

Caltrans TDDC | Report on Transit Technology Ecosystem

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Author: RebelGroup

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Glossary

APC	Automated Passenger Counter
Cal-ITP	California Integrated Travel Project
CalSTA	California State Transportation Agency
CARB	California Air Resources Board
Caltrans	California Department of Transportation
CIM	California Integrated Mobility
DBE	Disadvantaged Business Enterprise
EMV	Europay, Mastercard, and Visa Standard
GTFS	General Transit Feed Specification
GTFS-RT	General Transit Feed Specification Realtime
LPA	Leveraged Procurement Agreement
MPO	Metropolitan Planning Organization
MSA	Master Service Agreement
MVP	Minimum Viable Product
RFP	Request for Proposal
SaaS	Software as a Service
TIRCP	Transit and Intercity Rail Capital Program
UCD	University of California, Davis
ZETCP	Zero Emission Transit Capital Program



1. Executive Summary

Transit providers in California leverage technology to support their operations and improve the rider experience. These transit technologies come in many shapes and sizes and are becoming increasingly integral to service provision. In California, there are over 250 fixed-route transit providers, each engaging with the broader transit technology market. Yet transit providers and state agencies alike lack a complete understanding of this market and its dynamics. This report is the culmination of an ecosystem mapping exercise to inform California's development of a strategy for deploying modular, scalable, and competitive statewide technology solutions to meet key policy objectives.

The report draws from a variety of data sources – both quantitative and qualitative – to arrive at several key findings. Previous experience has shown that providing direct technical assistance to transit providers is an effective way for California to influence technology implementation, and thereby advance adopted policy outcomes. Not only that, but transit providers want (and need) technical support for technology procurement and deployment. For many transit providers, technical support means hand holding and having California agencies take on a larger supporting role both at the technology scoping and acquisition phase and throughout the life of the contract to assist with vendor management.

In-house procurements remain the most common acquisition method to obtain transit technology, even for small agencies. These procurements are often done as a reaction to contract expirations or technology obsolescence. Of the transit technology categories identified in this report, safety and security technology tends to be the "least common dominator" for the current technologies used by transit providers, regardless of provider size or geographic service area.

Unsurprisingly, there is a correlation between the size of a transit provider and the number of transit technologies it uses. This correlation is largely related to the availability of resources – in terms of funds, staff time, and product market fit.

Providers are looking ahead to innovative technologies to improve their service but recognize they must establish a strong base of technologies to do so effectively. Both providers and vendors agree that integration and interoperability are critical to success and the resiliency of all their transit technologies (i.e., their transit tech stack). However, a strong base of interoperable and integrated technologies has been slow to be implemented. California can help bridge the gap between transit providers' operational priorities, passengers' interest in outcomes, and the market's ability to respond.



2. Context & Purpose

Public transit is fundamental to meeting the transportation needs of many Californians and is a core component of an integrated, sustainable, and equitable transportation network. In California alone, there are 250 fixed-route transit providers and nearly 600 paratransit and non-fixed route service providers, including non-profits. All of these transit providers leverage some form of transit technology to support their operations and potentially to improve the rider experience. However, the extent to which operators can obtain, implement, and maintain the latest transit technology is often dictated by availability of staff and resources.

The majority of California transit providers are relatively small and have limited staff and resource capacity. Particularly when it comes to assessing, adopting, and implementing new technology, many are too small to have the dedicated staff with technical skills needed to accomplish this in an economy in which many sectors are digitizing and automating. As a result, they are often unable to take advantage of modern information systems and data standards that improve service delivery, reduce operational costs, and meet rapidly evolving customer experience' expectations. To support California's transit providers in transit technology implementation, the State of California is first mapping and analyzing the transit technology ecosystem to better understand the barriers and pain points. This assessment will inform California's strategy for modular, scalable, and competitive statewide technology solutions. In this first step, California undertook a data collection effort to augment its understanding of the current landscape. This report serves as a summary of the key findings emerging from the effort.



3. Data Sources & Samples

This report is informed by data from a variety of sources.

