



# DISCUSSION PAPER

## PAYMENT CARDS CENTER

### The Electronification of Transit Fare Payments: A Look at the Southeastern Pennsylvania Transportation Authority's New Payment Technologies Project

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**Summary:** *Over the past decade many of the nation's largest public transit providers have gone from fare-payment systems based on cash and coin to more modern electronic systems that implement payment cards, including agency-issued prepaid cards, credit cards, and debit cards. On September 16, 2008, the Payment Cards Center of the Federal Reserve Bank of Philadelphia hosted a workshop to discuss the challenges and opportunities facing the Southeastern Pennsylvania Transportation Authority (SEPTA) as it attempts to redesign its transit-fare payment system to accept payment cards. Jerry Kane, manager of SEPTA's New Payment Technologies Project, led the workshop. This paper summarizes Kane's presentation and the ensuing discussion. In addition, this paper offers some thoughts on why the modernization of transit-fare payment systems has begun around the country; what obstacles still stand in the way of using credit, debit, and prepaid cards to pay fares; and what this movement means for consumer payments generally.*

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## **I. Introduction**

In just over a decade more than half of the nation's largest public transit agencies have modernized or begun projects to modernize their transit fare payment systems, all with a focus on implementing electronic payments based on the use of contactless cards.<sup>1</sup> As a result, contactless payment cards (credit cards, debit cards, or prepaid cards) can now be used, or will soon be able to be used, to pay for rides on public transportation in most major U.S. cities, including Atlanta, Baltimore, Boston, Chicago, Houston, Las Vegas, Los Angeles, Minneapolis, New York, Newark, Salt Lake City, San Francisco, San Diego, Seattle, Washington D.C., and on systems run by regional transit providers, such as the Port Authority of New York and New Jersey (PATH), the Port Authority Transit Corporation (PATCO), and Maryland's Department of Transportation. For these agencies — organizations that have historically made primary use of proprietary coin- and paper-based payment systems (in the form of paper tickets and tokens),<sup>2</sup> and which have, more recently, put in place closed-loop, proprietary, card-based systems — the move to fare-payment systems based on contactless open-loop payment cards represents a significant change, one that will affect the daily lives and possibly the payment preferences of millions of Americans.

Recognizing that the transit industry's adoption of contactless-card-based payment systems is likely to increase consumers' use of electronic payments overall and that transit-fare payment programs based on the use of contactless cards are likely to influence consumer acceptance of particular payment technologies such as contactless cards, the Payment Cards Center held a workshop on September 16, 2008, to discuss the challenges and opportunities facing the Southeastern Pennsylvania Transportation Authority (SEPTA) as it designs a new, modern transit-fare payment system that accepts payment cards. The center invited Jerry Kane, manager of SEPTA's New Payment Technologies Project, to lead the workshop. This paper,

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<sup>1</sup> American Public Transportation Association operator groupings by mode of transportation, 2004 data on heavy rail and bus system usage, available at: [www.apta.com/research/stats/rail/hrservuse.cfm](http://www.apta.com/research/stats/rail/hrservuse.cfm) and [www.apta.com/research/stats/bus/20largest.cfm](http://www.apta.com/research/stats/bus/20largest.cfm) (accessed January 13, 2009).

<sup>2</sup> See Figure 1.1., "Traditional Transit Fare Payment Media."

based on Kane's presentation and additional research by center staff, provides background information on SEPTA, an overview of factors contributing to the nationwide development of transit-fare payment systems that accept payment cards, a summary of the reasons SEPTA is motivated to move to electronic payments, and an inside look at the challenges facing SEPTA as it attempts to modernize its fare-payment system. In addition, this paper concludes with some thoughts on how budding partnerships between mass transit agencies, banks, and electronic payment providers may affect consumer payments generally.

## **II. SEPTA's New Payment Technologies Project: Background**

Formed by the Pennsylvania General Assembly in 1964 to provide public transit to Philadelphia and the surrounding counties, SEPTA is approximately the sixth largest mass transit operator in the nation, the fourth largest operator of buses, and the sixth largest operator of light and heavy rail.<sup>3</sup> SEPTA has an operating budget of around \$1.2 billion dollars, a workforce in excess of 9,000 individuals, an average daily ridership of around 1.3 million trips, and annual fare revenue of more than \$425 million.<sup>4</sup> In December 2007, SEPTA announced that as part of a newly created initiative called the New Payment Technologies Project (NPT project) it would begin modernizing its fare-payment infrastructure with a focus on creating an electronic collection system that uses payment cards. This decision followed a general study of SEPTA's systems that was completed in 1999 and a study of SEPTA's payments infrastructure that was commissioned in 2005. The payments infrastructure study, called the 2006 Baseline of Existing Fare Collection System Study,<sup>5</sup> cited numerous findings about the complexity and state of SEPTA's legacy fare-payment infrastructure. Based on these findings, SEPTA developed a vision for what a better, more efficient fare-payment system might look like and established a

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<sup>3</sup> American Public Transportation Association, *2008 Public Transportation Fact Book* (Washington D.C.: APTA, June 2008), pp. 17, 44, 53, and 55. Figures are based on statistics for total unlinked passenger trips.

<sup>4</sup> Jennifer Lin, "Next SEPTA Chief Wants a Clean Start," *Philadelphia Inquirer*, December, 21, 2007.

<sup>5</sup> SEPTA, *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, (Philadelphia: SEPTA 2006).

foundation for the NPT project. Jerry Kane outlined that vision, characterizing SEPTA's planned system as "an integrated electronic fare-payment and collection system capable of accepting both SEPTA- and bank-issued payment cards and capable of interfacing with both bank and nonbank financial clearing systems for transaction settlement." Kane described the future system as the latest step in a long evolution of transit-fare payment systems, a step that will ultimately position SEPTA as a mainstream merchant capable of accepting electronic payments at the point-of-sale. Kane explained that once SEPTA accepts payment cards at its points-of-sale (or what are for SEPTA points-of-entry into its transportation systems), it will become an "open-platform merchant"—a merchant capable of accepting bankcards (credit and debit cards), proprietary contactless payment cards issued by the transit agency, and, if developed, electronic payment technology of the future (such as cell phones equipped with near-field communication).

To provide historical context to the workshop's discussion of the nationwide movement to electronify transit-fare payment systems, Kane examined the past 100 years of transit-fare payment system technology and identified several periods during which a particular payment technology was dominant. Kane explained that coins were the first preferred payment medium for transit operators, and coins were eventually replaced by tokens issued by the transit agency. Next came disposable plastic cards equipped with magnetic stripes; these cards rose to prominence in many systems (and they play an important role for SEPTA today).<sup>6</sup> These were followed by contactless smart cards (now popular among a number of America's largest transit agencies), which ultimately led to today's "open-platform" environment and to the acceptance of contactless credit and debit cards. On this last point, Kane referred to several projects and pilot programs underway around the country<sup>7</sup> designed to allow transit agencies to accept contactless bank-issued credit and debit cards at turnstiles, fare gates, fare boxes, and other points-of-entry. He noted that, overall, an ever increasing number of transit agencies are focusing on engineering

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<sup>6</sup> See Figure 1.2., "SEPTA'S Proprietary Transit Fare Payment Media."

