

Technology and Entrepreneurship



Center at Harvard



Equity and Transport Ticketing

by Rikesh Shah and Robert Benner

Working Paper | January 2024

Transport providers worldwide are rushing to implement new payment technologies that rely on smartphones and bank accounts. How can they introduce systems that rely on these tools while maintaining a commitment to equity?

INTRODUCTION

As cities focus on strategic goals such as tackling the climate emergency, cost of living crisis, health challenges, or creating a city accessible for all, transport plays a key role through city mayors, transport agencies, and transport operators. Many cities believe mass transit and active travel are the way forward as they envision the future cities of 2040 and beyond with a greater focus on sustainability. Adequate transportation options need to be delivered in the context of rising customer expectations, higher costs, and rapidly advancing technology.

For sustainable forms of transport to be attractive to those living and visiting cities, mass transit, walking, and cycling must be a compelling alternative against the private car, in particular, the single occupancy driver. Users/customers must have confidence and trust in the system in areas such as **reliability and speed** (the train or bus turns up on time and takes them to where they want to go on time), **safety and security** (they will get from A to B without an incident and feel protected), **convenience** (the system will be easy to navigate).

The role of ticketing is critical here. For transit riders in many major cities across the globe, paying for public transport has never been easier. Due to the implementation of open-loop systems, riders can now pay for trips with the same debit or credit card they use for all other purchases by tapping their smartphone on a reader. The reader deducts the funds from their accounts, automatically caps fares after a certain number of trips per week, and provides transfer discounts across both public and private transport modes. In cities such as

London, Hong Kong, and New York City, riders no longer have to obtain and reload agency-branded fare cards for each ride. Instead, they pay for trips the way they would pay for any good or service, creating a more convenient and seamless user experience than ever before.

However, the promise of these systems is not distributed equally. Basing a payment system on the possession of a smartphone and/or bank account can potentially exclude lower-income individuals who rely on public transport the most. This trend of relying on digital payments threatens to undermine the core goal of any public transport service: to offer accessible, reliable, and safe service for all.

This white paper focuses on this core tension: how can transport providers implement new payment systems without leaving riders behind? The paper examines the trends, opportunities, and challenges transport providers face as they consider implementing these systems. Based on research from all over the world, along with conversations with leading transport agencies, payment servicers, and banks, the paper provides a series of considerations for transport providers to implement new ticketing systems that offer greater efficiency and ease of use while ensuring access for all riders, regardless of whether they have a mobile phone or a checking account. Ultimately, the paper aims to demonstrate how to build these new payment systems in a way that incorporates all riders while promoting and enhancing equity across the transport network.



Shifting riders onto public transport is a key component of global climate strategies

Evolution of Transport Ticketing

While it has never been easier for public transport riders, it has never been harder for public transport providers. Until recently, ticketing for public transport was simple. Throughout much of the 20th century, transport providers operated using branded tokens (which riders paid for with cash and flowed easily throughout the system) or through single-use tickets (which riders purchased ahead of time and allowed them to get through a gate or door for their ride quickly). In the late 20th and early 21st centuries, transport providers began issuing agency-branded magnetic swipe or tap cards, allowing riders to pay for trips in bulk more easily. This improved boarding speeds and reduced reliance on single-use fare media.

While these systems relied on distinct technological tools, they maintained a similar approach. In both, transport providers offered the full end-to-end experience of ticket purchasing and payments. Transport providers distributed and managed fare media and handled all fare collection. Fare media was largely limited to their own services.

Recent trends, such as open-loop payment systems, have fundamentally shifted this approach in several key ways:

- **Ticket Distribution.** Instead of issuing tickets as branded tap cards, open-loop systems remove the ticket from the equation. The ticket is now a rider's smartphone or credit card.
- **Fare Collection.** Banks collect fares reported through the system and send those funds back to the transport providers. Further, riders are charged for trips taken at the end of the day rather than upon boarding.

- **Partnerships.** Along with banks, transport providers have a new suite of partners intimately involved with the process. This includes technology partners that provide terminals for riders to tap their card or smartphone and deliver back-office systems to ensure transport providers can receive fare amounts back from banks. This also includes payment processors to facilitate transactions between riders and banks.
- **Modes.** Since they are no longer issuing tickets, and because private providers such as rideshare and bikeshare companies are providing key roles in many urban transport networks, transport providers form partnerships to allow riders to make multimodal trips more easily and affordably. They do so through transfer discounts and funding for modes beyond traditional public transport.