- **California Provider Map** | Originally created in 2019 by Cal-ITP and updated in 2024, this dataset provides an overview of the transit providers in California.
- NTD 2022 Reports | Datasets created each year by the National Transit Database from mandated reporting. The key datasets within the NTD reports include the funding and vehicle counts.
- **Funding Sources** | Created by Cal-ITP to describe transit providers receiving federal funds from two sources: FTA 5307 grants and FTA 5311 grants.
- **Contract Database** | Cal-ITP, on behalf of Caltrans, requested transit providers submit their existing vendor contracts. This database is a reflection of the contracts received to date (March 2024) and examined systematically for key contract terms.
- **UC Davis Survey** | Survey created and administered jointly with UC Davis, focused on assessing the existing transit technology "stacks" of transit providers, the challenges experienced by transit providers, and the support that transit providers desire from Caltrans.
- Follow-up Transit Provider Interviews | Interviews conducted with UC Davis survey respondents to gain additional insights on their responses.
- Transit Provider / Vendor Webinars | A series of two webinars, hosted through CTA (in partnership with CALACT for the transit provider webinar), with one geared toward transit providers and the other geared toward vendors. Included interactive Q&A with anonymous responses.
- Senate Bill 125 (SB125) Google Survey Responses | As a part of a pilot program for reporting templates for SB125 funds, the survey collected data on procurement, fare payments, and scheduling technologies.

Detailed descriptions of these sources, their use, and their sample size can be found in the appendix to this report.

3.1 Transit Provider Base Sample

This report is based on the subset of transit providers in California ("Base Sample") that report to NTD (both mandatory and voluntarily) and meet the Provider Map definition¹ totaling 233 providers. This scoping decision was made based on the logic that transit providers who meet the definition criteria are both more likely to engage with the State of California and its programs. In addition, these providers are believed to be more likely to be impacted by state actions as opposed to privately operated and funded providers which function largely – if not completely – independently from the government.

The list of transit providers for the Base Sample comes from combining the 2019 and 2024 iterations of the California Provider Map. When combined, the 2019 and 2024 California Provider Map includes a total of 413 transit providers with varying levels of column details.

¹ Defined as: "all publicly-funded transit providers in California that provide fixed-route service that is available for the general public to ride without advance reservations."



- The 2019 version identified 401 transit providers including publicly and privately funded transit operations as well as fixed-route and on-demand services.
- The 2024 version included a smaller number of transit providers (227) as it was updated to reflect a more focused subset of these transit providers: "all publiclyfunded transit providers in California that provide fixed-route service that is available for the general public to ride without advance reservations."² For this subset, additional columns of information were included such as Caltrans District, public entity status, public operating status, and funding sources.

To create the Base Sample, the combined California Provider Map was filtered between NTD reporters and non-NTD reporters. Of the 413 transit providers, 233 report to NTD. NTD reporting was a key indicator of data availability for each transit provider listed in the California Provider Map. The NTD reports provided critical information and also allowed for "matching" of providers across sources using the NTD ID as a unifier.

The 180 which do not report to NTD exhibit one or more of the following characteristics: 1) paratransit, on-demand, or rail service, 2) non-profit or private provider, and/or 3) small public providers not receiving federal funds. Transit providers that do not report to NTD have been largely excluded from the findings in this report because there is little to no public data available about them.

Transit Providers by NTD Reporting Status



Do Not Report to NTD

3.1.1 Transit Provider Classification

To provide deeper analysis of California transit providers, this report uses two identification criteria based on size and service area. Size

There is not a universal transit provider sizing metric to categorize transit providers.³ For this analysis, the decision was made to classify transit providers as either "small", "medium", "large", or "extra-large" based on the total number of vehicles operating in revenue service ("revenue vehicles"). Revenue vehicle count was drawn from the latest edition of the National Transit Database (NTD) "Vehicles (Type Count by Agency)" data set (2022). These classifications are defined below.

- Small (0 10 total revenue vehicles)
- Medium (11 25 total revenue vehicles)
- Large (26 100 total revenue vehicles)

² Cal-ITP Mobility Marketplace - <u>https://www.camobilitymarketplace.org/provider-map</u>

³ Definitions can be numerous. For example, CARB categorizes transit agencies as either "large" or "small" in its Innovative Clean Transit (ICT) regulation, defining a "large transit agency" as an agency that operates either more than 65 or 100 buses in annual maximum service (depending on their operating region), and "small transit agency" as "any transit agency not a large transit agency". Transit literature also varies in size categorization. For example, basing it on population of area served (Ederer, et. al. 2019) and cost per vehicle revenue hour (Iseki 2008).