<sup>7</sup> He referred to programs and pilots underway in Washington D.C., New York City, Chicago, Salt Lake City, and Los Angeles.

transit-fare payment systems to accept credit and debit cards alongside agency-issued prepaid cards.<sup>8</sup>

### **III. Factors Driving Development of Electronic Transit-Fare Payment Systems**

Kane explained that SEPTA's and, more generally, the transit industry's focus on creating open-platform payment infrastructures is driven by a number of factors. Chief among these are underlying changes in consumer payment preferences and growing consumer use of electronic payments. He noted that consumers are now familiar with using payment cards to load and reload prepaid electronic travel-related products and with using their bankcards to pay for low-dollar-value transactions. Finally, from the supply side, Kane observed that payment networks and banks have demonstrated a real interest in this extension of card-based payments and provided support to develop electronic transit-fare payment technology that accepts bankcards.

#### **a. Sustained Growth of Electronic Payments**

In 2007, the Federal Reserve published its most recent analysis of noncash payment trends in the United States. This study, the third in a tri-annual series begun in 1999, confirmed earlier observed trends about the growth in electronic payments.<sup>9</sup> From 2003 to 2006, electronic payments (including, among other forms, credit card and debit card payments) grew at a combined compound annual rate of 12.4 percent, with debit card payments outpacing all other noncash payments (growing at a compound annual rate of 15.8 percent for signature debit cards and 20.6 percent for PIN debit cards). Moreover, in 2006, and for the first time, payments made with credit and debit cards exceeded 50 percent of all noncash consumer payments.<sup>10</sup>

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<sup>8</sup> See also Dan Balaban, "Open-Loop Transit Payment Starts to Pick Up Speed," *Cards & Payments Magazine* (January 2009), observing that numerous transit agencies are starting to focus on enabling their payment systems to accept credit and debit cards.

<sup>9</sup> The Federal Reserve System, "The Electronic Payments Study: A Survey of Electronic Payments for the 2007 Federal Reserve Payments Study," (March 2008), p. 42.

<sup>10</sup> See p. 5 of "The 2007 Federal Reserve Payments Study," cited in footnote 9.

Consumers' growing preference for electronic payment media is a phenomenon that, as Jerry Kane explained, has been recognized by SEPTA and its officers. And because SEPTA is strategically focused on providing consumers with a top-notch transit experience,<sup>11</sup> revamping the fare-payment system is seen as an important response to customers' demands. On this point, Kane noted that increased use of credit and debit cards and reduced use of cash and checks have caused the agency to focus on building a system that will allow consumers to pay for fares using payment methods they prefer.

#### **b. Consumer Electronic Payments Behavior: Adoption of Bankcard-Linked Prepaid Models and Micropayments**

Kane argued that specific consumer payments behavior has been influential in the movement to electronic transit-fare payment systems. In particular, he pointed to growing consumer familiarity with prepaid payment devices funded with bankcards and to consumers' use of bankcards to pay for low-dollar-value transactions. Focusing first on consumers' adoption of bankcard-linked prepaid models, Kane explained that although SEPTA plans to ultimately build a fare-payment system centered on contactless agency-issued prepaid cards as well as credit and debit cards, contactless cards are likely to serve as the cornerstone payment device during the initial phases of the project.<sup>12</sup> Highlighting how SEPTA riders will load and reload these cards using the new system or, more precisely, how consumers will learn to load and reload SEPTA prepaid cards, Kane looked outside of transit to an electronic payment instrument popular among East Coast drivers: E-ZPass.<sup>13</sup> E-ZPass, an electronic payment instrument that emits a signal registered by toll booths when a vehicle passes through, provides tolling agencies in the northeastern U.S. a means of identifying driver-account holders and charging them for their use

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<sup>11</sup> This is something that the transit provider's CEO, Joseph M. Casey, has recently called the agency's "focal point." See the article cited in footnote 4, "Next SEPTA Chief Wants a Clean Start," p. 1.

<sup>12</sup> See Figure 1.3., "Contactless Transit-Agency-Issued Prepaid Cards," providing examples of contactless prepaid cards currently issued by major U.S. transit agencies; these cards are similar to those SEPTA will issue.

<sup>13</sup> E-ZPass Informational Website, "Welcome to E-ZPass," E-ZPass (2008), [www.ezpass.com/](http://www.ezpass.com/) (accessed January 14, 2009).

of toll roads. Operationally, information is communicated by drivers' individual devices to readers and is then relayed to a central computer system that uses the information for collecting payment. Kane noted that when a driver signs up to receive an E-ZPass transponder, he or she must make a payment — a prepayment — before that transponder will function to pay for tolls.

Kane explained that, as is the case with E-ZPass programs, prepayment will be necessary before riders will be able to use SEPTA-issued contactless cards to pay for rides. He further explained that although SEPTA will allow prepaid card prepayments and reloads, or replenishments, to be made by cash or check, the use of bank-issued debit or credit cards (bankcards) to fund cards and automatically reload cards will be encouraged. This is something that turnpike and transportation authorities that use E-ZPass do by guiding consumers toward tools that enable them to load and reload their E-ZPass accounts with credit cards and by providing incentives for using bankcards to load/reload.<sup>14</sup> Looking more generally at how enrollment in the E-ZPass programs might influence consumer use or adoption of electronic transit-fare payment systems,<sup>15</sup> Kane observed that the success of the E-ZPass programs (in the Northeast, there are presently more than 9 million account holders who possess 16 million transponders)<sup>16</sup> creates a wide-ranging consumer familiarity with proprietary, prepaid electronic payment devices related to transit. Furthermore, as Kane pointed out, overlapping demography between SEPTA riders and E-ZPass customers may work to SEPTA's advantage when it comes time to encourage Philadelphia area residents to adopt the new system because many will already have experience with a somewhat similar product.

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<sup>14</sup> See New Jersey E-ZPass, *New Jersey E-ZPass Customer Reference Guide* (Newark, NJ: NJ E-ZPass publication; [February 2007]), p. 18-19, directing consumers to use their credit cards as the primary funding source for prepaid accounts associated with E-ZPass and waiving fees only for customers who load and reload their E-ZPass accounts with credit cards. See also the Pennsylvania Turnpike Authority, *Pennsylvania Turnpike Commission E-ZPass Agreement* (Harrisburg, PA: Pennsylvania Turnpike Commission Consumer Contract; February 2009), p. 1, waiving fees for E-ZPass holders who use their credit cards to replenish underlying accounts.

<sup>15</sup> For examples of the types of cards used by these systems, see Figure 1.3., "Contactless Transit-Agency-Issued Prepaid Cards."

<sup>16</sup> See the E-ZPass Interagency Group's website, at: [www.e-zpassiag.com/IAG-Home.htm](http://www.e-zpassiag.com/IAG-Home.htm), accessed February 9, 2009.

Kane continued his discussion of the importance of consumers' behavior to transit operators' movement to electronic payments by noting that a large number of consumers today use payment cards for small-dollar-value transactions (what payments industry analysts call micropayments). He observed that the average transit ticket is less than \$5 and that not too long ago no one would have thought of using a bankcard to pay for such a small transaction but that things like iTunes have changed the way consumers think of these types of payments. This phenomenon — the emergence and viability of electronic micropayments — was first addressed in detail by the Payment Cards Center in “Micropayments: The Final Frontier for Electronic Consumer Payments,” a 2006 Discussion Paper.<sup>17</sup> In that paper, industry specialist James McGrath argued that electronic micropayments had reached, or were about to reach, the tipping point — a point at which widespread consumer adoption would occur. McGrath found that innovative products and services (such as the aggregation of transactions), as well as a cohesion between critical market participants (such as that which McGrath argued existed between payment card networks and issuers), caused electronic micropayments to obtain enough market share to change both consumers' and businesses' perceptions about how to pay for or accept payment for small-dollar-value transactions. In addition, McGrath observed that payment networks seemed to be coming to grips with revenue models surrounding micropayments and that the development of new and increasingly scalable payment technologies allowed for profitable processing of small-dollar transactions. For SEPTA, with a base fare presently at \$2,<sup>18</sup> technical progress in micropayments processing and increased consumer experience with micropayments may, as Kane supposed, increase the speed with which consumers successfully adopt contactless transit-fare payment cards.