On its face, this is all good news. Shifting riders onto public transport is a key component of global climate strategies and, especially in the wake of reduced ridership after the COVID-19 pandemic, transport providers will need to use the authority at their disposal to make public transport more convenient, frictionless, and attractive for all users. Open loop systems and other new payment technologies offer significant promise: they can improve efficiency through faster boarding times, reduce barriers to system use by simplifying complex ticketing systems, and lower fare collection costs that can be reinvested in service improvements.



Managing these two systems in tandem produces significantly greater benefits for riders and agencies.

Definitions: What Are the Characteristics of Modern Transport Payment Systems?

Before discussing the equity implications of these new payment systems, it is critical to understand what they consist of and what characteristics drive their adoption.

These new payment systems have many different names with limited distinctions

between them, including cashless payments, contactless payments, and digital payments. While all three are reasonable descriptors of these systems, they also have flaws. For example, systems that some transport providers refer to as cashless still accept cash but simply move the use of cash from paying upon boarding a



bus to loading a card at a ticketing machine. Similarly, many systems may brand themselves as contactless or digital but still retain physical fare media for riders.

Despite multiple names, the key distinction of these systems is in the shifting relationship between transport providers and the ticketing distribution, collection, and management process. Instead of managing this process end-to-end, these open systems rely on new partners, tools, and processes, transitioning the ticketing process into a broader infrastructure relying on multiple parties, systems, and communication methods. Open payment systems incorporate a wide range of payment types, fare media, riders, and modes and can be adjusted and adapted accordingly.

The shifts in transport payment systems can be categorized into two buckets: (1) transitions from closed-loop to open-loop payments and (2) transitions from card-based (or front end) to account-based (or back end) systems. These broad categories are not mutually exclusive. For example, transport providers can simultaneously maintain elements of both open and closed-loop systems. However, any transport agency headed toward open payments has begun to go down one or both of these paths.

Open Loop vs. Closed Loop

The biggest transition for agencies has been the shift from closed-loop to open-loop payments.

Closed-Loop System	Open-Loop System
Payment from agency-issued fare media. Requires pre-loading with cash or bank cards. Can only be used at explicitly-defined locations.	Payment from existing bank cards, Apple Pay accounts, or other digital payment methods. No agency-issued or agency-branded fare media is required.
For example, in 2021, New York City Metropolitan Transportation Authority (MTA) launched the open-loop OMNY payment system. This replaced the authority's closed-loop system with magnetic swipe cards and kiosks, enabling payment with any regularly accepted debit, credit card, or other payment method. MTA has maintained closed-loop capabilities with an OMNY card for riders who do not have bank accounts.	



Open-loop and closed-loop systems are not mutually exclusive. In fact, managing these two systems in tandem produces significantly greater benefits for riders and agencies than if

implemented alone. Depending on their goals, their existing payment system, or other factors, agencies can play around with their emphasis on open or closed payments to meet their needs.

Card-Based to Account-Based

Changes from card-based to account-based systems are slightly more complex. While not as prevalent, they are still a critical component of an open payment system. Account-based

systems differ from card-based systems in that payment for trips is no longer stored on a physical card, and riders are typically charged for trips in bulk at the end of the day rather than with each individual ride.

Card-Based System	Account-Based System
<p>Value is stored directly on an agency-branded fare card, and funds are removed from the card as soon as it is tapped on an agency fare reader. Each time a rider purchases a ticket, the fare is automatically deducted from their account. Except for transfer fares, all fares charged are based on the stated fare at the beginning of the trip.</p>	<p>Value is not carried on a physical fare medium but is stored in a separate account. The fare medium, whether a physical card or digital pass, functions as an identifier to let the rider go through the system. Riders are then charged for trips taken at the end of the day, processed through the transport provider's back-end system. All trips are charged to a rider's account, which could be a separate agency-managed account or a rider's bank account. Back-end charging adds flexibility to fares, allowing agencies to process variable fares or fares across multiple service types without physical updates to card readers.</p>
<p>Example: While it is currently planning for a payment system overhaul in 2025, the Massachusetts Bay Transportation Authority in Boston, MA, provides a standard card-based system for all trips. Riders use the agency-branded card to add funds for trips, and the funds are automatically deducted from the card upon tapping a gate. In Portland, Oregon, the transport provider TriMet maintains an account-based system across three regional transport providers and multiple modes, including on-demand and bike-sharing services. Based on an agency-issued card, the system tallies up the cost of trips across all modes each day and then charges the rider for the appropriate fare from their account.</p>	

While payment systems typically include only a card-based or account-based component, account-based systems can be launched either

with an open-loop or closed-loop system, enabling additional flexibility for transport providers.

Agencies view open payment systems as having the potential to enhance convenience, reduce operating costs, and create a more multimodal transport network.

What's Driving Changes in Transport Payment Systems?

