

Mobility Accounts Market Sounding Summary Report

Issued by: Caltrans, on behalf of the California Integrated Travel Project (CalSTA, Caltrans, CCJPA, regional and local partners); and California Air Resources Board

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Disclaimer

This Market Response Summary Report presents the highlights of the Market Sounding process that the California Integrated Travel Project (Cal-ITP) undertook in early 2021. To protect the Market Sounding respondents' commercial information, and to foster candor, the information outlined in this report is summarized without reference to specific companies or products.

This report will provide clarification as to whether certain information is attributable to Market Sounding participants or to Cal-ITP.

Caltrans and its regional and local partners conducted this Market Sounding exercise by collecting written information and conducting follow-up interviews about the knowledge and capabilities of various market players and industry professionals. The information outlined in this report represents the individual commercial views and interests of these Market Sounding participants. This report is intended solely for informational purposes and is not to be construed, under any circumstances, by implication or otherwise, as a recommendation for any specific policies, solutions, or services.

Executive Summary

People have more options than ever before to get around in California. From public transit and ridesharing to shared bikes and e-scooters, a multimodal transportation system that provides travel options is critical to meeting California's climate, equity, and economic goals. As the global trend towards a more complex mobility ecosystem continues, the California Air Resources Board (CARB) and California Integrated Travel Project (Cal-ITP) want to identify opportunities to integrate and improve accessibility within the mobility ecosystem, especially for vulnerable communities, through mobility accounts.

Mobility Accounts can be defined broadly as an account held by a private or public organization which stores and exchanges information pertinent for travel such as travel preferences, payment methods, and personal attributes which may inform travel preferences or eligibilities. Mobility accounts improve the customer travel experience by storing relevant customer information that can be used to ensure safety and personalize a trip based on specific transportation needs.

A Market Sounding solicits confidential insights from private companies about their products and services in the marketplace. The goal of this process was to receive feedback from the private sector on how the state could use mobility accounts to help increase multimodal trip opportunities and measure multimodal travel that occurs. Responses to the Market Sounding were received from companies which could, or already do, leverage mobility accounts across a diverse set of business models: general technology account providers, wayfinding and journey planning applications, mobility service providers, and payment hardware and software platforms.

Responses to the Market Sounding emphasized that demand for Mobility as a Service (MaaS) services and mobility service providers continue to evolve in the United States and are not yet mature. Therefore, participants suggested the need to prioritize *increasing* multimodal travel before seeking opportunities to *measure* it. The responses highlighted the important role CARB and Cal-ITP should continue to play in developing specifications and reporting standards for transportation providers as part of a multimodal ecosystem. Market Sounding respondents highlighted the importance of protecting customer privacy with multimodal trip measurement and suggested a role for state agencies in fostering an environment of strong privacy protections within all public and private mobility account holders.

Before finalizing the Market Sounding, CARB and Cal-ITP engaged other critical stakeholders such as public transit agencies, nonprofit organizations, and academic researchers to validate and refine the findings. These interviews generally confirmed the initial results of the Market Sounding while providing additional perspectives, and a summary of the findings is included in the appendix.

To further support California's transportation and environmental goals, CARB and Cal-ITP can use these findings to inform the development of public policies to incentivize and ultimately measure sustainable transportation choices.

Contents

Executive Summary.....	2
1 Introduction.....	5
1.1 Overview of integrated mobility systems	5
1.2 Potential for mobility accounts.....	5
1.3 About the California Integrated Travel Project (Cal-ITP).....	6
1.4 About the California Air Resources Board (CARB).....	7
2 Market Sounding	7
2.1 Process overview	7
2.2 Market Sounding respondents	8
3 Key findings.....	8
3.1 Key finding #1: Increase availability of multimodal options	10
3.2 Key finding #2: Develop standardized data reporting templates.....	11
3.3 Key finding #3: Multimodal travel is propelled by open discoverability.....	11
3.4 Key finding #4: Analyze aggregated data to develop linked-trip estimation methods.....	12
3.5 Key finding #5: Account creation is an opportunity to promote multimodal travel.....	12
3.6 Key finding #6: Account linking through tokenization is a measurement opportunity.....	13
3.7 Key finding #7: Accounts enable great customer service	14
4 Conclusions and next steps.....	14
Appendix A	16

Abbreviations

Abbreviation	Definition
API	Application Programming Interface
CARB	California Air Resources Board
Cal-ITP	California Integrated Travel Project
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CMS	Clean Miles Standard
EMV	Europay, Mastercard, and Visa
GHG	Greenhouse Gas
GTFS-RT	General Transit Feed Specification Realtime
MaaS	Mobility as a Service
ICT	Innovative Clean Transit
PII	Personal Identifiable Information
TNCs	Transportation Network Companies
ZEBs	Zero-Emission Buses

1 Introduction

1.1 Overview of integrated mobility systems

The past decade has seen explosive growth in transportation technologies, new mobility business models, and shared service providers across California. From transportation network company (TNC) platforms to shared micromobility services such as e-bikes and e-scooters, travelers today face an increasingly complex and dynamic mobility ecosystem. With more mobility service providers in the marketplace, people are better able to choose how they wish to get around without a private vehicle and combine services into multimodal trips. As a result, the relationship between public- and private-sector mobility service providers and their customers has become more complicated.