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<sup>17</sup> James McGrath, “Micropayments: The Final Frontier of Electronic Consumer Payments,” Federal Reserve Bank of Philadelphia Discussion Paper (June 2006).

<sup>18</sup> SEPTA fare costs, available at: [www.septa.org/fares.html](http://www.septa.org/fares.html) (accessed February 6, 2009).

### **c. Participation of Payment Networks and Issuing Banks**

Noting that payment network and bank involvement in planning and designing open electronic transit-fare payment systems has resulted in some common operating procedures for electronic transit-fare payment systems, Kane pointed to the Washington [D.C.] Metropolitan Area Transit Authority's (WMATA) electronic payments infrastructure and to a set of pilot programs for transit-fare payment underway in New York City between the Metropolitan Transportation Authority (MTA), Citibank, and MasterCard. Drawing attention to WMATA's system first, Kane argued that the involvement of a payment network and an issuing bank in designing and building open, contactless electronic transit-fare payment systems is a key driver of the electrification of transit-fare payment systems. He explained that WMATA, long at the forefront of electronic transit-fare payment systems, helped develop the first products and business models related to the use of payment cards in transit and, in doing so, earned the attention of payment networks and banks. In fact, WMATA was not only the first transit agency in the U.S. to introduce an agency-issued contactless prepaid card (launching the SmarTrip card in 1999),<sup>19</sup> but it was also the first to work with banks to enable its payment system to accept credit cards at points-of-entry.<sup>20</sup> The success of this venture demonstrated to the rest of the transit industry that it was possible for multiple parties to coordinate their efforts to make electronic

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<sup>19</sup> Lyndsey Layton and Karin Brulliard, "Metro Forced to Halt Sale of SmarTrip," *Washington Post*, July, 23, 2004, p. A01.

<sup>20</sup> Washington Metropolitan Area Transit Authority, "Metro to Combine SmarTrip, Credit Card Into One," (Washington D.C.: WMATA press release, May 13, 2004), p. 1; Citibank SmarTrip Credit Card Advertisement and Application Information (2009), entitled "All in One Card," Citibank, [www.smartrip.citicards.com](http://www.smartrip.citicards.com) (accessed January 7, 2009). See also Figure 1.4., "Advertisement for a Co-Branded Multi-Application Contactless Credit Card Usable at Points-of-Entry into the WMATA Transit System." Note, however, that the credit cards accepted by WMATA at turnstiles and fare boxes — which are contactless credit cards issued by Citibank and branded with the Citibank, WMATA SmarTrip, and MasterCard logos — are unlike contactless bankcards typically issued by banks; the WMATA cards are equipped with two contactless chips. In addition to carrying a contactless bank-implanted chip, WMATA co-branded cards are outfitted with special contactless transit-only chips that interact with readers at points-of-entry into WMATA's system (the same chips that are in WMATA's own SmarTrip cards). Kane explained that, more recently, transit agencies have started accepting contactless credit cards that do not possess second transit-only chips.

transit-fare payment systems a reality, and, perhaps more important, it showed that the convenience that these systems delivered to consumers could motivate acceptance and use.

Looking at a more recent example of network, bank, and transit industry cooperation and innovation in this area, Kane pointed to a series of pilots currently underway in New York City. In these pilots, fare gates on the Lexington Avenue subway line and special readers in Grand Central and Union Square stations have been outfitted to accept contactless, MasterCard-branded credit cards, debit cards, and key fobs (plastic tags that attach to key rings) issued by Citibank (in addition to traditional disposable plastic MTA-issued prepaid cards equipped with magnetic stripes).<sup>21</sup> Under the program, bankcard-carrying riders simply tap designated turnstiles with their cards and pass through. However, users must elect in advance whether to prepay for rides (called “pre-funding” under the program) or to use their cards to pay on a ride-by-ride basis (called “pay-as-you-go”). If the ride-by-ride option is selected, card numbers are recorded by turnstiles when tapped, forwarded to an agency-managed system, batched (in a process known as aggregation), and submitted for settlement. Although the process for consumers who have elected to prepay is largely similar, the cost of rides is deducted from a prepaid balance instead of being submitted individually (or in the aggregate) to cardholders’ banks for settlement.

Similar to Washington D.C.’s program, New York City’s pilot programs allow consumers to use bank-issued payment cards to access transit systems directly. However, unlike the cards used in Washington D.C.’s program, contactless bankcards usable in New York’s systems are not embedded with special transit-only contactless chips. Instead, cardholders chosen from “across [Citi’s] major product portfolios” can use any already issued contactless Citi debit or credit card that has been registered in the program. Kane noted that the New York pilots have provided SEPTA and transit agencies nationwide with an example of how unmodified contactless bankcards can be used to pay for transit rides and how these cards can, if necessary

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<sup>21</sup> MasterCard Worldwide, “Case Study: Teaming Up to Put NYC Subway Riders on the Fast Track” (New York City: MasterCard Press Release, 2008), pp. 4, 6-7.

and under certain circumstances, ride the rails of an existing processing system for contactless agency-issued prepaid cards.

Kane explained that SEPTA, like the MTA, plans on allowing consumers to prepay for a certain number of rides with their bankcards, as well as to transact on a pay-as-you-go basis. Kane argued that, for now, permitting both types of card use makes sense. He observed that, for example, steering consumers toward using their bankcards to prepay for rides limits the risk of fraud because the agency has received authorization from a consumer's bank for the payment transaction in advance. Conversely, Kane noted that enabling consumers to pay on a ride-by-ride basis may appeal to those consumers who are accustomed to and have a preference for paying for goods and services when they are consumed.

Turning to which factors motivate nontransit agencies involved in these programs, Kane observed that payment network participation appears driven by a desire to capture more transaction volume. With MasterCard's and Visa's conversion to publicly traded companies and the growing stagnation of more mature, traditional payment card segments, networks have been paying more attention to untapped business opportunities. Transit-fare payment systems, which have historically used cash or cash-like media, have been viewed as one such opportunity.<sup>22</sup> Of partial appeal is the large number of fare-payment transactions that take place each year, a number that is on the rise. In 2007, Americans made more than 10.25 billion trips on public transportation vehicles; 39 million trips each weekday.<sup>23</sup> And ridership is growing, increasing around 10 percent in 2008 over 2007.<sup>24</sup> With \$290 billion of transit-related transactions under \$25 each year and an underdeveloped supply side for technology related to electronic transit-fare

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<sup>22</sup> See "Ticketless, Please," *Cards & Payments Magazine*, 20:12 (December 2007), pp. 27-31, discussing the appeal of the electrification of transit-fare payment systems to transit agencies, banks, and payment networks generally.

<sup>23</sup> Based on a comparison of 2007 and 2008 first- and second-quarter ridership statistics available from the American Public Transportation Association.

