



## **Transit Mobile Payments: Driving Consumer Experience and Adoption**

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## I. Overview

Over 7.3 million people use public transportation to commute to and from work every day in the United States.<sup>1</sup> Many commuters travel with their smartphones in hand to check the day's news, send emails, update social network status, watch movies, and shop. Increasingly, commuters are seeing the value in using their mobile phones to pay for transit fare (where available) to avoid waiting in ticket lines or having to carry cash or a fare card. Being able to seamlessly connect all parts of their journey via mobile—including trip planning, paying for fares, parking, and admission passes to local attractions, and receiving promotional offers for nearby retailers—could enhance that value.

Increasing numbers of regional US transit operators are seeing the benefits of incorporating mobile technology into their business and payment strategies. Benefits include greater convenience and additional payment options to customers, reduced fare collection costs and increased efficiency. Historically, changes to fare systems require long, complex procurement processes. However, mobile ticketing apps using visual and QR code<sup>2</sup> validation are relatively easy to deploy and require limited hardware upgrades and integration into existing systems. Transit agencies in Boston, Dallas, and Portland (Ore.) currently offer mobile ticketing apps for commuter rail, buses, and ferries. A number of transit agencies are in the process of implementing open payments infrastructure that allow riders to choose from several electronic payment options, including near field communication (NFC)<sup>3</sup> contactless mobile payments. Transit agencies in Salt Lake City and Chicago have already installed open fare payment systems, and Washington, D.C. and Philadelphia will follow suit in 2015.

Consumer adoption of transit mobile ticketing appears to be growing at a strong pace. While current use of NFC is limited, contactless mobile transit payments will likely increase with greater availability of NFC-enabled devices and broader acceptance in transit and retail locations. Frequent and habitual use of mobile phones to make daily transit payments should increase consumer comfort level and influence consumer behavior to encourage use of mobile payments in other venues.

The author conducted interviews with 16 executives representing transit agencies, transport system integrators and companies that provide digital security solutions, mobile ticketing platforms, and mobile marketing solutions, and conducted secondary industry research. The purpose of the research was to assess whether transit mobile payments can help drive adoption of mobile payments in the US by considering the following:

1. Consumer interest in transit mobile payments and other drivers, such as broader smartphone adoption and availability of NFC phones.
2. How transit agencies are leveraging mobile technologies in their payment strategies to create more opportunities to pay for fares via mobile.

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<sup>1</sup> US Census Bureau (2014, September 18). American Community Survey (ACS) data. Retrieved from <http://www.census.gov/acs/www/>.

<sup>2</sup> A Quick Response (QR) code is a machine-readable two-dimensional barcode that contains information (e.g., payment account data) which can be scanned and decoded quickly.

<sup>3</sup> Near Field Communication (NFC) is a standards-based wireless communication technology that allows data to be exchanged between devices that are a few centimeters apart. Some NFC-enabled mobile phones incorporate a smart chip (secure element) that stores payment credentials (or token) securely. NFC payment transactions between a mobile phone and a POS terminal use the standard ISO/IEC 14443 communication protocol also used by EMV and US contactless credit and debit cards that allows the mobile phone to emulate a physical contactless card.

3. How use of mobile for transit payments can encourage customers to use mobile in other retail venues.

## II. What's Driving Consumer Adoption of Transit Mobile Payments?

Mobile phones have become an integral part of many consumers' lives. According to the 2014 Pew Research Center Internet Project Survey, 90% of American adults have mobile phones and 58% have smartphones.<sup>4</sup> More than half of US smartphone users (51%) identified commuting as one of the top three occasions for using their smartphones each day.<sup>5</sup>

Most commuters who take mass transit have smartphones and use them for mobile commerce. Over three-quarters of Boston's Massachusetts Bay Transportation Authority (MBTA) riders and 85% of New York's Long Island Railroad (LIRR) and Metro-North riders have smartphones.<sup>6</sup> Furthermore, over half of transit riders in Portland (OR) and Dallas also have smartphones.<sup>7</sup> The MBTA conducted a survey on two commuter rail lines to assess potential mobile ticketing adoption in 2012. Results indicated that approximately half of MBTA riders made mobile purchases (e.g., Starbucks, iTunes, Google Play) at least once a month, and more than 40% said they were "somewhat likely" or "very likely" to use mobile ticketing.<sup>8</sup>

Commuters want more convenient and efficient ways to pay for transit. According to a 2013 Accenture global survey of public transit users, 80% of US transit riders indicated they would be willing to pay more per ride for a completely paperless journey, while over 75% said they would pay more if they could use their smartphones for ticketing. In particular, commuters want to avoid waiting in lines—93% of respondents in New York and 87% of those in Washington, D.C. said they would find it easier to use public transit if queuing were eliminated.<sup>9</sup>

A 2012 MasterCard Commuter Survey reported that nearly half of US commuters (47%) would use a mobile phone to pay for mass transit.<sup>10</sup> The report also noted several common pain points among commuters concerning transit fare payments:

- 44% worry about missing a bus or train while waiting in line to buy or add money to a fare card
- 34% worry about not having exact change
- 26% worry about having enough cash to pay for a mass transit ride.

Mobile ticketing and payments can reduce some of the stress associated with waiting in lines and the need to carry cash or exact change.

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<sup>4</sup> Pew Research Center Internet Survey Project (2014, January). *Cell phone and smartphone ownership demographics*. Retrieved from <http://www.pewinternet.org/data-trend/mobile/cell-phone-and-smartphone-ownership-demographics/>.

<sup>5</sup> Ericsson Consumer Lab. (2011). *From apps to everyday situations*. Retrieved from [http://www.ericsson.com/res/docs/2011/silicon\\_valley\\_brochure\\_letter.pdf](http://www.ericsson.com/res/docs/2011/silicon_valley_brochure_letter.pdf).

<sup>6</sup> MBTA and MTA, 2014.

<sup>7</sup> TriMet, July 2014 and Barry, Keith. (2013, September 23). Dallas commuters can now download their transit tickets on their phones, *Wired*. Retrieved from <http://www.wired.com/2013/09/dallas-fort-worth-transit-app/>.

<sup>8</sup> MBTA, 2012.

<sup>9</sup> Accenture. (2013) *Using Technology to Deliver Better Services to Travelers*. Retrieved from <http://www.accenture.com/us-en/Pages/insight-technology-public-transport.aspx>.

<sup>10</sup> MasterCard Worldwide (2012, March). *Half of US commuters would use their mobile phone for transit payment*. Retrieved from MasterCard Slideshare presentation <http://www.slideshare.net/MasterCardNews/mastercard-transit-survey>.