Mobility as a Service (MaaS) is the integration of various forms of transportation into a seamless mobility service available on demand to travelers.¹ With MaaS, people can choose between different modes of transportation and service providers and combine these options into multimodal linked trips based on their travel needs and preferences. MaaS also facilitates people being able to travel using different multimodal options throughout the day depending on their trip characteristics. For example, a traveler may complete a longer-distance commute on public transit, they may run lunchtime errands on a shared bike, then commute home via a TNC ride.

The public sector can leverage MaaS to achieve public policy goals around mobility, equity, and sustainability. MaaS has the potential to provide a convenient, reliable, and affordable mobility option, which can improve quality of life for people who can't or don't drive. It can also reduce the amount that people drive alone, helping to reduce CO₂ emissions and improve the environment.² However, while initial research from other regions is promising, MaaS models remain relatively new and untested in the United States.

1.2 Potential for mobility accounts

Mobility accounts are an essential component of MaaS. Accounts allow customers to customize information about their trip such as origin and destination, payment account, and booking details, as well as to be able to save recurring travel preferences. For shared mobility service providers, accounts provide a way for customers to access information about their travel history, rate and review the services provided, and receive eligibility-based discounts, such as low-income programs and travel rewards. MaaS platforms that do not directly provide mobility services also use mobility accounts to allow customers to indicate their recurring travel preferences and plan their trip. Sometimes these platforms also allow customers to book and pay for some types of transportation services.

Mobility accounts that are integrated across different mobility services providers are relatively rare in the United States, but have the potential to allow customers to plan, book, and pay for multiple transportation modes or services in a single trip. Since these accounts contain information about travel preferences and uses for multimodal linked trips, they could be used to measure reductions in vehicle-miles traveled (VMT) and greenhouse gas (GHG) emissions across transportation modes. Further, in aggregate and with customer

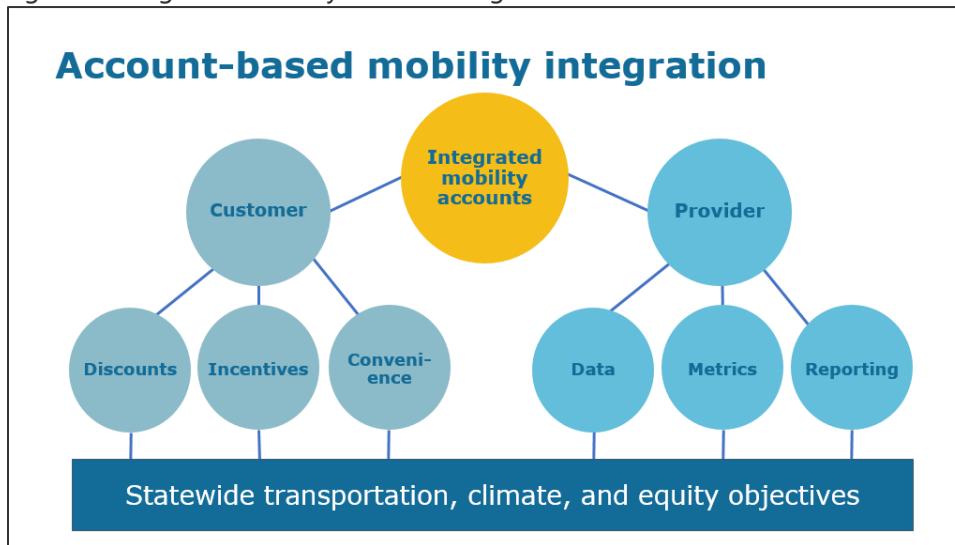
¹ MaaS Alliance. (2017). White Paper: Guidelines & Recommendations to create the foundation for a thriving MaaS Ecosystem. Brussels: MaaS Alliance and TNO. (2020). Policy Options to Steer MaaS: International Case Studies

² For much more research on MaaS and potential benefits, see the UC Davis 3 Revolutions Future Mobility Program at <https://3rev.ucdavis.edu/>

privacy protected, accounts could also be a source of travel demand information for public-sector transportation planning purposes. In this way, mobility accounts, while primarily customer-facing, can also function as a way to understand travel demand across different public and private mobility service providers.

A framework for account-based mobility integration is shown in Figure 1.

Figure 1. Integrated Mobility Account Diagram



1.3 About the California Integrated Travel Project (Cal-ITP)

Cal-ITP is pursuing the development of mobility accounts as one component of a broader, statewide effort to facilitate easy and accessible travel planning and payment, starting with transit. With hundreds of public transit providers in California, the state lacks a standardized system for collecting fares, verifying eligibility for transit discounts, or providing up-to-date vehicle arrival information to riders. This lack of uniformity creates barriers for new riders, complicates travel across different systems, and increases administrative expenses for individual agencies. Cal-ITP is supported by the California State Transportation Agency (CalSTA) and the California Department of Transportation (Caltrans) through a grant from the California Transit and Intercity Rail Capital Program (TIRCP) to help California deliver the following statewide goals:

- Improve the customer experience
- Increase transit ridership
- Lower transportation costs for transit providers and people riding transit
- Reach environmental targets