The transition toward open payment systems has moved quickly, especially by public sector standards. For example, open-loop payments were first launched by Transport for London on city buses in 2012. Open-loop systems are now operational in approximately 100 cities across every continent.

Broader Trends

The migration to open payment systems has been driven by several trends over the past 20 years, including, but not limited to:

- **Credit and Debit Card Technology.** The growth of tap-based debit and credit cards has facilitated this change because it has created a faster, contactless way for individuals to process transactions. For ticketing, this means that riders can simply tap a card or their smartphone on a ticketing gate rather than swiping their card at a separate ticketing machine for a stored value card.
- **Smartphone Adoption.** New tools for storing payment information, managing accounts, and tracking transit services have made it easier to implement open-loop systems.
- **Private Mobility Services.** Privately owned and/or operated transport services, such

as bikeshare and rideshare, have pushed transport providers to take a more holistic view of all transport services in their city.

- **Environmental Concerns.** As one of the world's largest sources of greenhouse gas emissions, transport providers have been searching for ways to make transport greener and cleaner by enhancing the public transport experience.
- **COVID-19 Pandemic.** Many agencies implemented contactless payment methods to combat the spread of COVID-19 and have maintained or scaled these systems to mitigate potential future health concerns.

These changes and the swift global implementation have created a world where open payments are the new norm, especially in wealthier cities across Europe, East Asia, parts of the Middle East, and the United States.

Benefits of Implementation

Alongside macro trends, transport providers see significant opportunities coming from the transition to open payment systems for riders and their operations. While these benefits are broad and, in many cases, intuitive, as a still fairly new type of payment system, their

validity is still being assessed by transport providers and scholars alike. While these proposed benefits are critical in understanding the shift to open payment systems, it is still difficult to understand the extent to which they live up to or exceed their promise.

For riders, these systems offer the ease and convenience of paying for any transport service with an easy tap of a credit card or a smartphone. This reduces the friction and strain on these cards and reloading them at a separate machine. Riders can also easily transfer across modes of transportation. Leveraging account-based functionality, they can purchase a bus trip and a bikeshare trip but only be charged once, without having to worry about complex fare validation or extra charges. Further, riders can more easily receive volume-based discounts, with fare capping kicking in after a certain number of rides per week or month.

For providers, open payment systems offer a potential opportunity to reduce costs across several areas. Quicker, tap-based payments reduce dwell time and bus bunching due to prolonged boarding times. Meanwhile, a reduction in cash collection can reduce handling costs, insurance costs, and maintenance work of onboard fareboxes.

Money saved can be reinvested to improve service quality over time.

Beyond operational changes, these new payment systems incentivize transport providers to coordinate payment schemes with local, private transport providers, such as rideshare, scooters, and bikeshare, to place all modes on a single payment system. Incorporating open payment systems for transit allows riders to transfer the same payment methods and behaviors for those private systems, creating consistency across modes. With the increasingly important role of private providers in urban transport services, this coordination could be a critical step in developing better data sharing and planning for regional transport beyond solely traditional public transport.

Combined, agencies view open payment systems as having the potential to enhance convenience, reduce operating costs, and create a more multimodal transport network. However, the impact of open payment systems will vary based on specific factors of an individual city, such as the makeup of its existing transport network, the number of residents with bank accounts, and the culture of public transport.

Potential Benefits of Open Payment Systems

Riders	Providers
<ul style="list-style-type: none"> • Supports equity by allowing regular riders to receive high volume discounts, even if they are unable to pay for upfront weekly or monthly passes • Reduces boarding and dwell time that is often caused by cash payments • Allows individuals to pay for trips provided by other transit providers or other modes with a single payment type • Riders will not lose money stored on a single card • Riders do not need to reload cards or app 	<ul style="list-style-type: none"> • Reduces fare handling and collection expenses • Reduces maintenance work of onboard fareboxes • Improves safety for bus drivers due to reduced disputes over fares with customers • Improves fare collection with the reduction in drivers waving on riders who cannot pay with cash • Improves data collection on boarding • Improves regional transportation planning through payment coordination

Even in wealthy countries such as the US, many transport authorities serve regions where only 6 or 7 out of 10 regular riders have either.

Where Does Equity Fit into OpenPayment Systems?

At face value, even with the benefits still being fully understood, transitioning to an open payment system seems like a great idea for most transport providers. It has the potential to enhance the rider experience, reduce ongoing costs and hassle for agencies, and catalyze a comprehensive regional transport system. However, open payment systems come with their fair share of challenges, including the high cost of implementation and maintenance, the risk of alienating riders with another new process they must understand, and the need to negotiate interchange fees with payment providers to ensure they do not miss out on fare revenue.