Transit agencies in the US are implementing QR code and NFC mobile platforms for transit payments. Mobile ticketing apps using visual and QR code validation are software-based and relatively easy to deploy. They are primarily developed for the two most common smartphone operating systems (OS) in the US – Google Android with 53% and Apple iOS with 42% market share as of November 2014.<sup>11</sup> NFC contactless mobile payment implementation is more complex because it requires transit agencies to install open fare payment systems and riders to have NFC-enabled phones.<sup>12</sup>

Although NFC contactless mobile payment transaction volume is low, it is expected to increase with broader availability of NFC-enabled phones and increased consumer awareness of mobile wallets such as Apple Pay, Google Wallet, and Softcard. Interestingly, since Apple Pay's release in October 2014 more (Android) smartphone users have downloaded the Softcard and Google Wallet apps for the first time, and existing wallet customers have used these mobile wallets more frequently.<sup>13</sup> Consumers can use NFC mobile wallets to pay for purchases at about 205,000 NFC-enabled POS merchant locations across the US. NFC mobile payment adoption will continue to grow as more retailers, including transit, support contactless payment technology.

Mobile phones enabled with NFC chips may eventually become as common and ubiquitous as mobile phones with cameras. Several research firms forecast substantial growth in NFC mobile phones and transactions over the next few years:

- One in three mobile phones will come with NFC by 2017, *Berg Insights*<sup>14</sup>
- Nearly two-thirds of mobile phones (64%) will have NFC in 2018, *IHS Technology*<sup>15</sup>
- 29.4 billion mobile NFC transactions worldwide in 2018, *451 Research*<sup>16</sup>

### III. Why Transit Agencies are Considering Mobile

There are several reasons why transit agencies are building mobile technology into their payment strategies – to increase consumer choice and engagement, to accommodate and keep pace with new, emerging technologies, and to decrease costs associated with fare collection.

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<sup>11</sup> comScore. (2014, December 4). *comScore reports November 2014 US smartphone subscriber market share*. Retrieved from <http://www.comscore.com/Insights/Market-Rankings/comScore-Reports-November-2014-US-Smartphone-Subscriber-Market-Share>.

<sup>12</sup> This report focuses solely on the use of mobile NFC wallets in transit systems with account-based open payment systems. Transit agencies can also offer their own mobile transit applications that emulate traditional fare media that functions like a closed-loop transit contactless fare card. Closed-loop systems allow a transit agency without open payment capability to implement NFC with changes to their existing infrastructure and no changes to their back office processing system. No US transit agency has deployed this type of mobile payment service. For more information, see Smart Card Alliance (2012, February) *Near Field Communication (NFC) and Transit: Applications, Technology and Implementation Consideration*, available at [http://www.smartcardalliance.org/resources/pdf/NFC\\_and\\_Transit\\_WP\\_20120201.pdf](http://www.smartcardalliance.org/resources/pdf/NFC_and_Transit_WP_20120201.pdf).

<sup>13</sup> Isaac, Mike and Brian X. Chen, (2014, November 14). Apple Pay gives glimpse of mainstream appeal for mobile payments, *New York Times*. Retrieved from <http://www.nytimes.com/2014/11/15/technology/apple-pay-gives-glimpse-of-mainstream-appeal-for-mobile-payments.html>.

<sup>14</sup> Berg Insights. (2014). *Mobile wallet services*. Available for purchase at [http://www.berginsight.com/ShowReport.aspx?m\\_m=3&id=163](http://www.berginsight.com/ShowReport.aspx?m_m=3&id=163)

<sup>15</sup> IHS. (2014, February 27). *NFC-enabled cellphone shipments to soar fourfold in next five years*. Retrieved from <http://press.ihs.com/press-release/design-supply-chain/nfc-enabled-cellphone-shipments-soar-fourfold-next-five-years>.

<sup>16</sup> McKee, Jordan, (2014, July 28). London's Oyster card goes contactless, mobile. *451 Research*. Retrieved from <http://maps.yankeegroup.com/ygapp/content/f157a80dfddf4d73b51c821a910830cc/51/DAILYINSIGHT/0>.

Transit operators want to provide more payment options via mobile to meet consumers' increasingly mobile lifestyles. Some transit agencies already offer mobile ticketing apps to complement existing payment methods. Several are looking to add more robust functionalities, such as the ability to purchase tickets online and deliver to mobile devices, or to verify mobile ticket purchases using a customer's phone number. Other agencies are equipping train conductors with mobile card readers to accept credit/debit card payments onboard trains.

Helping to drive the shift to mobile is that many transit agencies have aging fare infrastructure that will soon require replacement. The Southeastern Pennsylvania Transportation Authority (SEPTA) and Tri-County Metropolitan Transportation District of Oregon (TriMet) plan to migrate from paper-based schemes to electronic fare systems for greater efficiency. The Chicago Transit Authority (CTA), Pace (suburban bus system) and Metra (suburban rail system) are required by state law to adopt a single, shared-fare payment method by 2015. Regardless of the reason, the agencies are exploring new technology options, such as open systems that can accept a variety of payment methods, including bank-issued contactless credit and debit cards, federal employee and university ID cards, and NFC mobile. An open, pay-as-you-go system enables transit riders to use their preferred payment method and reduces the transit agency's need to issue proprietary fare media. While mobile payments may not be the current top priority for many transit agencies implementing open payments, most realize that more consumers are comfortable using mobile as a payment form factor for purchases, including transit fare, and view mobile technology as essential to their business strategies.

Several transit agencies indicated the need to reduce production and cash-handling costs. Proprietary fare media is expensive. For example, the New York Metropolitan Transportation Authority (MTA) prints and encodes 160 million cards a year at an average annual cost of about \$9.5 million.<sup>17</sup> One ticket machine costs approximately \$50,000 and carries with it additional maintenance and repair costs.<sup>18</sup> The high costs and risks associated with accepting and handling cash, which still constitutes a substantial portion of fare payments, must also be considered. According to the 2013 Federal Reserve Payments Study, riders made 4.7 billion transactions using transit electronic fare cards, totaling \$7.9 billion in 2012.<sup>19</sup> Cash was the primary method used to fund the card in over 334 million transactions, representing \$3.6 billion. Implementing mobile ticketing and NFC payments could help transit agencies reduce the need for proprietary fare media and cash acceptance. Pricing structures for mobile ticketing vary based on agreements between the transit operator and mobile solution provider. Transit agencies may pay a percentage of each transaction, a flat fee per transaction, or use another option. For example, Masabi receives 2.8% of each MBTA mobile transaction, the same rate retail businesses earn for selling commuter rail tickets.<sup>20</sup>

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<sup>17</sup> Donohue, Pete. (2013, May 12). "The MTA's \$1 MetroCard 'green' fee is producing unexpected revenue for the transit agency," *New York Daily News*. Retrieved from <http://www.nydailynews.com/new-york/green-fee-producing-unexpected-revenues-mta-article-1.1342198>.

<sup>18</sup> Badger, Emily (2013, January 16). Finally: A transit ticket on your smart phone, *The Atlantic CityLab*. Retrieved from <http://www.citylab.com/commute/2013/01/finally-transit-ticket-your-smart-phone/4414/>.