<sup>24</sup> Data from the American Public Transportation Association, *Public Transportation Ridership Report, Fourth Quarter 2007* (Washington D.C.: APTA, 2008), p. 1, available at: <http://www.apta.com/research/stats/ridership/riderep/documents/07q4cvr.pdf> (accessed January 8, 2009).

payment systems, payment networks' attention to transit-fare payments and their willingness to play a prominent role in electronifying these systems are understandable.<sup>25</sup>

Card-issuing banks involved in these programs have also recognized benefits from their involvement. In addition to the opportunity to displace cash payments and earn interchange fees on card-based transit-fare transactions, banks have found that transit riders possess characteristics that make them good customers. Muge Yuzak, the head of global transit ventures for Citigroup, has observed that consumers who adopt transit-related bankcard products use those products/cards more often elsewhere (at nontransit-related merchants) and are more likely to develop lasting relationships with issuing banks.<sup>26</sup> Based on her experience working with electronic transit-fare payment programs worldwide, Yuzak has also noted that the strength of relationships between bankcard-holding transit riders and their transit agencies — relationships that are typically very positive — often transfer goodwill automatically to partnering financial institutions. Essentially, Yuzak argues that not only do consumers use a financial institution's cards more outside of transit when they can use those cards contactlessly in transit systems, but they also tend to like their transit agencies and transmit that positive brand equity to bank partners. This phenomenon was also observed by MasterCard during the New York City pilot programs when it recognized that consumers who began using their contactless credit and debit cards in the subway began using their cards more frequently and routinely at other merchants'

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<sup>25</sup> Both Visa and MasterCard have publicized recent efforts to become more involved in transit-fare payments. See, for example, Steve Bills, "More Transit Fare Contactless Tests," *American Banker* (November 5, 2008), p. 5; "Visa to Improve Payment Experience for Commuters in Los Angeles and Paris; Working with Transit Operators to Enable Visa Payment at the Fare Gate," *Business Wire* (November 4, 2008), detailing two partnerships between Visa and public transit providers to enable seamless credit and debit card use at turnstiles; and MasterCard Worldwide, "MasterCard, MTA and Citigroup Trial Fast and Convenient 'Tap & Go' Payments in Select NYC Subway Stations" (New York City: MasterCard Press Release, July 11, 2006), detailing the beginning of the first stage in a series of ongoing transit-related payment pilots between MasterCard, Citigroup, and New York's Metropolitan Transportation Authority.

<sup>26</sup> Because some pilots use a mix of applications and technologies, the use of a particular card for transit-fare payments and to purchase nontransit-related goods and services does not signify use of identical functions. Nonetheless, increased use of payment cards with transit-related-functionality has been observed. For more information, see Daniel Wolfe, "Citi's Transit Plan Turns Riders into Customers," *American Banker* (September 23, 2008), p. 12.

outlets. MasterCard noted in its press releases that for a significant number of participants there is a definite and measurable “top-of-wallet effect.”<sup>27</sup>

Another aspect of these partnerships that is likely to benefit financial institutions has been recognized by Sandy Thaw, a senior business leader for Visa currently working on transit applications. Thaw observes that there is significant overlap between the unbanked and underbanked markets and public transportation riders<sup>28</sup> and notes that this overlap will potentially allow banks to reach customers they ordinarily would not be able to. Although, to date, no transit-fare payment program or pilot program has tested this observation by specifically targeting unbanked and underbanked consumers, overlapping demography between these groups could result in banks not only being able to increase the number of transactions using their cards but also being able to expand their customer base as well. For this reason, Jennifer Tescher, director of the Center for Financial Services Innovation, has argued that “public transportation could be a solid distribution channel for reaching the unbanked.”<sup>29</sup>

#### **IV. Factors Motivating SEPTA to Electronify Its Transit-Fare Payment System**

Focusing on why payment system electronification makes sense for SEPTA specifically, Kane observed that the new payment technology provides several important benefits, including the opportunity to streamline the current electronic payments process for consumers; to make necessary upgrades to the current fare-payment infrastructure; to generate additional efficiencies (such as a reduction in collection costs); and to develop better, more accurate data on system operations.

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<sup>27</sup> See pp. 5-7 of “Case Study: Teaming Up to Put NYC Subway Riders on the Fast Track,” cited in footnote 21.

<sup>28</sup> Steve Bills, “Visa to Test General/Transit Payment Card for Underbanked,” *American Banker* (November 11, 2008).

<sup>29</sup> See “Visa to Test General/Transit Payment Card for Underbanked,” cited in footnote 28.

### **a. Streamlining the Current Electronic Payment Process for Consumers**

Although one of the main goals of the NPT project is to enable consumers to pay for transit fares using bankcards, the agency already routinely accepts bankcards. This acceptance, however, differs from that planned under the NPT project in that SEPTA's current bankcard acceptance, unlike the way in which most merchants accept bankcards — as a means to pay for a good or service — creates a two-transaction payment process for consumers. Where customers might ordinarily use their bankcard to pay for the purchase of a good at a retail store or for a service at another type of merchant, consumers who use their bankcards to purchase SEPTA fare media<sup>30</sup> must first purchase SEPTA-issued fare-payment media and must then use those media to pay for the underlying good/service — the ride. As a result, riders often need to wait in line to purchase fare media from station agents before they can pay for a ride. Kane explained that eliminating this two-step transaction process, or at least reducing the need for it, will enable the agency to deliver significant time savings to riders and may, for many riders, make paying for rides simpler and easier — something well aligned with the agency's new rider-centric focus.<sup>31</sup> Moreover, Kane observed that enabling consumers to directly pay for rides using bankcards helps to reduce SEPTA's need to issue its own currency equivalent (token coins and paper tickets), something, Kane pointed out, that is expensive and is not one of the agency's core competencies. As Kane put it, "SEPTA is in the business of providing quality transportation to its riders, not printing money."

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<sup>30</sup> Across all transit lines, SEPTA's proprietary fare-payment media include tokens, paper tickets, paper transfers, plastic passes equipped with sticky backing so as to adhere to cut paper transfer sheets, plastic passes equipped with encoded magnetic stripes, scripts or coupons valid for complimentary rides, and prepaid paper invoices. SEPTA also accepts cash for fare payments and enables customers to use cash, credit cards, and debit cards to purchase proprietary media. See Figure 1.2., "SEPTA'S Proprietary Transit Fare Payment Media."

<sup>31</sup> See pages 5-6 for more details on SEPTA's consumer-centric focus (noting that consumers are using electronic payment media more frequently than ever and that SEPTA believes it must embrace this movement).

## **b. Making Necessary Improvements to the Current Payments Infrastructure**

Turning to SEPTA's current fare-payment infrastructure and how it operates, Kane noted that much of the technology currently being used by the agency has reached the end of its projected life and that firmly established goals of the NPT project include making necessary upgrades and, at the same time, reducing the agency's dependence on a complex and costly web of agents and legacy payments-processing equipment. This legacy equipment, largely the result of SEPTA and its predecessors having developed varied bankcard acceptance practices across its different lines of transportation over time, consists of numerous overlapping technologies (including different types of point-of-sale devices and different networks over which payment apparatuses communicate) as well as myriad business partnerships with common characteristics (for example, SEPTA's present arrangements with several merchant-acquirers for similar merchant-banking-related services).<sup>32</sup> Kane explained that the NPT project offers the opportunity to unify these practices and to eliminate redundant overlapping infrastructure by consolidating the agency's electronic payment processing methods. He argued that by doing both, SEPTA will be able to operate more efficiently.

Noting that SEPTA's embrace of electronic payments is also partly driven by the increasing obsolescence of its legacy payment infrastructure and rising costs associated with maintaining its fare-collection equipment (which SEPTA collectively calls the "revenue collection equipment"),<sup>33</sup> Kane also observed that "parts of the system have simply reached the ends of their useful lives." He explained that logic boards used in turnstiles and fare boxes, for example, are no longer available for purchase and that 100 MHz Pentium processors used in

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<sup>32</sup> See SEPTA, *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, footnote 5, pp. 22-23, 77; SEPTA, *SEPTA New Payment Technologies Request for Information, Respondent Questions and SEPTA Answers*, (Philadelphia: SEPTA, April 24, 2008), p. 6; and SEPTA, *New Payment Technologies System Procurement; Version 1.0*, (Philadelphia: SEPTA RFP, November 7, 2008), detailing SEPTA's use of third-party agents to accept credit and debit card payments and the prospects for altering these means.