While these are all valid concerns, the key challenge with these systems is equity. This is because interacting with these systems in their ideal form requires ownership of a bank account and/or a smartphone, an item many transport riders, especially those who fully rely on public transport to get around, may not have. This is a critical issue for communities all over the world. Even in wealthy countries such as the US, where well over 9 in 10 residents have a bank account and a smartphone, many transport authorities serve regions where only 6 or 7 out of 10 regular riders have either. This challenge is even greater in cities with much lower rates of smartphone and/or bank account access, including many in the global south.

Considering the recent acceleration of open payment systems, there is a risk of transport providers leaving these riders behind by limiting their access to open payment systems. While few agencies or transport providers are limiting access blatantly by, for example, eliminating the use of cash across the system, many risk doing so inadvertently by making it more difficult to reload fare cards or failing to communicate changes with comprehensive buy-in and feedback. Maintaining access is critical to ensure riders without smartphones or bank accounts can continue to use transport services. It is also vital to ensure these riders can receive the equity-related benefits of these new systems. One example is automatic fare caps, which allow riders to take advantage of volume-based discounts even when they cannot afford the upfront costs of a monthly or weekly pass. Other benefits include seamless and discounted transfers to privately owned

transport modes, which ensure riders can affordably use the full transport network. Allowing everyone to access these perks can only be done by baking equity into the transition process rather than viewing it as a necessary add-on.

Incorporating equity into transit payment systems is also critical, considering the high cost of implementation. Open payment systems often require long-term contracts with multiple partners and significant infrastructure costs. These costs can be recouped in the long term, but only if the system is successful. As a result, launching an inadequate system that excludes riders without a bank account and/or smartphone has the potential to reduce equity and negatively impact financial inclusion in the city. These problems will be difficult and expensive to remedy.

Riders	Providers
<ul style="list-style-type: none"> • Riders without bank accounts are unable to use the system • Riders lose control of the cost of each trip, which cash provides • Riders without smartphones are unable to use the system • Riders with limited data are unable to purchase tickets if necessary • With account-based systems, many riders are unsure of fare cost 	<ul style="list-style-type: none"> • Potential pushback from riders if rollout goes poorly • Cost of new fare collection devices • Increased coordination with operational modes, payment vendors, and financial institutions • Potential for high interchange fees from payment providers for individual transactions

There is not a “one size fits all” solution to make this work.

Case Studies: How Are Providers Incorporating Equity into Payment Systems?

Recognizing the challenges of equitably implementing open payment systems, many transport providers are experimenting with different approaches and strategies to incorporate access and inclusion for all riders into their open payment systems. There is no “one size fits all” solution to make this work. Transport providers are incorporating their unique needs, circumstances, and goals for their network to ensure they can take advantage of the benefits of these new systems while supporting access for all.

Below are five strategies transport providers have used around the world to find the balance between effective implementation and equity.

Strategy #1: TfL: Open-Loop System with a Supplementary Closed-Loop Card

Transport for London (TfL) became one of the first transport providers to launch open-loop payments in December 2012 when it began accepting payment from debit and credit cards on London buses. Despite being a leader in transport payments with the launch of Oyster, the agency’s tap card, in 2003, TfL overhauled its payments system to create an open-loop, account-based system that would enhance convenience for regular riders while enhancing the ease with which tourists could use the city’s massive transport network.

As one of the first open payment networks, TfL worked closely with banks, payment processors, and ticketing technology providers

to iron out the nuances of open payment systems, such as when a rider should go to their bank versus TfL for a refund request and how to ensure riders will only be charged for a ride on one card if their phone has multiple cards in a digital wallet. Ultimately, TfL systems launched the standard for open-loop systems that many cities have followed, with open-loop for most payments, the continuation of an agency-branded card for riders without bank accounts, and an account-based structure to facilitate multiple fare types.

Strategy #2, MTC: Closed-Loop System with Supplementary Open-Loop Functionality

The ability to experiment with the emphasis on open or closed payments is especially relevant for agencies such as the Metropolitan Transit Commission (MTC), which coordinates transit for all nine counties around San Francisco, CA. In 2002, MTC launched the Clipper Card (known originally as TransLink) as part of a closed-loop system and became one of the first transit agencies to implement a smart card for fare payments. The Clipper Card has since become the payment mechanism for all nine counties the agency oversees, enabling consistent and seamless regional transfers.

Despite launching its closed-loop tap card around the same time as TfL, MTC has been hesitant to move riders away from Clipper. Two decades after its launch, Clipper is known for its strong brand recognition among Bay Area riders. It can be used to pay for Uber,

Lime, and other private mobility services, and can be loaded onto a rider's smartphone for quick, contactless payments. In other words, it already offers many of the features touted by proponents of open-loop, with the added benefit of being a locally controlled resource that does not require a bank account.