<sup>19</sup> The 2013 Networks, Processors, and Issuers Payments Surveys (NPIPS) collected private-label prepaid card transit payments data from 24 local transit organizations in the larger metropolitan areas in the United States, but did not include smaller market areas where there were no fixed rail systems. However, cards could be used for bus services in those areas. Therefore, the estimated private-label prepaid card transit transactions should be viewed as lower bounds for the national private-label prepaid card transit fares collected from electronic fare cards. For more information, see [http://www.frbervices.org/files/communications/pdf/general/2013\\_fed\\_res\\_paymt\\_study\\_detailed\\_rpt.pdf](http://www.frbervices.org/files/communications/pdf/general/2013_fed_res_paymt_study_detailed_rpt.pdf)

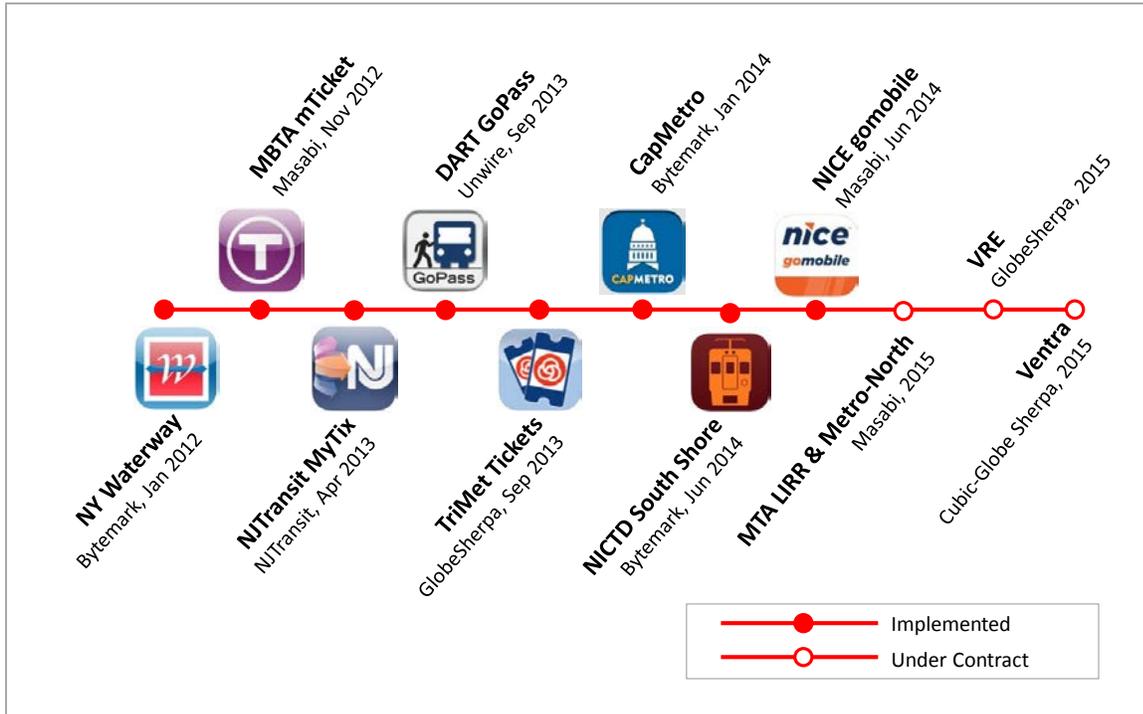
<sup>20</sup> Masabi is a mobile ticketing platform provider. For more information, see <http://www.masabi.com/about/>.

#### IV. Current and Future Transit Mobile Payment Implementations

##### *Transit Mobile Ticketing using Visual and QR Code Validation*

Transit agencies are launching mobile ticketing apps using visual and QR code validation as an alternative to paper tickets (Figure A). These apps work well for barrier free systems (e.g., commuter rail, buses, and ferries) that use visual fare inspection because digital tickets are easily displayed on a phone screen. Riders download the ticketing app, create an account, and add credit or debit card numbers to fund their ticket purchases. The app offers options comparable to paper tickets – pay-per-ride tickets (single or multi-ride) and monthly passes. For zone-based fares, the app displays originating and destination stations to help customers select the correct fares. The payment occurs in real-time over a cellular network and is processed on the backend like a standard credit or debit card transaction. After the transaction is complete, tickets are stored on the mobile device, which customers can access offline. Most apps provide purchase history and electronic receipts via email.

**Figure A. Transit Agencies with Mobile Ticketing Apps (by Provider and Launch Dates)**



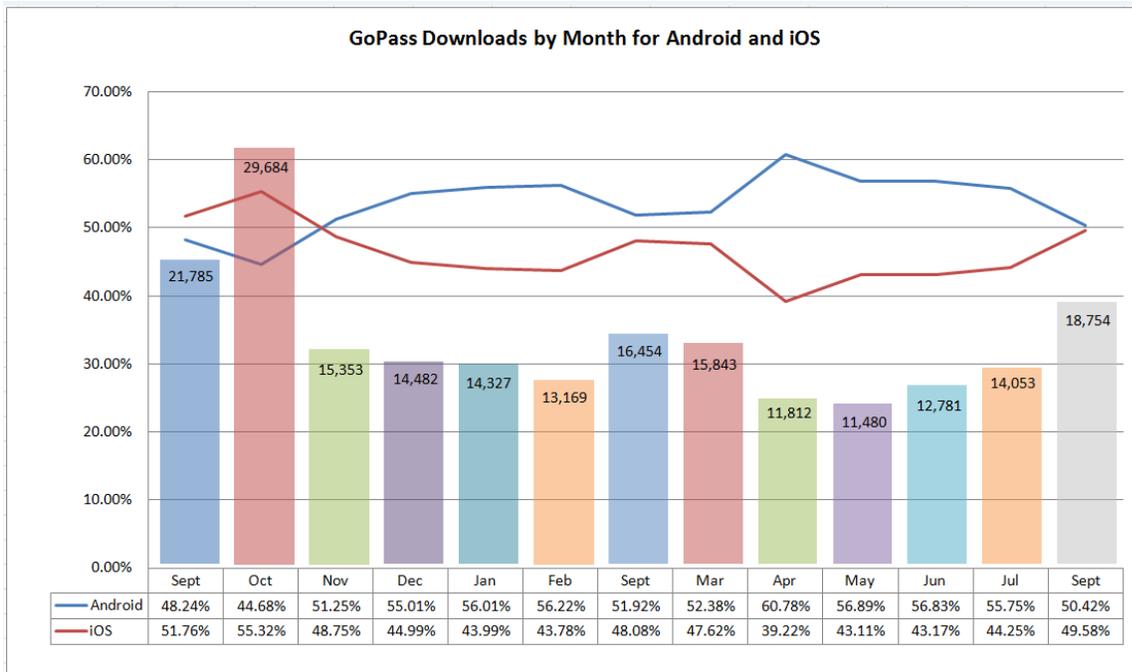
Source: *Payment Strategies, Federal Reserve Bank of Boston, 2015*

Riders must activate their mobile tickets before they are valid for travel. Conductors may validate tickets visually or electronically. Most agencies perform visual inspection of the ticketing screen for dynamic features that change depending on the route and time of day. Common features include changing ticket background colors, a visible time stamp, and animation that can move from left to right or top to bottom of the phone screen. These features allow for easy inspection by train conductors and bus operators. They also prevent riders from using screenshots or video recordings of mobile tickets, although transit agencies that offer ticketing apps have not reported issues with fraud. An alternative validation method

requires the passenger to display the QR code in an activated ticket, scan it under a hand-held or stationary validator, and receive an audible signal to confirm acceptance.