• Extra Large (>100 total revenue vehicles)

The following table compares the size characteristics of transit providers in the Base Sample against two key additional data sources.⁴

Transit Providers	<u>in Base Sample</u>	in UCD Survey	<u>in Contract</u> <u>Database</u>
Small	76 (35%)	6 (14%)	3 (10%)
Medium	49 (22%)	7 (17%)	5 (17%)
Large	54 (25%)	16 (38%)	10 (34%)
Extra-large	40 (18%)	11 (26%)	11(38%)
Regional Rail ⁵	-	2 (5%)	-
Total	219	42	29

<u>Service Area</u>

To capture differences that could be associated with a transit provider's service area, each transit provider is categorized as either "rural", "urban", or "suburban" (a mix of rural and urban). Receipt of FTA 5311 Formula Grants for Rural Areas and FTA 5307 Urbanized Area Formula Grants are used as proxies to determine rural and urban service areas, respectively. Transit providers receiving funds from both grants were classified as suburban. Nearly all the sample respondents have received one or both. In the few instances in which a provider has no record of receiving either formula grant, a "best guess" distinction was made using the geographic profile of the transit provider.⁶ The following table compares the service area characteristics of transit providers in the Base Sample across two key data sources.⁷

Transit Providers	<u>in Base Sample</u>	in UCD Survey	<u>in Contract</u> Database
Rural	52 (22%)	12 (29%)	10 (34%)
Urban	54 (23%)	13 (31%)	10 (34%)
Suburban	30 (13%)	12 (29%)	9 (31%)
Regional Rail ⁸	-	2 (5%)	-
Unknown ⁹	97 (42%)	3 (7%)	-
Total	233	42	29

⁴ Percentages in the table may not add up to 100% due to rounding.

⁵ The classification is only used for the UCD Survey and applies to Capital Corridor Joint Powers Authority (CCJPA) and Sonoma-Marin Area Rail Transit District (SMART).

⁶ In the UCD Survey and Contract Database, we classified the following transit providers as urban: Anaheim Transportation Network, Golden Empire Transit District, California Vanpool Authority, rural: Nevada County Transit Services, and suburban: Tahoe Transportation District, Palos Verdes Peninsula Transit Authority.

⁷ Percentages in the table may not add up to 100% due to rounding.

⁸ The classification is only used for the UCD Survey and applies to Capital Corridor Joint Powers Authority (CCJPA) and Sonoma-Marin Area Rail Transit District (SMART).

⁹ Multiple entries in the transit provider base sample did not receive either FTA 5311 or 5307 grant funding, and therefore could not be accurately classified.





4. Data Limitations

While this report leverages diverse and robust data sources, key gaps and limitations exist and are identified below.

Procurement Capability | No comprehensive data source exists to systematically analyze transit providers' procurement capabilities. To fill this gap, innovative methods including web scraping were tested, but were unable to generate results of a sufficient quality for use in this report. Extensive qualitative data – including engagement with all transit providers in the state – would be necessary to truly understand the full extent of their procurement capabilities. In the absence of a comprehensive data source, this report examines procurement capabilities through the UCD survey responses.

Sample Representativeness (Survey Response Rate & Contract Database) | The UCD survey garnered responses from 42 transit providers, roughly 18% of the 233 transit providers in the larger sample. These responses, while very informative, may not capture the full nuance of the transit technology landscape. Similarly, the Contract Database represents 29 transit providers who responded to Caltrans' request for contract information, and collectively skew towards larger agencies. Thus, they are neither a fully representative sample of transit providers nor their technology stacks. Moreover, despite reviewing 103 contract documents, several technology categories were very underrepresented (e.g. only one contract for connectivity technologies, two for integration technologies, and two for onboard rider communication technologies).

State and Local Funds | There is no comprehensive data source that provides the allocation of state funds to individual transit providers. Obtaining a full picture of the funding sources for each provider would be difficult and time-consuming. The lump sum amount of state and local funding can be found in National Transit Database (NTD) reports, for those transit providers who report, but lacks a level of detail on the specific funding sources themselves. This funding data can also be found by reviewing individual transit providers' budgets, which may not be easily accessible or published with that level of detail.

Private Transit Providers | Private transit operators lack the typical reporting requirements and linkage with key channels that provide data on other transit providers, leading to a lack of data transparency for this sub-sector. However, the importance of this limitation is decreased by the fact that California's policies, programs, and other tools are less relevant for private operators.

Paratransit and On-Demand Providers | Paratransit and on-demand providers are not fully represented in any of the data sets used. It is important to recognize that these providers both experience different challenges than fixed-route providers and leverage different technology stacks; and this means that fully understanding the dynamics in this sub-sector requires further research with a different set of resources, tools, and underlying policies.