To achieve the state's vision and make progress towards these goals, Cal-ITP is pursuing three initiatives identified in a [2019 Market Sounding](#):

1. Producing reliable information about available transportation options and their prices (e.g., vehicle arrival time, planned service changes, crowding, etc.)
2. Reducing friction in payment and promoting contactless fare collection
3. Providing a seamless process for transit riders to verify eligibility for discounts (e.g., youth, older adults, commuters receiving employee benefits, veterans, persons with disabilities, and low-income riders)

Across these areas, Cal-ITP leverages existing global standards for mobility service information and fare payments. Working with transit and rail industry partners, Cal-ITP is developing tools, resources, and technical assistance to assist rail and transit agencies to quickly deploy contactless payment options and provide customers with accurate and reliable travel information. The adoption of global trip planning and payment standards by public transit and rail providers in California creates the potential to leverage mobility accounts to achieve state climate, equity, and economic goals in close collaboration with other state agencies, such as the California Air Resources Board (CARB).

1.4 About the California Air Resources Board (CARB)

CARB is the state agency responsible for carrying out programs to combat climate change and protect the public from the harmful effects of air pollution. In particular, CARB is developing the Clean Miles Standard (CMS), a regulation in accordance with the statute SB 1014 passed by the state Legislature. The CMS seeks to regulate greenhouse gas emissions (GHG) emitted by TNCs by establishing a baseline emissions allowance and setting gradual targets for reductions that TNCs will be required to meet. CARB has also established regulatory design principles to maximize transportation access equity and promote pooling, active transportation, and transit. To that end, the CMS regulation, adopted by the CARB Board on May 2021, includes optional credits for TNC trips connected to transit via an integrated fare program.

The Innovative Clean Transit (ICT) regulation governs the state's public transit agencies, with a goal to gradually transition to a 100% zero-emission bus (ZEB) fleet by 2040. To broaden the impact of these programs and create more flexible pathways for compliance, both CMS and ICT regulations include pathways for compliance that provide alternative means for TNCs and transit agencies to meet their respective targets under the regulations. These pathways are designed to promote other environmentally oriented mobility outcomes not directly targeted by the regulation, such as incentivizing investments that lead to more walking, biking, and other zero-emission mobility modes, as well as incentivizing first/last-mile connections to mass transit. To track outcomes and evaluate lessons learned from these first/last-mile credit options, CARB would benefit from accurate and reliable data on multimodal trips that include transit for a portion of the trip. Mobility accounts could provide an opportunity to measure these multimodal trips.

2 Market Sounding

2.1 Process overview

CARB and Cal-ITP jointly undertook this Market Sounding to gather information from the private sector regarding statewide actions to facilitate and measure multimodal linked trips. A Market Sounding is an opportunity to engage with industry stakeholders and solicit confidential insights from private companies about:

- Products and services in the marketplace, either currently or soon to be available
- Important network and community considerations to inform development of statewide policies and programs
- Observations and insights about modern business practices and processes
- Lessons learned from similar projects and applications in other jurisdictions

This Market Sounding details insights from the private sector as one component of the multimodal mobility ecosystem. Public transit providers, local transportation agencies, the traveling public and communities, and many other critical stakeholders will also be needed to build a complete understanding of mobility accounts

and integrated mobility in California. Therefore, the preliminary results of this Market Sounding were used to further engage with these additional perspectives, summarized in the appendix.

CARB and Cal-ITP distributed a [Market Sounding document](#) to companies and organizations in the shared mobility, payments, journey planning, and mobility accounts industry and published the same document through the Caltrans website on February 1, 2021. All interested parties were invited to a Market Sounding Webinar/Q&A event on Tuesday, February 16, 2021, at 10am PST. Attendees were able to learn more about the purpose of the Market Sounding and given the opportunity to ask questions. Submissions from private-sector companies were due by Friday, March 5, 2021, at 5pm PST.

2.2 Market Sounding respondents

The Market Sounding included 14 participating companies, representing different business models, customer relationships, and perspectives on mobility accounts. In order to better understand the insights offered from the industry, we grouped them into the following business models:

Mobility service providers

The market for shared mobility is rapidly evolving as companies determine the mix of vehicles, transportation modes, service models, and partnerships that are of interest to customers. Micromobility companies with shared bike and scooter fleets, TNCs, carpool services, and carshare providers all feature a customer account needed to access the mobility service. Examples of mobility service providers include Via, Lyft, Uber, Lime, Spin, and Revel, among many others.

Mobility information and trip planning

Some customer-facing companies focus on aggregating accurate mobility information and providing multimodal trip planning capabilities to consumers. These companies rely on data created and provided by public and private mobility service providers, sometimes through open APIs or negotiated partnerships. In some cases, customers may have an account associated with a payment option that can be used to book and pay for a trip, while in others, customers receive information and trip planning, but must book and pay for the trip through an account with the mobility service provider. Examples of travel information and trip planning providers include Transit App, CityMapper, Google Maps, and Apple Maps, among many others.

Payments for mobility services

The ability to pay for a trip on a public- or private-sector mobility service involves either cash or digital payments. Retail payment service providers such as Square and PayPal, payment networks like Visa and Mastercard, and mobility-focused payment companies like Cubic, Bytemark, or Masabi offer another source for understanding mobility accounts.