Transit customers have been very receptive to mobile ticketing apps where available; downloads and sales continue to grow. In most cases, adoption rates have exceeded transit operators' expectations. For example, download rates for the *TriMet Tickets* app surpassed the agency's year one goal within the first month of launch, and mobile accounted for approximately 8% of ticket sales as of June 2014, ten months after launch.<sup>21</sup> Since the launch of Dallas Area Rapid Transit's (DART) *GoPass* app, there have been approximately 210,000 downloads on both Android and iOS devices (Figure B), and monthly ticket sales totaled over \$100,000 as of September 2014. Mobile ticketing currently accounts for over 27% of Boston's MBTA commuter rail ticket sales (Figure C). Transit agencies have also observed a decline in credit and debit card payments and fewer cash purchases at vending machines and onboard.

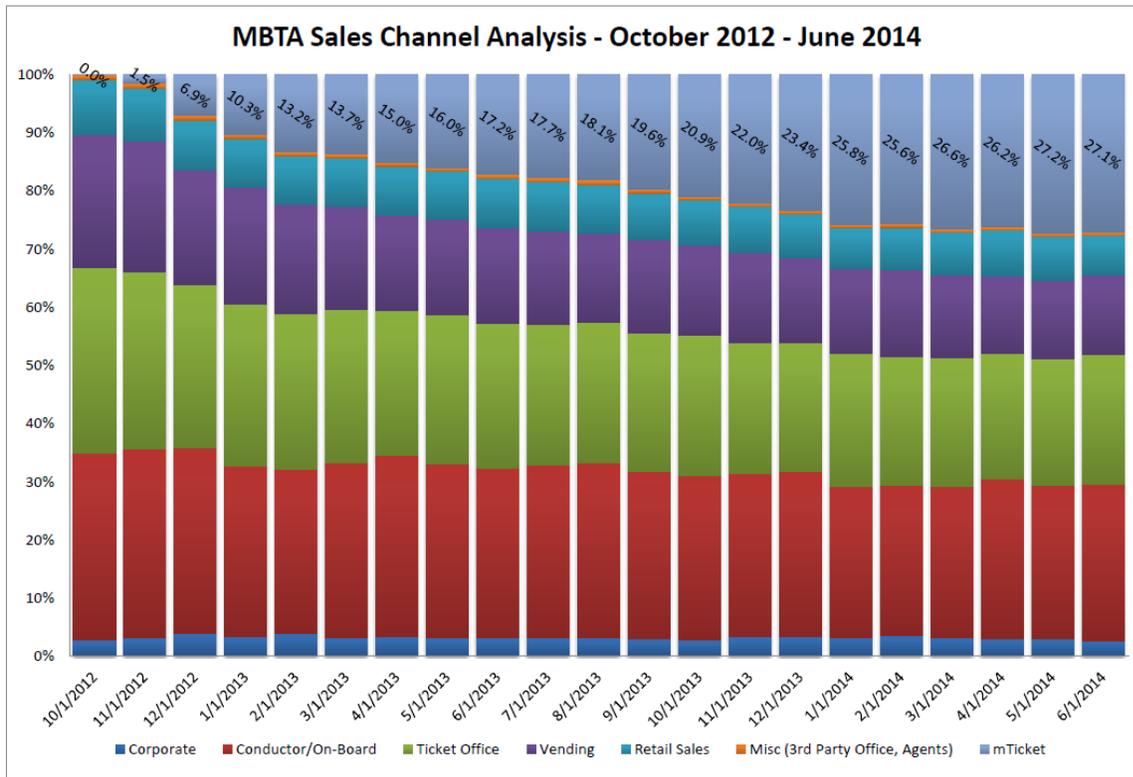
**Figure B. DART GoPass Downloads by Month**



Source: Dallas Area Rapid Transit (DART), September 2014

<sup>21</sup> TriMet, July 2014.

**Figure C. MBTA Commuter Rail Ticket Sales by Channel**



Source: Massachusetts Bay Transit Authority (MBTA), October 2014

Marketing has been critical in building consumer awareness and adoption. Transit agencies market their mobile ticketing apps via traditional and digital media channels. Many run ad campaigns on bus exteriors and through signage and printed cards in train cars. Some operators hold promotional launch events at local venues, such as universities, and receive press coverage for their new app. The MBTA offers discounts for certain products purchased through the *MBTA mTicket* app; for example, consumers receive a \$10.00 discount if they use the app to purchase monthly passes, but the passes do not include free transfers to bus or subway.

### ***NFC Contactless Mobile Acceptance in Transit Open Payment Systems***

Using NFC for mobile payments is more suitable for gated fare schemes; particularly because of the faster read-speed the technology affords large transit systems with exceptionally high volume (e.g., New York and London). Fare validators typically require transaction speeds faster than 500 milliseconds to handle rapid passenger throughput during peak travel times.<sup>22</sup> QR code validators may not work fast enough to accommodate all gated systems, particularly those with high volume.

Using open architecture, transit agencies can offer more payment options to customers. A contactless open fare payment system uses validators that conform to the ISO 14443 international contactless

<sup>22</sup> Finextra. (2012, June 1). Mobile NFC fails TfL's need-for-speed transit tests. Retrieved from <http://www.finextra.com/News/Fullstory.aspx?newsitemid=23775>.

standard,<sup>23</sup> which enables a transit agency to accept bank-issued contactless credit, debit and prepaid cards, and NFC mobile payments. Commuters tap and pay for transit services with their contactless cards or NFC smartphones as they pass through subway turnstiles or board buses, similar to how they pay at NFC-enabled retail POS venues. The transit agency acts as the merchant and processes the transactions through the card networks.<sup>24</sup> Several US transit agencies are in the process of installing open payments infrastructure (Figure D). Current US implementations include Salt Lake City (SLC) and Chicago (Ventra),<sup>25</sup> as well as London in the UK.