<sup>33</sup> See p. 77 of *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, cited in footnote 5.

subway/elevated line computers are no longer supported by Intel, leaving SEPTA to cannibalize used Chicago Transit Authority turnstiles and look for more used equipment to break apart when all of Chicago's old instruments are used up. Essentially, the agency has concluded that, when it comes to certain instruments, it needs to do something more than break apart outdated equipment, particularly since costs associated with fixing and replacing equipment are likely to rise and replacement parts are likely to become unavailable.

In 2005 (the last year for which operating costs for revenue-collection equipment are available from SEPTA), the cost of simply maintaining revenue-collection equipment was \$3,360,080.00.<sup>34</sup> In 2006, at the completion of the last comprehensive review of the revenue-collection equipment, the number of existing replacement parts, although adequate (there were 180 spare units for 1800 fare boxes and 33 spare units for 300 turnstiles and new replacement pieces were either unavailable or becoming increasingly expensive), was static.<sup>35</sup> And while the 2005 maintenance costs for the revenue-collection equipment are typical for a large metropolitan transit operator, the cost of obtaining replacement parts will rise as these parts become more and more scarce.

Although Kane pointed out that not all devices need to be replaced in order to achieve the goals of the NPT project and that in some cases the agency is looking to prolong the life of current equipment by using its inventory of replacement parts and adding complimentary technology to some old fare boxes and entry devices (small instruments that would enhance the functioning of devices but would not be as costly as full replacement of the entry devices), he noted that the agency has anticipated the need for these upgrades for a long time. He explained that, consequently, funds have been set aside for this project. Kane also drew attention to the fact that contactless payment card technology may present an added benefit when it comes to

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<sup>34</sup> See p. 76 of *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, footnote 5.

<sup>35</sup> See p. 65 of *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, cited in footnote 5.

minimizing future costs associated with maintaining revenue-collection equipment by pointing out that because contactless payment cards are not swiped through terminals, fewer terminal components are being worn down by daily use and fewer parts are likely to require repair.

### **c. Additional Efficiencies**

Because SEPTA distinguishes between purely cash transactions — ones where riders pay in cash and there is no corresponding liability — and cash transactions that incur future liability, such as cash sales of prepaid fare media, collection costs of cash sales vary.<sup>36</sup> As of 2006 (the last time these costs were studied), the average estimated cost of collecting each dollar spent as part of a purely cash transaction was estimated to be just over 8 cents (8.3 cents, 8.1 cents, and 8.5 cents for fiscal years 2001, 2003, and 2005, respectively).<sup>37</sup> On the other hand, the cost to collect each dollar associated with the second type of transaction — transactions in which SEPTA sells fare media — was estimated to be, on average, 15 cents on surface lines, 40 cents on the subway/elevated lines, and 14 cents on regional rail lines.<sup>38</sup>

Although reports from SEPTA note that “there is no standard method to estimate the cost of fare collection” in the industry,<sup>39</sup> the agency’s cost estimate figures are in line with the cost of collection estimates compiled by industry analysts who have attempted to measure these costs. One 2006 report that looks at the cost to transit providers of collecting each dollar associated with cash-based sales that incur a corresponding liability (essentially cash sales of proprietary transit-issued payment media) found that the average cost of collecting a dollar ranges from 8 cents to

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<sup>36</sup> See p. 46 of *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, cited in footnote 5.

<sup>37</sup> See pp. 46 and 65 of *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, cited in footnote 5.

<sup>38</sup> See p. 93 of *Automated Fare Collection System; Phase 1: Project Development; Task 2: Baseline of Existing Fare Collection System [Study]*, cited in footnote 5.

<sup>39</sup> Smart Card Alliance, “Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence,” Princeton Junction: SCA White Paper (2006), p. 80.

16.5 cents, depending on factors such as whether automated fare-collection systems or more traditional systems are used.<sup>40</sup>

Other related research tends to confirm SEPTA’s operating cost analyses. Recent research by the Federal Reserve Bank of Boston on transit agencies’ collection costs, for example, finds that “the overhead processing cost incurred to accept cash is about twice that of debit and credit cards.”<sup>41</sup> Analyzing data from one large transit operator in particular, the study concludes that when end-to-end ticketing transactions are included in aggregate cost measurements, the cost of cash payments is six-fold more than the cost of credit/debit payments.<sup>42</sup> The study notes that accepting cash as the main form of payment for transit fares “slows the transaction time, and requires [ ] very labor-intensive back-office cash-handling process[es]”— which, at the observed agency, included employing “hundreds of people who [were required to] manually collect, count, and process [cash] payments,” as well as operating a “money train” whose only purpose was to travel transit lines collecting cash and coin. The study argues that when traditional transit-fare payment systems are compared with newer, electronic systems, electronic payments “can be processed more efficiently... potentially reduc[ing] complaints and customer service-related costs,” and that lost or stolen electronic payment devices can be identified and “negative listed” — prevented from operating at entry devices — whereas cash cannot be. The study also points out that by “negative listing” lost, stolen, or fraudulently used cards, transit agencies can avoid conducting costly and difficult investigative procedures associated with exploring reports of lost or stolen agency-issued, cash-sale-based fare media.

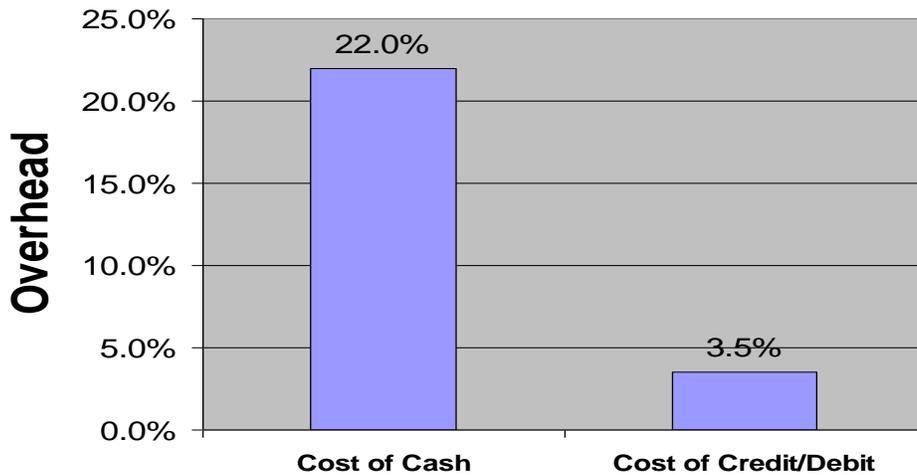
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<sup>40</sup> See p. 80 of “Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence,” cited above.

<sup>41</sup> Nasreen Quibria “The Contactless Wave: A Case Study in Transit Payments,” Federal Reserve Bank of Boston *Emerging Payments Industry Briefing* (June 2008), p. 4.

<sup>42</sup> See the figure below and p. 4 of “The Contactless Wave: A Case Study in Transit Payments,” cited in footnote 21.

## Cash v. Card as a % of Total Operating Cost



Source: p. 4, “The Contactless Wave: A Case Study in Transit Payments,” cited in footnote 43.