3 Key findings

The Market Sounding solicitation presented a framework of potential solutions for facilitating and measuring multimodal linked trips. The framework outlined three potential approaches, each progressively involving a more significant role for the state of California:

- Option A: California would determine and develop the data specifications and reporting standards by which transportation providers would provide information to governmental agencies to determine that a linked trip occurred.

- Option B: California would define data specifications and reporting standards but require that more comprehensive trip data be reported for transportation planning purposes beyond just the determination of linked trips.
- Option C: California would create customer-facing “mobility accounts,” which would be accepted by and integrated with various transportation providers.

Responses to the Market Sounding emphasized that the market for MaaS and shared mobility services is not yet mature in the United States. Customer interests, travel demand, and business models continue to change, so the marketplace and the role of public policy interventions continues to evolve.

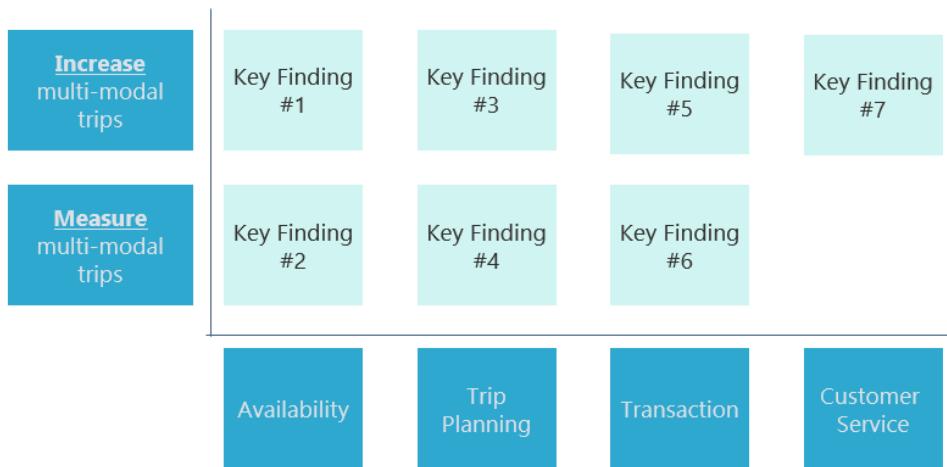
Therefore, participants suggested the need to prioritize *increasing* multimodal travel before seeking opportunities to *measure* it. The responses highlighted the important role CARB and Cal-ITP should continue to play developing specifications and reporting standards for transportation providers as part of a multimodal ecosystem. This standardization facilitates the availability of multimodal options and integrated customer trip planning that may lead to increased ridership and improved measurement capabilities over the long term.

The solutions discussed in Market Sounding submissions and interviews can be grouped according to the phases of a multimodal journey from a customer perspective:

1. Availability: Making multimodal travel options available to customers
2. Trip planning: Providing customers with the ability to easily discover and compare multimodal options available to them
3. Transaction: Allowing customers to easily book and pay for multimodal services
4. Customer service: Enabling customers to review trip information, ask questions, and provide feedback on their journey

This framework for categorizing solutions corresponds with our key findings as shown in Figure 2.

Figure 2. Key Findings Diagram



3.1 Key finding #1: Increase availability of multimodal options

In exploring the complexities of new mobility business models and partnerships, it is possible to overlook the important role for the state in simply supporting the availability of shared mobility options. MaaS remains an emerging market in the United States and California and, especially in unserved and underserved areas, and has the potential to provide additional mobility choices for people who cannot or do not own or drive a private car. The availability, reliability, and convenience of transit (including options for first/last-mile connections to transit), as well as efficient and more equitable modal alternatives to private car travel, is critical to supporting shifts toward sustainable and equitable transportation patterns.

Mobility service providers are eager to explore options for collaboration with the public sector to make multimodal options more widely available. In many areas in California, such as lower-density areas or communities where travel demand is low, the business model for shared mobility services has not yet been fully developed. In some rural parts of the state, for example, the distance within a community is too short, and the distance between cities too large for mobility providers to justify services and cover costs. Yet, in many of these areas, there is a public interest in having mobility options such as bike sharing, scooter sharing, ridesharing, or microtransit available. More diverse mobility options can enable more equitable access to economic opportunities, such as employment, healthcare, or education, and could displace private vehicle trips and reducing carbon emissions.

One role for the state could be to provide subsidies/funding to enable private mobility service providers to expand service to areas—such as lower-income communities, areas with air quality concerns, or even first/last-mile transit zones—that achieve public policy goals. The state could provide access to statewide data on the location and frequency of transit routes and use this information to identify these potential areas of opportunity and to facilitate these public-private partnerships.

Beyond funding, the state could assist small and rural transit providers and municipalities with procuring on-demand services from mobility providers. Similar to the approach Cal-ITP took creating a marketplace for transit agencies to procure contactless fare collection technology, the state could work to develop leveraged procurement agreements—or pre-negotiated, competitively bid statewide contracts—from

which local agencies could choose to procure for services. This would assist under-resourced public agencies with expanding access to multimodal services by reducing costs and procurement barriers. It would also facilitate statewide standardization of hardware and software, mobility service models, consumer privacy protections, and data reporting templates to measure multimodal travel.