MTC still recognizes the benefits of open-loop for many riders and plans to launch open-loop payments in 2024. However, while many agencies approach open-loop with the mindset that the average rider will pay with a credit card stored in their smartphone's digital wallet and the closed-loop card will be used by individuals without bank accounts, MTC views Clipper as the primary payment source, with open-loop payments coming from tourists or individuals who do not frequently use local transit service. This approach will allow MTC to maintain Clipper's existing benefits and brand recognition while enabling additional benefits of open-loop for those who need it.

Strategy #3, TfNSW: Future-Proofed Control of Backend Technology

Transport for New South Wales in Australia launched as a closed-loop card for all light rail, heavy rail, bus, and ferry services in 2016 and added open-loop functionality three years later in 2019. Like many transport providers, such as MTA mentioned above, TfNSW promoted open-loop cards to enhance convenience for riders while maintaining its original closed-loop card to ensure riders without bank accounts continue to have access to the service.

Unlike other transport providers, TfNSW is building its digital channels to manage its open payment system rather than contracting this work out to a third party. This includes a travel planning app, a service website, and a backend account management system for account-based ticketing. This will require third parties to integrate into TfNSW's system rather than

the other way around. While this approach may not work for smaller transport providers with limited technical skills or for providers who want to launch and scale a system quickly, TfNSW is using it to control system costs and rollout and test new features on their own rather than relying on a third party. The strategy will reduce the risk associated with contracting and ensure the transport provider can quickly and effectively meet the needs of riders at any time.

Strategy #4, Cal-ITP: Integrated, Statewide Benefits Through Open Loop

The California Integrated Transit project is a partnership between the state of California and a group of regional transport providers to experiment with and scale open-loop systems. Cal-ITP provides transport providers with the tools and resources to launch open-loop systems effectively and negotiates favorable rates with card providers to reduce the burden of transaction fees.

The vision of Cal-ITP is to integrate transit and all other statewide benefits onto a single platform. To start, Cal-ITP is focused on providing a simple process to determine eligibility for low-income riders who may qualify for reduced fares and then distributing those fares directly to a card of the rider's choice. This could be a debit or credit card, Cash App, or a prepaid card. The goal is to ensure riders have easy access to statewide or local benefits funds that are reloaded regularly and consistently. In the long term, Cal-ITP is working to integrate this funding with other types of public funding, such as EBT, to provide residents with a single login and account and a single card to receive funds. For them, open-loop payments are key in ensuring the simple distribution and use of transit benefits for all riders.

Strategy #5, LA Metro/LADOT: Simplified Bank Account Signups

In 2021, the City of Los Angeles launched Angeleno Connect, a program designed to streamline benefit distribution for lower-income residents. Through the program, eligible residents receive an LA-branded card with public benefits, such as food assistance, distributed automatically. The card can function purely as a benefits card or as a formal debit card through a bank account with MoCaFi, the sponsoring bank. This allows unbanked residents to easily set up a bank account if desired while ensuring individuals who are hesitant to form relationships with financial institutions can still receive benefits.

At the same time, LA Metro and the City are currently piloting a Mobility Wallet. The Mobility Wallet is a reloadable card that allows residents to automatically receive funds for transportation services throughout the city, including public transit, regional bus service, Amtrak, Uber, Lyft, electric scooters, Zipcar, and services in bike shops.

While Angeleno Connect and the Mobility Wallet are separate programs today, they speak to how cities and transport providers can shift toward open payment systems to build broader financial literacy skills, comfortably offer access to banking, and centralize the distribution of public benefits. While providers should not force residents to open bank accounts, they have an opportunity to use open payment systems to provide resources for those interested in doing so.

“As new technologies such as ticketing services advance and modernize transit systems across the globe, at the same time, we have to make sure we don’t leave some citizens behind.”

Stanley Toussaint from Mocaifi.

As many parts of the world move away from cash, what does that mean for an industry whose riders are disproportionately dependent on it?

Considerations for Transport Providers

Because of the importance of providing connectivity to citizens regardless of income, most transport strategies and manifestos state that the fundamental role of a city administration is to provide transport service for all. This means providing the right services at the right time, whether it’s a bus, metro, light railway, bike, etc.

The transit ticketing ecosystem consists of multiple organizations and agencies with differing strategic goals, including banks, payment processors, transport agencies, transport operators, retailers, and many more. Despite this, every party acknowledges the need to focus on accessibility, affordability, and equity. There is a consensus that transport is a public good and the benefits of new technologies shouldn’t be an entitlement to a limited number of people. This must be a core principle in any system design; otherwise, there is the risk of creating a multi-tier network.