### d. Improving Data Capture

Kane explained that, for SEPTA, another advantage electronic payment systems have over cash-based systems is the ability to readily capture and record detailed fare-payment and ridership information. Kane noted that while, at present, the agency captures some information on payment and ridership patterns with its existing systems, the greater electronification of its payment systems under the NPT project will allow it to capture more information about riders and the types of electronic payments they make. He pointed out that this information can be of significant value when serving a wide range of constituents and figuring out, as an agency, how to deploy vehicles and use equipment efficiently. While Kane observed that laws and regulations related to operating rules and data for electronic payment systems may limit whether or how some card-related data are stored, a great deal of useful information will nonetheless be available.

## V. Challenges Facing SEPTA

Kane discussed several challenges to bankcard acceptance that must be addressed before SEPTA can achieve open-platform status. They include the need to develop technology or

methods of processing bankcards — accepting, authenticating, and authorizing — in an expeditious, transit-friendly fashion; the need for contactless payment cards and contactless point-of-sale devices to achieve greater ubiquity among consumers and businesses, forming, in essence, a well-used payment network (something payment industry researchers typically refer to as “network effects”); the need for transit operators and payment networks to establish better pricing for electronic payments; and the need for SEPTA to surmount challenges specific to its particular infrastructure and vehicles.

#### **a. Meeting Throughput Requirements**

Pointing to numerous contactless payment cards already used in transit systems, including the CharlieCard in Boston, the SmartTrip card in Washington D.C., the Q Card in Houston, the Chicago and Chicago Plus cards in Chicago, the Breeze card in Atlanta, and the Freedom card used by PATCO,<sup>43</sup> Kane observed that most electronic transit-fare payment systems in the U.S. center on contactless prepaid cards issued by transit agencies themselves and that operate over those agencies’ internal networks.<sup>44</sup> Kane noted that these cards have until very recently been the only alternative available to large-scale urban transit operators because technology that makes bankcards usable at points-of-entry is largely undeveloped or underdeveloped. But he observed that this is changing.<sup>45</sup> Kane explained that in any electronic transit-fare payment system, riders must pass through points-of-entry quickly so as not to hold up other riders, hinder vehicle schedules, and delay systems overall. Kane noted that an industry

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<sup>43</sup> The Port Authority Transit Corporation, which services southern New Jersey and the Philadelphia area.

<sup>44</sup> See Figure 1.3., “Contactless Transit-Agency-Issued Prepaid Cards.”

<sup>45</sup> See Ben Jackson “Accepting Contactless Cards for Fares Is the Wave of the Future for Transit,” *Prepaid Trends Magazine* (December, 3, 2008), pp. 3 and 9, quoting Dennis Marshall, the general manager of business development for the Chicago Transit Authority (another transit agency seeking to better integrate bankcards into its payment system). Marshall characterizes real-time bankcard acceptance in transit as a “few years” away. But see “Utah Transit Authority Showcases Open Payment System for Transit,” *PaymentsNews from Glenbrook Partners* (February 23, 2009), which reports that a transit-fare payment system currently employed by the Utah Transit Authority enables riders to use their contactless credit and debit cards at points-of-entry, processing transactions within two hours of initial triggers. While the Utah system represents an advancement of electronic transit-fare payment systems, additional new technology and business practices are being tested in several pilot programs around the country and may soon enable transit systems to accept payment cards at points-of-entry in faster or less risky ways. For more information on how recent initiatives are changing this, see pages 8 through 12.

benchmark for passing through points-of-entry (known as “throughput”) is 300 milliseconds or less and that because 300 milliseconds is too little time for online, or “real-time,” bankcard authorization using today’s technology, new technology must be developed that can decrease authentication and authorization times, or payment network rules must be adapted and business practices developed to permit such rapid payment times. This is not a trivial task, since these rules and practices must balance the throughput requirement against the risks that a card is a fake or is being used fraudulently (and will not be spotted without using online authorization and sophisticated fraud-monitoring programs put in place by payment networks and banks). Kane further noted that requiring riders to pass through entry points in 300 milliseconds makes obtaining signatures, having consumers enter PINs, or printing receipts impossible. While Kane drew attention to the fact that payment networks and banks have relaxed the requirement that receipts be printed for credit card transactions under \$25 — an important new development that has facilitated the use of payment cards in numerous situations — he also pointed out that only when rules applicable to accepting bankcards agree with the dynamics of how bankcards must be used in transit systems will a seamless incorporation of bankcards into transit-fare payment systems be possible.

**b. Network Effects (the “Chicken or the Egg Problem”)**

Focusing on present-day merchant and consumer adoption of contactless payment cards, Kane observed that many Philadelphia-area merchants are unequipped to accept contactless payment cards and that many Philadelphians either do not have contactless bankcards or are unaware that they can use their bankcards contactlessly. These observations about the existence of both hardware and software that can accept a particular type of payment instrument, businesses’ willingness and ability to accept that payment instrument, and the prevalence of that instrument among consumers are part of a set of considerations typically belonging to a concept

that payment industry analysts call “network effects”<sup>46</sup> (or, more colloquially, “the chicken or the egg problem”).<sup>47</sup> Essentially, the concept of network effects is that for a particular payment instrument to be successful it must achieve contemporaneous and widespread adoption among businesses and consumers — both sides of the electronic payments marketplace. Businesspersons must be willing to enter into contracts with merchant banks and/or payments processors to accept the payment instrument; upgrade or buy new devices, such as new point-of-sale terminals; and train or re-train staff. Likewise, consumers must be willing to carry and present the new payment device.<sup>48</sup> Only after a payment instrument has reached critical mass on both sides can it be successful. Moreover, each factor is inter-reliant (the chicken or the egg part). The more businesses that accept a particular form of payment, the more likely a consumer will find carrying that instrument convenient and desirable. Similarly, the more consumers carry and use a particular payment instrument, the more likely merchants are to accept that instrument for payments and to make any investments necessary to do so. Additionally, as adoption increases on both sides, consumers and businesses gain incremental experience with contactless payments, and, over time, these experiences — experiences successfully using contactless cards or point-of-sale terminals that accept contactless cards — serve to further increase acceptance and to bolster contactless payments overall.<sup>49</sup>

Insomuch as the concept of network effects concerns contactless bankcards, estimates of contactless cards in issuance range widely, from approximately 25 million<sup>50</sup> to approximately 50

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<sup>46</sup> See, for example, Stuart E. Weiner, “The Federal Reserve’s Role in Retail Payments: Adapting to a New Environment,” Federal Reserve Bank of Kansas City *Economic Review* (Fourth Quarter 2008), discussing the concept of network effects.

<sup>47</sup> See, for example, Daniel Wolfe, “Business Case for Contactless: Made in India, Aimed at U.S.,” *American Banker* (February 20, 2009), electronic edition, quoting banking executives discussing the state of contactless payments in the United States and the effects of worldwide contactless trials here.

<sup>48</sup> See pp. 31-32 of “Micropayments: The Final Frontier of Electronic Consumer Payments,” cited in footnote 17.

<sup>49</sup> See Julia Cheney, “An Examination of Mobile Banking and Mobile Payments: Building Adoption as Experience Goods?,” Federal Reserve Bank of Philadelphia Discussion Paper (June 2008), applying the concept of experience goods and discussing the influences that consumers’ experiences with mobile banking and mobile payments may have on the marketplace for mobile financial services.