3.2 Key finding #2: Develop standardized data reporting templates

Market Sounding respondents highlighted the need for greater standardization in mobility data across modes of transportation and across jurisdictions and transportation agencies in California. For example, the California Public Utilities Commission (CPUC) regulates TNCs and requires them to report aggregate trip information, while bike and scooter sharing are permitted at the local level using different standards. While General Transit Feed Specification (GTFS) and General Bike Feed Specification (GBFS) are industry standards for transit and micromobility respectively, specifications for on-demand services remain in development. Recognizing that different business models and modes of transportation may have unique data features, there may be an opportunity to align both the way service availability information is shared and how much information about travel is collected to protect consumer privacy.

Public-private partnerships where mobility services are subsidized may be one place to start aligning data specifications and reporting templates. In some communities in California, mobility service providers that provide trips subsidized by a public agency report certain trip information to public-sector partners to document the service provided. However, these requirements are not uniform across cities, modes of transportation, or mobility companies.

As the market for mobility services continues to mature, the state could play a role assisting local governments and public transit agencies in understanding and measuring multimodal linked trips by developing and promoting a data specification for mobility providers across modes and jurisdictions. By enhancing the mobility measurement capabilities of the public sector around service provision and availability, Cal-ITP could facilitate integration of disparate data streams, providing greater insight into multimodal travel behavior and gaps in services. Standardizing information about multimodal trips linked to transit would also create greater certainty for mobility service companies around reporting requirements.

3.3 Key finding #3: Multimodal travel is propelled by open discoverability

To facilitate multimodal trips, mobility options must be available, but they also need to be easily discoverable by customers. In Cal-ITP's first Market Sounding, the industry offered clear feedback that the primary focus in creating a seamless, improved transit experience should be on getting all transit providers onto the General Transit Feed Specification (GTFS) for transit schedules and real-time information. Empowering transit customers to see when their train or bus is arriving (and what it costs)—both online and in journey planning and wayfinding mobile applications—is critical if transit is to be at the core of California's future multimodal ecosystem. Cal-ITP is already supporting transit agencies across the state in publishing GTFS feeds, with the goal of getting all agencies onto GTFS Realtime by the end of 2021.

Market Sounding respondents applauded these efforts and suggested the state play a role supporting the development and use of standards for the discoverability of other shared modes. Several Market Sounding participants advocated for the state to play a role in expanding the reach of the General Bikeshare Feed Specification (GBFS), which is a data standard for shared mobility availability that, while used by many bikeshare and scooter operators, is not always used uniformly in such a way that third-party trip planning and wayfinding apps can easily access this information. Continued engagement by Cal-ITP on GBFS to work toward a more open, standardized approach could help promote multimodal travel.

Similarly, the Market Sounding revealed support for efforts to develop specifications for on-demand services like ride hailing. Cal-ITP supports development of the General On-Demand Feed Specification (GOFS) and to ensure coordination with GTFS-Flex, an extension of GTFS that provides information for demand-responsive transit services. Although the project has broad support by the industry, the path toward becoming a widely adopted standard is still uncertain. Cal-ITP is already participating in the GOFS working group, which may end up providing a helpful tool to aid in multimodal discoverability.

3.4 Key finding #4: Analyze aggregated data to develop linked-trip estimation methods

Market Sounding responses noted that there may be opportunities to leverage companies' experience with surveys and customer travel patterns as inputs into modeling of multimodal linked trips. Mobility service providers, journey planning platforms, and other mobility apps that integrate information about multiple modes of transportation have robust information on customer intent, even when they cannot prove that a multimodal trip occurred. For example, mobility service providers can use the technique known as "geo-fencing" to determine whether a particular trip started or ended near a transit stop. While they cannot report whether a transit trip actually occurred, this information could still be used in modeling efforts to understand the actual and potential use of multimodal trips in a region. Additionally, mobility service providers conduct extensive surveys to help inform their business and investment decisions, determine where service is needed, and understand what alternative(s) their service is substituting. Taken together, these estimation techniques can detect shifts in travel patterns and provide a useful proxy for actual measurement of multimodal linked trips, which presents significant complications (discussed in greater detail below).

CARB and Cal-ITP, along with the research community, can play an important role in aggregating and analyzing data from these estimation methods. By working with private companies, nonprofits, and research institutions in the mobility ecosystem, state agencies interested in measuring and understanding multimodal travel behavior for planning and/or regulatory purposes can lead efforts to collect relevant information and improve existing tools. Especially where public subsidies for trips are provided, mobility service providers could be required to provide information for these purposes, ideally through a standardized template (as discussed in Key Finding #2).

3.5 Key finding #5: Account creation is an opportunity to promote multimodal travel

The transit industry shift towards contactless open payments presents exciting opportunities to increase transit ridership. Many companies are working towards integrations with other mobility service providers, including transit, to offer customers the ability to book and/or pay for an entire multimodal linked trip as one transaction. Many Market Sounding respondents reported an interest in public transit discoverability and payment as part of a customer's multimodal trip planning. Transit integration was widely seen as a competitive advantage for mobility providers who wished to showcase first/last-mile options and connections to transit services. There was widespread support for transit providers to allow customers the ability to pay through digital payment methods, which would allow for multimodal payment integration.