There is also an acknowledgment of the gravity of these shifts. As many parts of the world move away from cash, what does that mean for an industry whose riders are disproportionately dependent on it? New payment systems place transport providers at the nexus of two trends: one that views money as an increasingly digital product and one that relies on physical currency for access to goods and opportunities. As this tension comes to a head directly at the farebox, transport providers must ask themselves what role they want to play in this trend. Do they push riders toward bank accounts and digital currency, advocate for the

continuation of a cash-based society, or seek out a happy medium?

To understand how to create inclusive and equitable open payment systems, we gathered feedback from key stakeholders and carried out desktop research, which we discussed in the earlier sections. Beyond what we have already covered, the interviews and research helped us identify a series of considerations that city leaders can reflect on as they embark on creating an equity system as they bring in new technologies.

Consideration 1: Level Up, not Level Down

There is general agreement from stakeholders on the risk that certain middle- to high-income earners of society could more readily gain the benefits of convenience, speed, and cost of moving to cashless payments. Conversely, it could result in the poorer socio-demographic segments not taking advantage and thus paying more per trip if paying by cash. When designing a new ticketing system, there is a strong need to consider all users from the outset to design a ticketing solution that is frictionless and convenient for everyone.

Consideration 2: Recognize the Broader Context

As discussed above, open payment systems are based on new technologies that public and private providers are still trying to fully understand, even as providers launch them

at an increasingly fast rate worldwide. New payment systems are also large investments that can take years to design and implement. This means that any new payment system is a high-risk, high-reward investment that needs to be designed with care and attention to detail.

Private providers understand the potential long-term benefits. So, for an open-loop system, they work closely with agencies to understand the city, its transport patterns, and riders, both today and decades into the future, to configure a system that will meet the needs of a particular community. Understanding that all payment systems are unique, private providers will suggest offerings that maintain financial inclusion in the context of cash use in the area, ensuring that cities with heavy cash reliance, such as those in India, are provided with different solutions compared to cities such as Tokyo or London. As a result, it is common for private providers to offer customized solutions, such as pre-paid cards for a network, rather than a fully open-loop system.

Transport providers can and should collaborate with private providers to ensure a new payment system meets their core needs, goals, and challenges based on a deep knowledge of other systems launched and their strengths and weaknesses. Further, transport providers can and should recognize that they are not limited to the look and feel of payment systems launched in the past. Providers can shape the future of this growing and evolving industry by pushing for new features and contractual arrangements that meet the needs of their riders, including those they have not seen before.

Consideration 3: Conduct Genuine and Authentic Community Engagement

All changes to transit, including routes, service types, and payments, required significant community input to guide the direction of those changes. It's also the provider's responsibility to communicate the impacts of the change through dialogue, understanding, and continuous engagement pre- and post-roll-out. For any changes to a system, riders need to be able to voice their concerns to ensure providers can incorporate their feedback wherever appropriate. This level of engagement is especially critical for new payment systems, as many riders, especially

those without bank accounts, are wary of a transport provider partnering with financial institutions.

Some cities and transport providers have brought financial partners directly into the community engagement process to mitigate these concerns. Many US providers have partnered with MoCaFi, a bank focused on increasing financial inclusion for lower-income communities. Through these partnerships, providers can offer engagement events that allow community members to better understand financial institutions, express concerns, and apply for a bank account if desired. Used properly, these types of partnerships can benefit riders by offering them tools for financial inclusion without pressuring them to sign up for services they do not want.

Consideration 4: Start with What You Have and Build from There

Transport payment systems around the world have as many similarities as they do differences, including card types, fare gate technologies, modes serviced, and trip cost calculations. Instead of fully doing away with current systems, transport providers should incorporate the best of their existing systems into any new payment structure.

MTC recognized this when incorporating open-loop payments into their system. After launching Clipper a decade ago, the agency spent years negotiating with other public and private transport providers to make Clipper the basis for payments across the entire region. They viewed Clipper as a critical component of the agency's brand and a positive symbol for regional mobility. Instead of doing away with the card and the complex contracts MTC had negotiated to bring it to its current state, the agency is incorporating open-loop payments while keeping the existing Clipper card. This enabled them to build on the strengths of the existing card while opening up flexibility for all riders throughout the region.

This is the opposite approach of the MTA, which took an unpopular system in Metrocard, its magnetic swipe card, and fully replaced the entire brand with OMNY to refresh rider perspectives on the citywide payment network.

Consideration 5: Seek Equity Gains Instead of Preventing Equity Losses

As many transport providers are considering new payment systems, they are asking how they can ensure these systems will not make their transport networks less inequitable. Instead, providers should focus on how they can make sure these payment systems will make their transport networks more equitable. They should seek gains rather than prevent losses.