Salt Lake City and Chicago transit customers with NFC phones can pay their fares with Apple Pay, Google Wallet, and Softcard. In 2012, Softcard piloted its mobile wallet with local businesses in SLC and advertised on Utah Transit Authority (UTA) vehicles to promote the use of contactless payments. Softcard worked seamlessly with 2,300 NFC card readers on UTA buses, light rail, and commuter rail. During the first two months of the pilot over 1,000 UTA riders became Softcard users.<sup>26</sup> UTA customers who used Softcard were satisfied with the mobile wallet, and some still use it daily. To encourage Chicago CTA and Pace riders to pay with smartphones, Softcard partnered with American Express (AmEx) to launch a promotion offering half-priced fares for users who paid with an AmEx Serve prepaid card stored in their Softcard mobile wallet between September and December 2014. In London, transit riders use mobile carrier EE's NFC mobile wallet (*Cash on Tap*) to pay for trips across the Transport for London (TfL) network.

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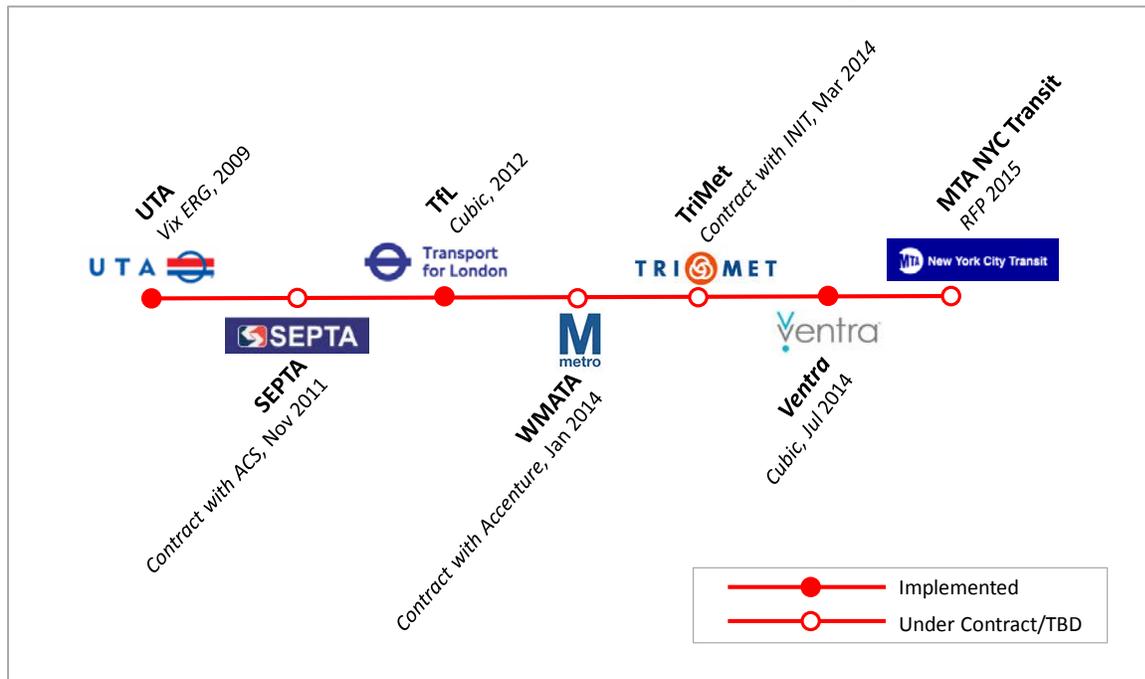
<sup>23</sup> For more information on ISO 1443 - *Identification cards – Contactless integrated circuit cards – Proximity cards*, see [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=50942](http://www.iso.org/iso/catalogue_detail.htm?csnumber=50942).

<sup>24</sup> For open bank card payments, the transit agency routes the transaction to the merchant acquirer for authorization, clearing and settlement through the payment networks to the issuers. For more information about NFC payments in transit, see Smart Card Alliance (2011, November) *Transit and Contactless Open Payments: An Emerging Approach for Fare Collection*, available at [http://www.smartcardalliance.org/resources/pdf/NFC\\_and\\_Transit\\_WP\\_20120201.pdf](http://www.smartcardalliance.org/resources/pdf/NFC_and_Transit_WP_20120201.pdf).

<sup>25</sup> Ventra is the new, joint open payment fare system for the Chicago Transit Authority (CTA) and Pace, which launched system-wide in July 2014. Ventra replaces all of CTA and Pace's old fare media with one card and system.

<sup>26</sup> UTA, July 2014. Softcard reimbursed UTA for fares paid with Softcard wallet during the pilot period.

**Figure D. Transit Agencies with Open Payments** (by Provider and Implementation/Contract Dates)



Source: *Payment Strategies*, Federal Reserve Bank of Boston, 2015

Broader availability of NFC phones and merchant NFC-enabled terminals should help boost consumer adoption of contactless payments in transit and other retail venues in the US as was the case in other markets, such as the UK. While very few consumers have bank-issued contactless cards in the US, the number of consumers who have NFC-enabled mobile phones is increasing.<sup>27</sup> Over 750 financial institutions have already signed on to implement Apple Pay<sup>28</sup> and most US-issued credit and debit cards can be used to fund Google Wallet and Softcard (with AmEx Serve). Most merchants are also in the process upgrading their point-of-sale (POS) terminals to accept EMV chip payments before the October 2015 deadline for liability shift. The new terminals include the ability to accept NFC mobile contactless transactions as part of the EMV upgrade, should merchants choose to activate the function. Over 80% of the terminals that Verifone shipped to the US in Q3 2014 were EMV-capable and included embedded NFC chips, and 70% of terminals that Ingenico shipped in Q1 2014 were NFC-enabled.<sup>29</sup>

Another difference between the US and UK payments markets is the use of contactless cards. In the UK, 55.9 million contactless cards (35.3M debit and 20.5M credit) had been issued as of November 2014.<sup>30</sup> Almost half of all contactless transactions occur in the Greater London area. Supermarkets dominate the UK contactless payments market with 44% of all contactless transactions, and fast food outlets make up

<sup>27</sup> While it is technically feasible for banks to offer contactless cards for the US EMV migration, the cards will more likely be “contact” not “contactless,” and therefore not be used for “tap and pay” transactions at an NFC-enabled POS or transit terminal.

<sup>28</sup> Tam, Donna. (2015, January 27). Tim Cook: 2015 will be the year of Apple Pay, *CNET*. Retrieved from <http://www.cnet.com/news/cook-2015-will-be-the-year-of-apple-pay/>.