<sup>50</sup> “A Radical Idea for Contactless Payments,” *Digital Transactions Magazine* (June 2008), pp. 10-12.

million.<sup>51</sup> However, and despite the fact that there are many contactless bankcards in consumers' pockets, the number of merchant terminals, point-of-sale devices, and other machines capable of communicating contactlessly with bankcards lags far behind. Analysts estimate the number of these terminals to be between 40,000 and 120,000.<sup>52</sup> And while the larger of these estimates tends to include individual taxi cabs and vending machines now equipped to accept contactless payments, the immense difference between the number of cards issued and the total number of terminals that accept contactless bankcards indicates that although card-issuing banks are trying to stimulate the marketplace by placing contactless cards in consumers' hands,<sup>53</sup> many merchants are reluctant to embrace contactless payments. One possible reason that more merchants may not be spending the money to upgrade or replace terminals is that despite having contactless cards (and the overall number of cards in the marketplace), few consumers are aware of how to use their cards contactlessly or even that they can use their cards contactlessly.<sup>54</sup> Another reason may be that merchants do not have adequate incentives in place to upgrade their point-of-sale terminals to accept contactless cards or to buy new terminals.<sup>55</sup> Although Kane explained that SEPTA plans to upgrade its system with contactless card readers as part of its strategic initiative to improve the experience of its riders, payment card networks have intervened in the past to encourage specific merchants or types of merchants to adopt contactless payment technology in the hope of advancing contactless payments. In 2005 and 2006, payment networks provided

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<sup>51</sup> John Stewart, "Can Contactless Stay in Touch?," *Digital Transactions Magazine* (December 2008), pp. 25-30.

<sup>52</sup> See p. 26 of "Can Contactless Stay in Touch?," cited in footnote 50.

<sup>53</sup> See, for example, Will Hernandez, "PSCU Launches Contactless-Debit Campaign to Attract Younger Cardholders to Credit Unions," *ATM & Debit News* (February 2009), electronic edition, noting that financial institutions that issue contactless bankcards have independent factors that motivate card issuance.

<sup>54</sup> See p. 27 of "Can Contactless Stay in Touch?," cited in footnote 50, noting that studies have shown that fewer than half of all consumers who hold contactless cards know how to use them and that consumer awareness of contactless payment options is generally low. Moreover, in a recent survey conducted by one payment industry research group, 33 percent of consumer respondents indicated that they do not even know what contactless payment cards are. For more information on that survey, see Glen Fest, "Fractured World of Contactless Cards," *Bank Technology News* (June 2008), quoting findings from a study by Jupiter Research.

<sup>55</sup> Will Hernandez, "Incentives Said to Be Needed for Contactless Debit to Grow," *ATM & Debit News* (January 2009), quoting analysts from Auriemma Consulting and Aite Group LLC, who argue that more incentives are necessary before merchants will adopt contactless terminals.

incentives to fast food retailers to upgrade to contactless point-of-sale terminals by providing terminal subsidies that amounted to \$50 to \$100 per checkout lane.<sup>56</sup> Given the state of contactless payments today, this has led some analysts to argue that many more such subsidies are necessary in order to spur adoption of contactless payments.<sup>57</sup>

Still another explanation for the speed at which the contactless payment network is developing, one that has been posited by payment industry executives, is that simply not enough time has passed for critical mass to build and for merchants to put in place terminals that accept contactless cards. Comparing the growth of contactless payment cards to the development of payment card types, some payments executives have made the case that the adoption curve for contactless payments has outpaced that of other payment instruments and their corresponding point-of-sale devices. Cathleen Conforti, senior vice president of MasterCard Global PayPass, has, for example, argued that contactless payments are moving along more rapidly than other payment instruments have in the past, noting that it took PIN pads “years, even decades” to reach a high level of acceptance among consumers and merchants.<sup>58</sup> Whatever the reason, and despite continued and steady growth of contactless payments, contactless payment card point-of-sale devices have not yet reached critical mass on their side of a two-sided market and efforts to educate consumers about how to use contactless cards already in their possession will be of little avail until there are places where consumers can use them.

### **c. Challenges Surrounding the Cost of Electronic Payments**

After addressing the adoption and penetration of contactless cards in Philadelphia, Kane concentrated on challenges surrounding the price of accepting bankcards. Kane observed that transit-fare payments are typically small-dollar transactions and that fee structures in place for

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<sup>56</sup> See p. 10 of “Micropayments: The Final Frontier of Electronic Consumer Payments,” cited in footnote 17.

<sup>57</sup> See “Incentives Said to Be Needed for Contactless Debit to Grow,” cited in footnote 54.

<sup>58</sup> See “PSCU Launches Contactless-Debit Campaign to Attract Younger Cardholders to Credit Unions,” cited in footnote 52, quoting Conforti.

accepting credit and debit cards can become onerous when applied to these sorts of transactions.<sup>59</sup> He stressed that for the successful development of electronic transit-fare payment systems, it is essential for payment networks, banks, and transit operators to establish fee structures that recognize each party's needs and that consider various unique aspects of transit-fare payment systems (such as the potential need to store and forward information that results from the throughput requirement). However, Kane noted that pricing issues are beginning to be resolved through the collaborative efforts of transit operators, banks, and payment networks currently engaged in pilot programs that establish workable fees for small-dollar transit-fare transactions paid for with bankcards. Kane also pointed out that payment networks are becoming more accommodating of small-dollar payments and observed that business practices, such as the aggregation of transactions, have become commonplace. He opined that aggregation, or a similar practice, will be an important option for dealing with the cost of independent transactions under traditional network pricing.

Payment industry analysts have proposed another potential solution to issues related to the cost and development of contactless networks: introducing special pricing for contactless cards. Nick Holland, a senior analyst at Boston-based Aite Group LLC, has argued that in order for more merchants to deploy contactless terminals, there must be greater financial incentives, specifically price-based incentives in the form of discounts on interchange fees or “a contactless-specific interchange rate.”<sup>60</sup> Holland argues that this would represent valuable cost savings as well as act as an incentive to stimulate the development of contactless payments.

#### **d. Unique Challenges Faced by SEPTA**

The final set of challenges to designing and building a transit-fare system that accepts bankcards has to do with the ways that SEPTA's current infrastructure will need to be modified in order to accept credit and debit cards. Kane turned first to SEPTA's surface vehicles: its buses,

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<sup>59</sup> See “Micropayments: The Final Frontier of Electronic Consumer Payments,” cited in footnote 17, focusing on issues related to payment card use for small-dollar transactions.

<sup>60</sup> See “Incentives Said to Be Needed for Contactless Debit to Grow,” cited in footnote 54, quoting Holland.

trolleys, and specialty transit vehicles. For these lines, Kane explained that SEPTA must decide whether to replace existing fare boxes or to re-tool fare boxes by attaching contactless credit, debit, and prepaid card validators capable of operating in a stand-alone fashion. Kane noted that on these lines, SEPTA is researching whether new or existing fare boxes can be equipped with wireless communication technology capable of supporting on-board credit or debit pay-as-you-go (real-time or near-real-time) transactions. Kane explained that a wireless solution would be ideal.

Next, Kane turned to SEPTA's subway/elevated train lines. Kane explained that for these lines SEPTA must decide whether to equip existing turnstiles with contactless card readers or to fully replace turnstiles with fare gates. No matter which option SEPTA chooses, under the project plan, points-of-entry/exit in its subway/elevated lines will communicate over a fiber-optic network (supported by cables that SEPTA is already in the process of stringing along its subway/elevated lines) to a central payment processing system. In individual stations, SEPTA will deploy fare vending machines capable of selling SEPTA-issued contactless prepaid cards and accepting cash, credit cards, and debit cards for purchases.