However, Market Sounding participants identified challenges with achieving scalable multimodal integrations, particularly with other private mobility providers. These challenges are primarily due to competitive dynamics rather than technical issues. A major component of these competitive dynamics is what some in the industry call the "battle for accounts," referring to the advantage of customer loyalty

through owning the customer account and controlling the end-to-end user experience and quality of the mobility services provided.

A potential solution that partially addresses that competitive tension would be to develop a standard for creating new customer accounts across platforms. For example, a TNC customer could create an account for a bike share operator directly through the TNC app and allow the operator to share limited customer information only to the extent required to create a new account. This would remove a barrier for customers to take multimodal linked trips and minimize the effort required to create a new account. Such a step would allow service providers to go beyond simple cross-platform discoverability and move toward cross-platform service provision, although it does not take the customer all the way to the point of payment. A customer accounts standard could be modeled off integration tools already widely used in the technology industry for “single sign-on” (SSO), such as the OAuth 2.0 standard. Although this approach also would face many potential roadblocks toward becoming an industry-wide standard, the state could play a role in engaging industry stakeholders and communities to determine options for standardizing cross-platform account creation as an additional tool to promote multimodal travel.

3.6 Key finding #6: Account linking through tokenization is a measurement opportunity

The central objective of this Market Sounding included identifying solutions to not just increase but also to *measure* multimodal travel through integrated payment. Participants confirmed various complications that prevent the deployment of scalable solutions to measure individual multimodal trips through integrated payment. The first major challenge is the high percentage of cash fares still used in transit. That issue is being addressed by Cal-ITP but will take several years at least to meaningfully change. Another issue related to transit payment is that, most often, only the starting point of a trip is digitally recorded, and there is no easy way to measure the endpoint, which would be needed to determine linked trips in which transit provides the first leg of the journey. Furthermore, customers may have different preferred ways to pay for different modes, preventing the ability to retroactively “link” two legs of a trip that were paid using the same payment credential. Even if all transit customers used digital payment methods for all types of trips and used them consistently across modes, measuring linked trips by aggregating the payment data through payment processors and/or acquiring banks does not appear to be a viable solution at this time, as the data lacks sufficient transportation-specific context to determine a linked trip.

One technical solution that was discussed in several Market Sounding interviews was using tokenization, the process of associating a unique ID, or “token,” with an account to enable the sharing of account information with personally identifiable information (PII) to allow for the linking of customer accounts solely on the “back end.” In other words, the tokenization process would be invisible to the user, but the customer’s account record that sits in the provider’s back-end database would have a unique identifier that could be used to anonymously link accounts. This would need to be done in a privacy-protective manner, recognizing that customer accounts would include sensitive information, including customer travel origin and destination location information. Under such a model, there could be a central “tokenization provider” that integrates with transit providers and mobility service providers and could report on linked accounts and trips at an anonymous, aggregate level. The state could look to organize limited-scope partnerships and demonstration projects to test this model with new multimodal features in combination with the rollout of contactless payments.

3.7 Key finding #7: Accounts enable great customer service

Customer service is the final element of a multimodal journey, often occurring after the customer has already paid for the trip. Common customer service features include allowing customers to monitor their travel history and past transactions, report payment problems, request refunds, and claim benefits and discounts. The existence of a customer account is critical to the delivery of these features and builds trust with the customer.

Market Sounding participants identified Cal-ITP's work to improve discount eligibility verification as a valuable tool to integrate into any future multimodal customer service solution. Cal-ITP is partnering with the California Department of Motor Vehicles to allow adults 65 years or older to verify their age through a simple enrollment process and associate their transit discount with their open-loop payment credential (credit or debit card). Participants were excited about the possibilities of applying a similar approach beyond transit into other modes of transportation and service providers. They were also excited about the potential to link into these systems and reduce the burden on customers to prove they qualify for reduced prices and discounts with each mobility service provider individually.

However, multimodal integration may also introduce complexities to customer service provision when two legs of a journey with different providers are booked and paid for on a single platform. In this case, it may be unclear to the customer which entity is responsible for providing the associated customer service features if something goes wrong with the trip. More exploration is needed to find customer-friendly solutions for multimodal customer service, but accounts will undoubtedly be a central component of those solutions.

4 Conclusions and next steps

Collectively, the Market Sounding findings above point to a rapidly evolving transportation and mobility landscape. Many private mobility service providers are already rolling out new multimodal features or are planning to. However, integration among providers remains piecemeal, and there was widespread skepticism from Market Sounding respondents about attempting to impose centralized accounts for multimodal integration at this stage in the development of the market. Companies are continuing to refine business models and meet evolving customer expectations for shared mobility. Companies did express that they shared many of the state's goals, admired the state's proactive approach and desire to facilitate innovation in the space, and were eager to engage in future discussions and collaboration.

