Conclusion**

As Lock, Troutman, and Gallagher explained at the workshop and as this paper highlights, the movement to electronify transit-fare payment systems presents several potential opportunities to transit agencies and payments firms. Adopting electronic transit-fare payment systems will allow transit agencies to reduce costs and to conduct payments-related operations more efficiently. For payments firms, the electronification of transit-fare payments is likely to increase consumers' use of certain payment instruments and technology, such as prepaid cards or contactless payment technology. In addition, partnerships between payments firms and transit agencies may create an opportunity to reach a population that does not participate in the electronic payments arena but that frequently uses public transportation — the underbanked and unbanked. However, a number of challenges remain before consumers will be able to use their bank-issued credit, debit, and prepaid cards to pay for transit fares at the POE. While these challenges may delay the adoption of open acceptance models among systems nationwide, the history of payment card acceptance by other segments of the market suggests that these obstacles can ultimately be overcome.