Last, Kane turned to SEPTA's regional rail lines. He pointed out that although 95 percent of regional rail riders pass through five stations every day — which may work to SEPTA's advantage if it builds platform validators or points-of-entry/exit at these stations — Kane noted that the current absence of entry devices, turnstiles, or fare gates at regional rail stations, the regional rail system's reliance on conductors to validate and collect payments, and the typical design of contactless fare-payment systems (which require tapping-in and tapping-out at points-of-entry and exit) make enabling bankcard use on regional rail lines particularly difficult. Characterizing challenges faced on regional rail lines as some of the most difficult problems SEPTA faces in making its NPT concept a reality, Kane reasoned that the eventual regional rail solution is likely to be some kind of handheld device capable of processing credit, debit, and prepaid transactions that conductors will carry. However, Kane stressed that no decision has been made and that the agency is assessing which scenario might be most effective.

Lumping SEPTA-specific challenges together and making the observation that building the new system cannot occur overnight, Kane explained that a multi-year implementation plan will be required and reasoned that only as the project progresses will problems mentioned during the workshop become resolved. Sketching out a series of points at which some unknowns are likely to become known, Kane explained that SEPTA anticipates four distinct stages of designing, building, and/or integrating new technology under the NPT project. The first step, what Kane calls “stage zero,” is to diligently research all aspects of building a transit-fare payment system that accepts bankcards, issue requests for proposals,<sup>61</sup> prepare functional requirements and technical specifications (allowing for potential bidders and interested parties to pose questions to the organization), solicit bids,<sup>62</sup> and award contracts.<sup>63</sup> Currently in this stage, SEPTA is working to better identify which of its goals are realistically attainable given external and internal factors, such as the state of payments technology today and the organization’s parameters for risk and loss. In addition, SEPTA is striving to document its current ridership revenue to accurately account for losses associated with theft and error, in order to provide potential partners truthful and precise information. In the next stage, what Kane calls “stage one,” SEPTA will (1) put in place the infrastructure necessary to allow it to issue its own prepaid contactless payment cards, which will function at turnstiles, fare gates, and fare boxes; (2) set up an agency-managed website that will allow consumers to purchase SEPTA-issued contactless prepaid cards using credit and debit cards (and to reload underlying stored values on those cards); and (3) solve issues associated with the regional rail. In “stage two,” SEPTA will (1) increase the number of turnstiles, fare gates, and fare boxes that read contactless cards; (2) expand its new payment

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<sup>61</sup> SEPTA issued a request for proposals in October 2008.

<sup>62</sup> SEPTA is currently seeking bids for the construction of those portions of its NPT project related to the self-issued contactless prepaid card system. For more information, see Paul Nussbaum, “SEPTA Ready to Seek Bids for Smart-Card Plan,” *Philadelphia Inquirer*, October 23, 2008, p. B5.

<sup>63</sup> SEPTA has extended its deadline for proposal submissions until May and plans to award the first of its NPT project-related contracts in the fall of 2009. For more information, see Paul Nussbaum, “SEPTA Delays ‘Smart Card’ Fare System,” *Philadelphia Inquirer*, March 20, 2009, available online at [www.philly.com](http://www.philly.com).

system to permit full access to its system using bank-issued contactless credit and debit cards; (3) work with other local transit providers such as PATCO to establish common standards and platforms so that riders can interchangeably use contactless cards issued by each agency; and (4) win the support of its riders, making sure to pay close attention to customers' wants and needs and to provide appropriate incentives and discounts to ensure that the system is used in the intended fashion. In "stage three," the final stage of the project, SEPTA envisions addressing emerging payments technology and accommodating devices such as mobile phones equipped with near-field communication. Noting that each stage will yield sub-challenges, Kane concluded the challenges portion of the workshop by noting that SEPTA is merely at the beginning of a very long road but that in the near future SEPTA riders will be able to pay for rides using contactless bank-issued credit and debit cards, as well as SEPTA-issued prepaid cards.

## **VI. Conclusion**

Because this paper has taken the approach of documenting the early stages of SEPTA's adoption of contactless electronic payments, as well as highlighting the motivations and challenges facing the transit agency as it attempts to modernize its payments infrastructure, subsequent research by the Payment Cards Center will have to address the further evolution of contactless-card-based payments in the transit industry and the true effects of the electronification of transit-fare payment systems on consumer payments. Nonetheless, the electronification of transit-fare payments is placing millions of prepaid contactless payment cards in the hands of Americans and bringing hundreds of thousands of contactless point-of-sale terminals into service, thereby enabling millions of consumers to use contactless credit and debit cards already in their wallets. In addition, with mass transit riders in Washington D.C., Salt Lake City, and New York able to use contactless credit and debit cards to pay for rides,<sup>64</sup> and SEPTA working to make it possible for riders to pay fares with contactless payment cards, a great many Americans will have

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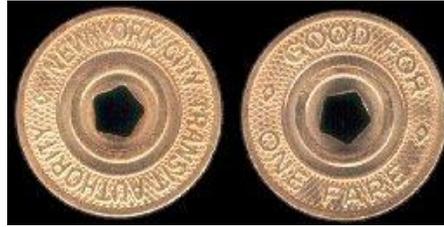
<sup>64</sup> As part of both pilot and fully operational programs.

their first experience with contactless payments when paying for a transit ride. In the aggregate, these experiences give consumers the opportunity to become familiar with contactless payment cards through learning-by-doing. Moreover, given all of these factors, the movement to electronic payments by transit agencies appears well positioned to affect the ultimate evolution of electronic consumer payments, particularly contactless payments. These effects will be the focus of continued research by Payment Cards Center staff and of future center workshops.

Figure 1.1. Traditional Transit-Fare Payment Media



1953 NYC: MTA Transit Token



1991 NYC (MTA) transit token. This token was put into circulation in 1995 and taken out of circulation for the MetroCard. The MetroCard is a disposable, agency-issued card equipped with a magnetic stripe.

Figure 1.2. SEPTA'S Proprietary Transit-Fare Payment Media



SEPTA Transit Tokens



SEPTA Paper Ticket



SEPTA Plastic Monthly Pass

Plastic, disposable weekly and monthly SEPTA passes (monthly pass depicted above) were introduced in a more durable plastic format in 1996. These passes can be swiped at fare boxes, fare gates, and turnstiles to gain entry to buses, trolleys, and subway/elevated trains. Magnetic stripes on the backs of cards are capable of being read and authenticated by devices at points-of-entry.

Figure 1.3. Contactless Prepaid Cards Issued by Transit Agencies

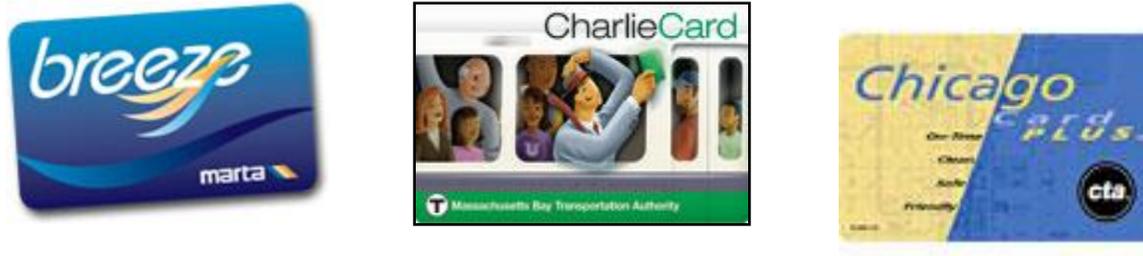


Figure 1.4. Advertisement for a Co-Branded Multi-Application Contactless Credit Card Usable at Points-of-Entry into the WMATA Transit System

Gets you on Metro faster.  
And pays for what really moves you.



**SmarTrip® Card and credit card in one.**  
Just tap it and hop on Metro.  
Use it to shop, dine and play everywhere.

1-877-282-0155  
SmarTrip.citicards.com