Market Sounding participants suggested a progressive, incremental approach toward large-scale multimodal measurement solutions, and emphasized several roles for Cal-ITP to play in the short term:

- Setting standards and supporting the use of specifications for reporting, discoverability, and account creation such as GBFS, GOFS, etc.
- Continuing the partnership program with the California Department of Motor Vehicles to refine and expand access to the eligibility verification system, which can securely associate rider characteristics (to determine discount eligibility) with mobility accounts for transit and eventually other modes
- Sponsoring research and surveys on multimodal trip estimation and mode shift as a proxy for (and complement to) measurement through integrated multimodal booking and payment
- Serving as a catalyst and convener to demonstrate and test new partnerships and/or business models for multimodal travel and data collection

This Market Sounding represents an important first step in fostering collaboration, both among state agencies and between the public and private sectors. There is broad acknowledgement from all parties that the tasks at hand to accomplish our shared mobility objectives are important but challenging. This Market Sounding has made clear that success can only be attained by breaking the problem into manageable pieces as outlined above and by identifying the proper roles for the key players involved.

CARB will continue to play a critical role in developing and improving state policies that address the concerns of California's communities and send strong signals to companies to reduce greenhouse gases and air pollution through the following efforts:

- Continuing to support policies and funding of multimodal travel options that increase that availability and discoverability of a variety of modes.
- Working with Caltrans, Cal-ITP staff, and other agencies on data reporting standards for consistency and integration in CARB's incentive programs and regulations.
- Exploring ways to build off CAL-ITP's eligibility verifications to streamline eligibility for CARB incentive programs.
- Testing and collaboration through pilots and regulations that support multi-modal linked trips.
- Collecting and analysing data from GTFS and other standard reporting mechanisms to incorporate them into CARB programs and models.
- Continuing partnerships and collaboration with Caltrans, Cal-ITP staff, and other agencies on our policy documents, research opportunities, etc.
- Developing technical assistance for transit agencies and/or the public around regulations, incentive programs, data standards, and best practices.

As an implementing agency, Cal-ITP's mandate is to execute the state's long-term vision to improve mobility and transit accessibility, harnessing the changes in technology and travel behavior to develop ambitious but feasible solutions. This Market Sounding has illustrated the power and importance of interagency collaboration on these complex problems, and ongoing collaboration is critical as new mobility solutions are developed and tested in our cities and towns.

Cal-ITP is uniquely positioned to structure mutually beneficial partnerships including communities and diverse mobility providers. As Cal-ITP works with transit providers to deploy contactless payment solutions, there will be additional opportunities to test new multimodal products and options directly with customers and to ensure that the solutions work for all Californians.

Appendix A. Highlights from Transit Agency, Nonprofit, and Academic Interviews

The private sector is just one component of the multimodal mobility ecosystem and the perspectives of other important stakeholders such as public transit agencies, nonprofit organizations, and academic researchers are needed to build a complete understanding of integrated mobility in California. Therefore, before finalizing the Market Sounding, CARB and Cal-ITP engaged with a few members of these stakeholder groups to review and refine the initial findings. The purpose was to better understand the full scope of customer needs regarding mobility accounts as well as potential roles for the state in facilitating and measuring multimodal travel. CARB and Cal-ITP interviewed people at ten organizations, representing regions throughout California, as well as customer relationships and perspectives on mobility accounts.

Overall, the feedback from these interviews was generally aligned with the direction of the feedback from the private sector in the Market Sounding. The interviewees emphasized the important role public transportation agencies must play in serving the public interest and integrating mobility solutions that meet broader social goals for equity, sustainability, and economic development. Regarding potential solutions, they echoed the private sector participants in suggesting the state play a stronger role in establishing consistent privacy policies, data sharing agreements, and reporting frameworks that could streamline public–private partnerships at the local level and facilitate regional coordination across service areas. Predictable and reliable funding for transit agencies was also frequently cited as both a challenge and an opportunity for the state.

To better understand the insights offered from these stakeholders, we grouped them into different themes related to the key findings from the Market Sounding.

Multimodal Travel in California

Transit agencies, researchers, and community advocates confirmed key finding #1 regarding the on-going need to increase the availability of multimodal options in California. The stakeholders emphasized that the market for integrated shared mobility services continues to evolve in the United States and California with new business models and technologies continuing to emerge. However, stakeholders noted there are important differences in the built environment, transportation systems, and density within California that likely mean the form of shared mobility options may be inconsistent statewide. For example, while micromobility services may provide an important travel option in an urban area like Santa Monica, different land use and density in a similarly sized community like Shasta might make this mobility option infeasible. Acknowledging these differences in programs and measuring these geographic differences that impact the availability and use of shared mobility options across California are potential roles for the State going forward.

Further, researchers of technology, travel demand, and mobility systems consistently highlighted that MaaS models in the California context will almost certainly be different than existing best practices globally. For example, governance models, project design considerations, and pricing signals are all different in California than in other parts of the world, particularly Europe, where MaaS has been more widely implemented.

California also has unique land use patterns and a more distributed built environment that often puts travel destinations farther apart than the places where MaaS models have been implemented to date. These land use patterns might require MaaS in California to look different than elsewhere around the world. The State should play a role in understanding these important differences and developing demonstration projects to test service models within the California context. The state should take a leadership role in enabling new models of public private partnerships that will work for California transportation agencies.

These important nuances to the availability and use of shared mobility services in different areas of the state were highlighted by several agencies building the components of the MaaS experiences "in house". These agencies were in the process of developing multimodal trip planning apps, digital fare payment systems, and new fare policies such as fare capping targeted to the travel needs of customers in their area. Agencies across the state and from both larger and smaller communities noted the need for greater technical, product development, and analytical support from the state to support their efforts.