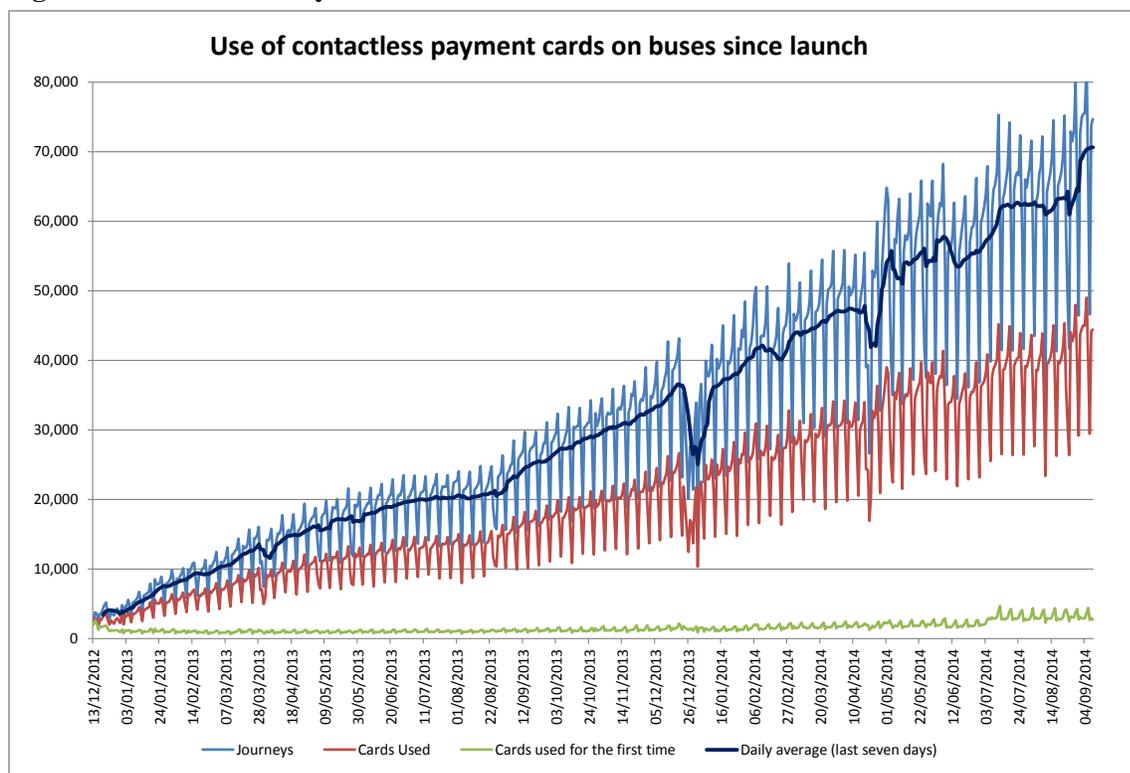
<sup>29</sup> Daly, Jim (2014, September 4). The US EMV Migration Produces a Windfall for POS Terminal Producer Verifone, *Digital Transactions*. Retrieved from <http://digitaltransactions.net/news/story/The-US-EMV-Migration-Produces-a-Windfall-for-POS-Terminal-Producer-VeriFone>.

<sup>30</sup> [http://www.theukcardsassociation.org.uk/contactless\\_contactless\\_statistics/index.asp](http://www.theukcardsassociation.org.uk/contactless_contactless_statistics/index.asp)

24% of transactions.<sup>31</sup> In a 2014 WorldPay UK survey, 71% of respondents found “tap and pay” to be more convenient than Europe’s EMV chip and PIN (contact) requirements.<sup>32</sup>

Interest in using contactless payments for transit fare has been growing around London, currently accounting for 5% of all pay-as-you-go trips on the TfL network. TfL started accepting contactless payment cards on buses in December 2012 and across other transport modes in September 2014.<sup>33</sup> Contactless card usage has increased on TfL buses (Figure E), subway, tram, and light rail. During the first week that acceptance was extended beyond buses, riders used contactless cards to pay for over one million trips.<sup>34</sup> Consumers were more receptive to using contactless cards once acceptance became ubiquitous across the TfL network. Not only do riders find it more convenient to pay for all rides with one card or a mobile phone, they also receive a TfL discount for using contactless cards in lieu of cash, and a maximum fare cap for unlimited travel in a single day or week.<sup>35</sup>

**Figure E: Contactless Payment Cards on TfL Buses**



Source: Transport for London (TfL), September 2014

<sup>31</sup> Finextra. (2014, November 18). Contactless payments in UK head for mainstream – Worldpay. Retrieved from <http://www.finextra.com/news/fullstory.aspx?newsitemid=26716>.

<sup>32</sup> Tung, Liam. (2014, September 11). Visa works on Apple Pay for Europe, MasterCard eyes NFC as standard by 2020. ZDNet. Retrieved from <http://www.zdnet.com/visa-works-on-apple-pay-for-europe-mastercard-eyes-nfc-as-standard-by-2020-7000033564/>.

<sup>33</sup> All UK issued contactless AmEx, MasterCard or Visa credit, debit, and prepaid cards are accepted for contactless payments. Other methods of contactless payment that meet financial industry standards, including mobile phones, may also be accepted.

<sup>34</sup> Finextra. (2014, September 29). Tube refit pushes London transit contactless journeys past the one million per week mark. Retrieved from <http://www.finextra.com/news/announcement.aspx?pressreleaseid=56915>.

<sup>35</sup> For more information on Transport for London (TfL) fares and payments, see <https://www.tfl.gov.uk/fares-and-payments/>.

## V. How Transit Can Broaden Mobile Payments Adoption

Transit can serve as a vehicle to drive broader consumer mobile payments adoption. This section explores ways transit agencies can leverage mobile payments to provide additional benefits to consumers using integrated transit apps, bundled ticketing, location-based offers and loyalty rewards, and mobile marketing in transit venues. Providing greater convenience and enhancing the customer experience can foster habitual use of mobile payments in transit, and influence consumer behavior and comfort level with making mobile payments in other venues and for higher-value purchases.

### *Integrated Transit Mobile Apps*

Transit agencies can provide integrated mobile apps that include comprehensive functionalities, such as ticketing, trip planning, related travel services, account management, real-time alerts, and promotional offers to deliver more compelling benefits to riders than a standalone payment feature. Additionally, integrated apps enable operators to increase communication with customers and collect data on ridership trends.

Many commuters travel daily on multiple modes of mass transit operated by different agencies with separate fare collection systems. Transit operators could collaborate to offer an integrated app (e.g., the Ventra mobile app) that enables fare payments and trip planning across regional transit systems and transportation modes. This would eliminate the need to carry multiple types of fare media or download separate apps for each system. Additionally, the transit app could integrate payments for other related travel services, such as commuter rail parking and taxis. Consumers may find it to be more convenient to pay for and plan the entire trip with one app.

### *Chicago's Integrated Regional Transit Mobile App*

CTA, Metra, and Pace are developing the Ventra mobile app – an integrated app and system that will support mobile ticketing, NFC contactless mobile payments, account management, and trip planning features across Chicago's three regional transit agencies. It will be the first truly regional transit app in the US, and the first to integrate mobile QR code ticketing with NFC contactless mobile payments. Chicago transit customers will be able to use the app for Metra mobile ticketing and to manage their Ventra card accounts (e.g., check account balance, manage funding sources, view transaction history, etc.). Later versions of the app will enable riders with NFC-enabled phones to store virtual Ventra cards in their phones to pay for transit. The Ventra mobile app will be introduced in early 2015, with periodic releases of additional features and functions through 2016.<sup>36</sup>

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<sup>36</sup> Cubic. (2014, December 15). CTA, Pace and Metra tap cubic transportation systems for integrated regional transit mobile app and services. Retrieved from <http://www.cubic.com/News/Press-Releases/ID/1145/CTA-Pace-and-Metra-Tap-Cubic-Transportation-Systems-for-Integrated-Regional-Transit-Mobile-App-and-Services>. For more information on the Ventra app, see [http://metrarail.com/content/dam/metra/documents/news\\_relateddocs/Ventra%20App%20Feature%20Onesheet.pdf](http://metrarail.com/content/dam/metra/documents/news_relateddocs/Ventra%20App%20Feature%20Onesheet.pdf).