LA Metro and LADOT understand this through the Mobility Wallet. Recognizing the role that private transport providers play in the daily lives of many residents, the Mobility Wallet incorporates payments across public and private modes to ensure public transport benefits can be applied to all modes, regardless of ownership. Designing a system around this shifting transport paradigm creates additional flexibility and convenience for the individuals most reliant on these networks. Because of this, the new payment systems increase equitable access to jobs, resources, and other opportunities.

Consideration 6: Explore Services Beyond Transport Benefits

Many transport providers (including Cal-ITP and LA Metro/LADOT through the Mobility Wallet) are using open payment systems to explore a world where transit benefits are attached to all other public benefit packages. An open system network that can work with other public benefits is a catalyst for equitable growth that goes well beyond transport alone. Also, if a transport agency will build the various systems internally, think hard about capability, cost, and how to keep the system future-proof in a modular way.

Consideration 7: Expand Benefits Beyond Public Transport Alone

Many providers, including MTC and LA Metro/LADOT, have used their payment systems to provide easier access to privately operated transport modes. This is critical in ensuring riders can access modes beyond public transport more easily. In addition, it helps providers reshape their view of transport services beyond those they provide to those

provided throughout their city, regardless of ownership. Transport providers should use new payment systems to create conversations around transfers and mode-specific discounts while using their authority to push for more coordination around pricing, operations, and service availability with modes they do not directly control. This can include everything from tolling and congestion pricing to ridesharing and micromobility.

Consideration 8: Ensure Ongoing Education and Trust

As transit payments move from cash to cashless, new concepts such as fare capping, pre-pay, top-up, post-pay, and others are introduced. This is in addition to the complicated transport fare zonal systems some cities have. Transit leaders understand people are concerned about safety, security, and value, so building trust through education is key. Many riders are dependent on transit agencies and cities.

Cities design equity-based discounts or concession programs, but take-up will be limited if people don't know about them. There is a strong need to educate riders so they are aware, understand, and trust the new payment system. Digital inclusion is also a potential friction point. With many app-based systems to access transport, transit agencies must constantly engage with customers to support those who don't have access to a smartphone.

Consideration 9: Measure Impact

While transport providers are reasonably concerned about the many equity impacts of open payment systems, there is limited consensus on how to measure these. Transport providers need to develop and refine metrics to gauge how new payment systems are changing the use of the transport network, from boarding patterns among specific rider groups to general system use and shifting payment types. Open payment systems are exciting for riders and can boost an agency's profile. Still, as new systems with significant costs, providers must be sure they are the right investment for them and, if so, that they are tracking how well these systems match up with what has been advertised.

The need for equity to be at the forefront of city leaders' minds is essential.

Conclusion

In this whitepaper, we have seen the crucial role of ticketing as a gateway for millions of people to access sustainable forms of transport daily, which in turn supports key areas from tackling the climate emergency, accessibility, or the cost of living crisis.

We have considered how new technologies in transport ticketing are benefiting cities, operators, and customers to unlock more value. We have seen how transit agencies, including California, Boston, New York City, London and New South Wales, have implemented new payment systems enhancing customer experiences in transport and beyond. Ticketing has significantly evolved in the past three decades with less reliance on cash payments by introducing pre-paid cards or Contactless using closed-loop and open-loop systems.

However, as we think about bringing in new innovative solutions to provide better customer experiences and more convenience,

a clear reflection in this whitepaper is not to leave some members of society behind and exclude them from benefiting from the new ticketing technologies. In particular, when designing new solutions for cities, the need to consider unbanked or underbanked, or those digitally excluded, is paramount. Otherwise, there is a risk that while the vast majority will benefit, those who need the added value the most will miss out.

In this whitepaper, we have shared some considerations, including thinking about a service for all from the outset, leveling up, creating a more equitable environment, building trust through regular and ongoing two-way dialogue, thinking about benefits beyond transport, and measuring impact.

Whether cities are thinking of bringing new ticketing technologies in or enhancing their current offering, equity must be at the forefront of city leaders' minds.

Considerations for cities thinking about equity in future payments:

- **Consideration 1:** Level-Up Not Level-Down
- **Consideration 2:** Recognize the Broader Context
- **Consideration 3:** Conduct Genuine and Authentic Community Engagement
- **Consideration 4:** Start with What You Have and Build from There
- **Consideration 5:** Seek Equity Gains instead of Preventing Equity Losses
- **Consideration 6:** Explore Services Beyond Transport Benefits
- **Consideration 7:** Expand Benefits Beyond Public Transport Alone
- **Consideration 8:** Ensure Ongoing Education and Trust
- **Consideration 9:** Measure Impact

ACKNOWLEDGMENTS/ REFERENCES

Interviews:

- Mastercard
- Metropolitan Transportation Commission (SF, USA)
- MoCaFi

Photo Credits

- MetroCard Photo
<https://secretnyc.co/metrocards-to-be-replaced-spring-omny/>
- Card Tapping Photo
<https://brazilnytour.com/dicas-de-nova-york/2021/2/9/metro-de-nova-york-novo-sisterna-omny/>

Support

- This work is supported in part by Mastercard.