Public sector agencies were also interested in exploring public-private partnerships and innovative service models that deliver shared mobility benefits to the traveling public. Public transit agencies pointed to both successful and challenging examples of multimodal pilot projects in their service areas. For example, transit agencies in California are experimenting with augmenting existing services with new types of vehicles, such as micromobility, or replacing services with shared mobility options, such as microtransit. At the same time, limited resources, funding constraints, and administrative burdens require transit agencies to always measure the benefits of new services against the costs of current services.

Participants noted the impact of the global pandemic on public transit operations and ongoing uncertainty about travel demand and ridership in the near future. When it comes to mobility accounts, transit agencies may not have the capacity to invest in new innovations to serve riders without leadership from the state. The ability to rapidly implement contactless open fare payment systems is an opportunity for transit agencies to address concerns about transmission and help with bringing riders back to transit and other shared modes of transportation.

Consistent with key finding #2 regarding standardized reporting templates, stakeholders cited the complexities of contracting with private service providers as a challenge within their agencies and echoed the findings of the Market Sounding that there were not industry standards around these issues. Particularly for smaller transit agencies, there was interest in the State playing a role assisting local governments with perspectives on navigating the marketplace, contracting, procurement of innovative services and business models, and development of evaluation metrics and data dashboards to evaluate the performance of the transit network statewide. With visibility across California, statewide agencies could build a community of practice to share best practices, standardize contracts and reporting, and reduce agency operational costs.

Data and Privacy Standards

Standard terms or contract templates could allow data about travel patterns to be aggregated across adjacent jurisdictions and combined into regional travel demand models, for example. Along with interest in data standards, all the stakeholders highlighted the importance of consumer privacy laws in California

and a desire for statewide agencies to assist with setting a clear strategy and consistent interpretation of them in California. There was a strong interest in the state in developing a community of practice within the transportation industry for consumer privacy protections for shared mobility services and exploring approaches to link accounts or information on customer discounts across service providers at the request of customers. Similarly, the interviews also emphasized the important role of the traveling public, consumer advocates and community-based organizations in ensuring that decisions about public and private service models develop in a way that meets the needs of the diverse users of shared mobility services. For example, nonprofit organizations in California have developed community engagement toolkits and equity framework models that center the rider in policy and planning decisions.

Relevant to key finding #3: multimodal travel is propelled by open discoverability, transit agencies, researchers, and community advocates highlighted the disaggregated marketplace for multimodal services. This impacts mobility service data standardization because agencies use a variety of technology tools, payment accounts, and overlapping customer databases to better understand the needs of customers and communicate accurate information about mobility services available out to them. Ongoing efforts by the state to standardize information for trip planning, automate customer discounts, and enable contactless open payments was widely supported to make progress towards a more multimodal transportation system in the future. For example, the state could work with developers to include mobility accounts and travel incentives and discounts as part of a standard package of TDM benefits to reduce a development's VMT.

Stakeholders in California are continuing to explore what works and what doesn't when it comes to accessing and analyzing aggregated travel demand, linked-trip patterns, and service availability. Supporting both key finding #3 and #4, agencies large and small are developing analysis tools in-house, and support efforts at the State level to standardize data across service providers in the transportation network. The nonprofits, academics, and transit agencies interviewed noted a strong desire to have access to data on travel patterns across mobility service providers for operational and planning purposes in their jurisdiction or community. On the academic side, research on how to define and measure success for California integrated mobility and public-private service models is also ongoing and could benefit from this type of data. Researchers noted they continue to document and assess factors that result in increased multimodal trip-making such as land-use design, the built environment, job and housing density, and customer experience. Additionally, researchers noted that mobility wallets could help show the customers true cost of travel, which may change their travel behavior. A nonprofit noted that collection and access to travel data could help to understand travel patterns more deeply beyond peak periods, which could lead to identifying transportation improvements.

Mobility Equity and Community Benefits

Finally, across interviews, stakeholders emphasized the need to involve communities in the design, development, and decision-making process around shared mobility and MaaS in California. Stakeholders pointed to an on-going need for strong community outreach and education about new programs and multimodal services, particularly in currently underserved communities. There is an important role for the state in reducing access barriers to paying for mobility services by addressing the needs of people without smartphones or payment accounts. For example, mobility wallets are a new approach to provide direct

funding/incentives/discounts to people traveling that could be facilitated by statewide efforts to reduce the costs of payment processing for transit agencies.

Tied to finding #2 and #7 stakeholders suggested the state take a leadership role to effectively embed equity into the process for grant funding through equity indicators and metrics to evaluate current conditions and track progress towards goals. As a major funder of transportation projects and programs in California, the state should continue to invest in projects that build on the relationships nonprofit and community-based organizations have already developed in communities and the transportation needs of those communities. This customer-first perspective will be essential to drive public policy interventions towards multimodal integration in a way that focuses on and meets the needs of the people using these mobility options. With a focus on customer services, consistency in trips, and making information about available travel options easy to use and navigate, people are more likely to use public and private services and reduce single occupancy vehicle travel.