More than 90% of public transit users want to connect with transit agencies on social media to receive daily updates on fares, delays, and service alerts, according to a 2013 Accenture study.<sup>37</sup> Operators can also connect directly with customers via mobile and leverage social media to provide such information. Transit agencies realize that using the mobile channel to engage with consumers and share data with third-party developers to enhance their apps can significantly improve customer satisfaction. Furthermore, transit agencies can leverage ridership data to improve services and route planning, and for marketing purposes, such as sending location-based offers to customers.

### ***Bundled Ticketing***

Bundling improves the efficiency of ticketing and encourages consumers to take public transportation to local events. Transit agencies that offer mobile ticketing apps can partner with local attractions to offer bundled ticket options – combining transit fare and admission passes. While many consumers prefer to take mass transit to public events, occasional transit riders who are less familiar with the fare system can cause bottlenecks at ticket machines. Bundling can help to address this problem and prevent frustrating customer experiences. DART’s GoPass app combines transit fare with discounted general admission to the Dallas Zoo, State Fair, and museums. DART’s *Safari Nights* promotion with the zoo in July 2014 allowed customers to pre-purchase discounted zoo admission passes with their train tickets via GoPass. DART also launched a similar promotion with the State Fair in September 2014 and sold over 4,000 tickets during the first four days.<sup>38</sup> DART may consider adding more robust features, including couponing or POS offers in the future.

### ***Hong Kong’s ‘Octopus’ Fuels Consumer Demand – How a Transit Payment Goes Mainstream***

*Octopus*, a contactless smart card initially developed for transit payment, expanded its acceptance across a variety of stores and restaurants in Hong Kong. Approximately 95% of people in Hong Kong use Octopus cards for about HK\$18 million in transactions daily.<sup>39</sup> In October 2013, Octopus launched the *Octopus Mobile SIM* card, which allows an NFC phone to emulate an Octopus card for payment.<sup>40</sup>

Although Octopus is a closed network, its success can be attributed to broad merchant acceptance and the convenience it affords consumers, in particular as a cash replacement for small ticket transactions. Octopus offered incentives to merchants for acceptance, including lower fees and shorter settlement time relative to major card networks. Given the speed and convenience Octopus payments afforded consumers, they began seeking acceptance at shops, restaurants, vending machines and other retail locations. As a result, merchant acceptance grew to meet consumer demands. Similarly, as consumers realize the convenience that mobile payments afford through transit payments in the US, they may demand that retailers accept mobile payments as well.

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<sup>37</sup> Accenture. (2013, May 21). *Public transportation users predict big increases in the use of smartphones, paperless travel and social media*. Retrieved from <http://newsroom.accenture.com/news/public-transportation-users-predict-big-increases-in-the-use-of-smartphones-paperless-travel-and-social-media-new-accenture-survey-reveals.htm>.

<sup>38</sup> DART, September 2014.

<sup>39</sup> Pisa, Katie and Kate Fleming. (2014, July 9). This little card is why people in Hong Kong don’t carry cash. *CNN*. Retrieved from <http://edition.cnn.com/2014/06/12/business/hong-kong-octopus-card/>.

<sup>40</sup> Unlike US transit mobile payment examples provided in this report, Octopus Mobile is a closed-loop mobile payment system based on FeliCa technology.

### ***Location-based Offers and Loyalty Rewards***

Public transit is a unique system because of the habitual nature of most of its riders. Transit operators can leverage this attribute to offer real-time location-based promotions and loyalty rewards. Several US transit agencies have expressed interest in partnering with businesses to provide location-based offers in future versions of their mobile apps. The Société de Transport de Montréal (STM) worked with their technology partner SAP to create a mobile loyalty program for registered fare cardholders.<sup>41</sup> The *STM Merci* app uses geo-location to provide offers and personalized travel information to customers based on their preferences and location. The app recognizes the rider's destination and sends real-time offers for nearby cultural, sporting, and entertainment events and stores, which are redeemable with a promotional code. The tiered loyalty program allows riders to earn rewards for transit trips in the form of virtual trees.<sup>42</sup> While the app currently does not include mobile payment or ticketing features, STM may consider adding these capabilities in the future.

### ***Mobile Marketing in Transit Venues***

Consumers can gain more exposure to and build familiarity with mobile payment technologies—QR codes and NFC—through interactive mobile marketing campaigns in transit locations. Travelers can scan a QR code with their phone camera or tap their NFC phone on signs at bus shelters, transit platforms and inside trains and buses for an interactive experience. Some mobile marketing campaigns target products that can be used during a commute and for attractions to visit. For example, Random House deployed smart posters offering free previews of books (Figure F) at train stations in Chicago and San Francisco. The publisher created a virtual bookshelf with NFC tags and QR codes so riders could scan or tap the bookshelf to view and download eBooks directly to their phones.<sup>43</sup>

In 2013, the Field Museum of Illinois launched a mobile campaign to promote the 1893 World's Fair Exhibit at transit locations throughout Chicago. The signage invited passersby to scan or tap to access the Field Museum app to view 1893 Chicago through the eyes of featured characters with augmented reality. In addition to the outdoor signage, QR codes printed in various magazines encouraged readers to explore Chicago, and interact with the mobile campaign through the use of the app.<sup>44</sup>

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<sup>41</sup> SAP is an enterprise application software solutions provider. STM Merci uses the SAP Precision Marketing solution, a cloud-based solution that enables one-to-one marketing between retailers and consumers, and real-time engagement at the point of sale.

<sup>42</sup> For example, one round-trip fare is equivalent to one tree. Riders can visually track their tree accumulation via the app, with different quantities resulting in varying loyalty levels and benefits. More trees amount to better offers. Eco-friendly riders are incentivized to take more public transit for better rewards and to reduce their personal carbon footprint. This feature is similar to the My *Starbucks Rewards* program – registered customers earn stars for purchases, and track them in a virtual coffee cup via the mobile app. For more information on the STM Merci app, see <http://sapinsider.wispubs.com/Assets/Case-Studies/2014/January/STM>.

<sup>43</sup> Source: Blue Bite Case Studies, Q3 2014.