Author Bios

Rikesh Shah is a Civic Innovator at the Technology and Entrepreneurship Center at Harvard. He is also the Head of the Innovation Procurement Empowerment Centre – a UK government-funded initiative to stimulate more market innovation for the public sector to create more value from the £300Bn spent each year. Previously Rikesh led Transport for London’s award-winning innovation team to create new value through advances in new technology for London by working with start-ups, corporates, academia, accelerators, and venture capitalists. He was responsible for creating TfL’s first Innovation Hub, which has delivered some pioneering projects in areas such as air quality, road safety, active travel, enhancing customer experiences to retail and property development. Rikesh was also responsible for TfL’s world-leading open data program, which has 17,000 registered users, 700 apps powered by TfL data used by 42% of Londoners, which an independent review stated that it’s worth to London is £130m per annum. He also was actively involved during the 2012 Olympic Games and TfL’s response to COVID-19.

Rob Benner is a Master in Urban Planning Candidate at the Harvard University Graduate School of Design with a concentration in transportation and infrastructure. Prior to Harvard, Rob spent three years at Via, a transit technology provider, where he crafted partnerships with cities and transit agencies to reform and enhance key components of their transportation networks. Before Via, Rob spent three years at Transportation for America, a national transportation advocacy group, where he worked with cities across the US and North America to develop policies, pilot projects, and design guidelines to manage new mobility technologies. He has a Bachelor in Arts in History from the University of Vermont.

References

Andreoli, Roberto, ATM Milano, Frederico Pimentel, Dominik Karall, Juan Corro, and Esteve Avila Aymerich. "Members of the Urban Mobility Open Payments Forum," n.d.

Arroyo-Arroyo, Fatima, Philip van Ryneveld, and Brendan Finn. "Innovation in Fare Collection Systems for Public Transport in African Cities." Africa Transport Policy Program, 2021.

Aruho, At, R Behrens, W Mitullah, and A Kamau. "A CASE STUDY OF MATATU CASHLESS FARE COLLECTION INITIATIVES IN NAIROBI," n.d.

Beale, Kirsten, Bogdan Kapatsila, and Emily Gris . "Integrating Public Transit and Shared Micromobility Payments to Improve Transportation Equity in Seattle, WA." *Transportation Research Record: Journal of the Transportation Research Board* 2677, no. 1 (January 2023): 968–80. <https://doi.org/10.1177/03611981221103233>.

Brakewood, Candace, Transit Cooperative Research Program, Transportation Research Board, and National Academies of Sciences, Engineering, and Medicine. *Considering the Unbanked in Cashless Fare Payment at Point of Service for Bus/Demand-Response Services*. Washington, D.C.: Transportation Research Board, 2022. <https://doi.org/10.17226/26589>.

Klein, Aaron, and Miriam K Carliner. "How Better Payment Systems Can Improve Public Transportation." Brookings Center on Regulation and Markets, 2023.

Ko, Lily. "Equity Implications for Unbanked Riders in MBTA's New Fare Collection System— and What Can Be Done About It – Practical Visionaries," November 15, 2019. <https://practical-visionaries.org/equity-implications-for-unbanked-riders-in-mbtas-new-fare-collection-system-and-what-can-be-done-about-it/>.

Piacquadio, Andrea. "Demystifying Ticketing and Payment in Public Transport." International Association of Public Transport (UITP), 2020.

Pike, Susan, Mollie D'Agostino, and Kailey Flynn. "Un- and Underbanked Transit Passengers and the California Integrated Travel Project," n.d.

Portland State University, Aaron Golub, John MacArthur, Portland State University, Anne Brown, University of Oregon, Candace Brakewood, and University of Tennessee. "Applying an Equity Lens to Automated Payment Solutions for Public Transportation." Transportation Research and Education Center (TREC), 2021. <https://doi.org/10.15760/trec.261>.

Turner, Katherine, Staly Chin, Andrea Nguyen, and Susan Pike. "All Aboard! Easier Transit Travel with Standardized Payments," n.d.

Visa Economic Empowerment Institute. "Reimagining Ridership: Open-Loop Payments and the Future of Urban Mobility," 2023.