<sup>44</sup> *Ibid.*

**Figure F. Random House Brings eBooks to Life**



Source: Blue Bite, 2014

Blue Bite, the mobile marketing company that created the Random House and Field Museum campaigns, noticed a significant uptick in NFC usage between 2012 and 2014. In 2012 they received only 10% of hits from NFC and 90% from QR code. In 2014, the ratio shifted to 45% NFC and 55% QR code. Interacting with mobile campaigns in transit venues clearly helps to build experience and comfort using mobile phones for ticketing and payments.<sup>45</sup>

## VI. Lessons Learned

This section presents some recommendations and lessons learned by transit agencies and other industry players through their experiences offering mobile ticketing and enabling mobile transit payments.

**Education is key.** Training operators and customer service agents was a major challenge for transit agencies when establishing mobile ticketing programs. Training is essential to ensure that transit employees understand the new technology. Customer education is needed to build awareness of NFC contactless payments and mobile tickets and explain how to use them (e.g., activating a mobile ticket before the vehicle arrives and having it ready for inspection). Many transit operators include information on how to use mobile ticketing on signage and printed cards on trains and buses. Customer service agents should also be available at train stations and bus stops to assist riders when the apps initially launch.

**Recognizing product differences is important.** When transit agencies combine products, such as transit tickets, admission passes, or coupons, they need to analyze how the different features are used. While developing its bundled ticketing feature, one transit agency had to resolve differences between how transit and admission passes were used and validated (e.g., transit tickets are validated with visual inspection and admission passes with QR codes). Transit tickets also need to be active for the duration of the valid time period, whereas admission passes need to be voided after validation. The transit agency realized that one ticket would not suffice because the state of the ticket needed to be altered. The solution was to create a single transaction with two types of tickets delivered to a customer's mobile phone.

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<sup>45</sup> *Ibid.*

When developing new products or features, transit operators must analyze how they will be applied in different use cases. One size does not fit all, but mobile solutions can often be modified using software, rather than requiring hardware changes. Another factor transit agencies must consider when offering bundled transit and admission passes is the potential need for enhanced availability of WiFi to accommodate higher volumes of mobile ticket validation.

**Intuitive app design is a must for optimal user experience.** A simple and convenient app design is essential to the success of a mobile ticketing app. Testing and development of the app can take several months and numerous iterations, including fine-tuning minor details, such as the ideal font size for the ticketing screen. Another factor to consider in the design of an app is its size and power consumption to ensure adequate battery life through ticket inspection.

Optimal user experience will drive mobile payment adoption and wider use. While these issues are not unique to the transit industry, agencies offering mobile ticketing apps noted the need to build multiple versions of an app to support continuous changes in the mobile platforms. Frequent Android and iOS updates pose challenges because they also require updates to mobile ticketing apps. If a mobile app requires code changes, there is a risk that it might disrupt the user experience and deter customers from future use. For example, a 2013 SOASTA survey found that 91% of smartphone owners are likely to delete or uninstall mobile apps if they do not work properly or have frequent technical issues.<sup>46</sup>

**Mobile transit apps influence consumer behavior.** One transit agency offering mobile ticketing noticed that ticket options and the precision afforded by real-time activation influenced customers' financial decisions and product choices. The operator observed that most tickets were purchased and used within 24 hours, and more riders bought tickets valid for 2-hours as opposed to day passes, perhaps because riders could activate their digital tickets precisely for when they needed to travel. Another transit agency noticed more frequent ridership among members of its mobile loyalty program, and that many riders were taking advantage of the location-based offers and traveling to new destinations. As transit agencies collect more data on mobile use, they will be able to further enhance their services to attract more users.

## VII. Conclusion

Today, many US transit riders have smartphones that they rely on to complete everyday activities, including paying for their trips. Given their frequent and habitual use of public transit, commuters can use low value fare payments to build their experience and comfort level with mobile payments. Transit mobile payments can help influence commuters and other consumers' behavior and expand their overall use of mobile payments.

Transit agencies increasingly recognize the importance of leveraging mobile technologies to meet consumer demands and improve operational efficiencies. More operators are including mobile payment

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<sup>46</sup> SOASTA is a cloud testing solutions provider. For more information, see <http://www.soasta.com/press-releases/soasta-names-dallas-with-highest-smartphone-and-tablet-adoption-new-york-trails-major-cities-in-smartphone-ownership-and-usage-atlanta-trailing-in-tablets/>.

capabilities in their fare systems. New implementations of open payment systems, in particular, will create more NFC-enabled merchant locations. Broader availability of NFC phones, mobile wallets, and contactless payments acceptance will help foster greater consumer awareness and adoption of mobile payments in transit and elsewhere.

Mobile ticketing using visual and QR code validation has served as an introduction to mobile payments for many transit agencies and customers, and has been well received by both groups. As transit mobile ticketing apps mature, operators should add more robust features beyond payment functions and strengthen their marketing campaigns. Consumers find greater appeal and value in using integrated apps that are multi-functional, personalized, and afford more convenience. Transit agencies should incentivize mobile payments usage by partnering with local businesses to offer bundled ticketing, location-based offers, loyalty programs, and other promotions. With both consumers and transit agencies onboard, mobile payments are on track to broader adoption in transit venues, as well as other retail locations.

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## Appendix: Transit Agencies Mentioned

City	Transit Authority	Abbreviation	Website
Austin, TX	Capital Metropolitan Transportation Authority	CMTA (CapMetro)	<a href="http://www.capmetro.org">www.capmetro.org</a>
Boston, MA	Massachusetts Bay Transportation Authority	MBTA	<a href="http://www.mbta.com">www.mbta.com</a>
Chicago, IL	Chicago Transit Authority	CTA	<a href="http://www.transitchicago.com">www.transitchicago.com</a>
Chicago, IL	Metra (suburban rail system)	Metra	<a href="http://www.metrarail.com">www.metrarail.com</a>
Chicago, IL	Pace (suburban bus system)	Pace	<a href="http://www.pacebus.com">www.pacebus.com</a>
Chicago, IL	Ventra (joint open fare system for CTA and Pace)	Ventra	<a href="http://www.ventrachicago.com">www.ventrachicago.com</a>
Dallas, TX	Dallas Area Rapid Transit	DART	<a href="http://www.dart.org">www.dart.org</a>
London, UK	Transport for London	TfL	<a href="http://www.tfl.gov.uk">www.tfl.gov.uk</a>
Montreal, QC	Société de Transport de Montréal	STM	<a href="http://www.stm.info">www.stm.info</a>
New York, NY	New York Metropolitan Transportation Authority	MTA	<a href="http://www.mta.info">www.mta.info</a>
Philadelphia, PA	Southeastern Pennsylvania Transportation Authority	SEPTA	<a href="http://www.septa.org">www.septa.org</a>
Portland, OR	Tri-County Metropolitan Transportation District of Oregon	Tri-Met	<a href="http://www.trimet.org">www.trimet.org</a>
Salt Lake City, UT	Utah Transit Authority	UTA	<a href="http://www.rideuta.com">www.rideuta.com</a>
Washington, DC	Washington Metropolitan Area Transit Authority	WMATA (Metro)	<a href="http://www.wmata.com">www.wmata.com</a>