5. Findings

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Providing direct technical assistance to transit providers is an effective way for California to achieve policy objectives, particularly given the number of upcoming, planned transit technology investments. | State endorsements (by Caltrans, Cal-ITP, CARB, etc.) of certain transit technologies and/or standards – combined with state technical assistance for the given technology / standard – have led to dramatic increases in the uptake of specific technologies. Key recent examples of this phenomenon include the adoption of the GTFS and EMV standards. These endorsements, when implemented strategically, can simultaneously support transit agencies and achieve state-level policy objectives. California should prioritize its resources and efforts on technologies that most effectively reinforce larger state strategies and targets (e.g., VMT reductions) and drive customer-focused outcomes. Now is the ideal time to being this work at a state level given the number of transit providers who are in the market currently – or anticipate heading to the market in the next 1-3 years – for transit technology.

Transit providers want (and need) technical support. For many transit providers, technical support means hand holding. | Transit technologies are evolving rapidly, and most transit providers do not have dedicated staff with the technology expertise needed to keep up with the rate of change. This is especially true for smaller and more rural transit providers who face additional challenges such as no dedicated transit staff, connectivity dead zones, and long distances from key resources (vendor staff, maintenance facilities, etc.). A lack of resources makes it more challenging to write and

"For a small transit agency, it is already hard to deliver service with all the mandates and requirements. We do not have the staff, funding and talent to stay on top of technology."

"Template good to get started, but then couple hours with a Cal-ITP [or state agency] rep to go through it to refine it would be even better." manage a procurement/contract, particularly for more technical systems requiring significant subject matter expertise. For smaller agencies, the time and complexity associated with specifying requirements for an RFP result in a tendency to reuse language from other agencies. Various rural and small providers mentioned copying scope of work language verbatim from other RFPs and making minor adjustments to fit their specific needs. Transit providers tend to support each other during these procurements and provide input when requested by their peers. While boilerplate and template contracts are helpful, transit providers also need technical support to understand the technology's nuances, how best to implement and use it, and how to manage it.





This technical support does not stop with acquisition but should continue ad hoc throughout the life of the contract to provide support with vendor management. | Transit providers consistently cited frustrations with managing their vendors and holding them to their contractual obligations. While the vendor engagement may have been high when selling their product(s), the actual implementation period saw many complaints about vendors' inability to "follow through or provide ongoing support." Smaller and more rural providers felt this particularly acutely, with one provider anecdotally reporting experiencing weeks of delay between submitting changes to their GTFS data and seeing the relevant updates in their public

facing feed. Given the rural area served by this provider, the delays and lack of accurate data directly impacted whether customers chose to take their transit system or not. At the same time, vendors cite transit providers' lack of technical expertise, mismatched expectations, and limited staff resources to manage procurements and projects as key barriers to developing a positive working relationship.

In-house procurements remain the most common acquisition method for transit providers, even for small agencies. | This preference for in-house procurement is driven both by a lack of knowledge of alternatives and perceived convenience. Specifically, transit provider staff are not always aware of other potential procurement and purchase mechanisms -- such as Master Service Agreements (MSAs) and other forms of Leveraged Procurement Agreements (LPAs) -and may lack the authority to use them without board approvals. Identifying and using other types of procurements for preexisting technologies can be convoluted and involve

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"[It would] just be nice to have a little bit more help. Not necessarily doing it for us but making it easier to do."

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a learning curve, diverting already scarce staff resources. In addition to knowledgebased barriers, capacity is a known challenge for many transit providers. Interestingly, 50% of smaller transit providers say they have little or no available procurement resources, yet they are the most likely to use in-house procurement, explaining this seeming contradiction as a product of only needing a small number of procurements. Logistics can also factor into the procurement mechanism selected. If the timing of contract expirations is not well-aligned with other providers' needs and/or if technology is bundled into a bus purchase, joint purchasing mechanisms may be less attractive. In the context of these preferences and challenges, there may be an opportunity for a



state-led procurement function to enhance – not replace – transit providers' procurement capabilities.

In terms of procurement, I'm looking for the path of least resistance. I want whatever is easiest. The less work to get it up and running, the better.

It would be great to "have a point of contact where a transit agency can go and say, 'I want to implement X technology, is there something that's already out there to do this?'"

Procurements are often done in reaction to contract expirations or technology

depreciation. | The decision to procure for technology is often not a defined process or policy decision, but rather a reactive measure or a last resort. Because of the effort associated with a procurement, transit providers tend to prioritize using the "path of least resistance" which on one hand can mean extending existing contracts to avoid re-procurement or using the easiest / most familiar procurement vehicle available to them. Transit providers spoke of continuing relationships with vendors with whom they were only "somewhat" satisfied because it was too difficult – or costly – to switch. This is particularly noticeable in proprietary systems where system components are not interchangeable often due to vendor lock-in. When a system component fails or reaches end of life, the transit provider is left with a decision to replace that component with the "latest" vendor product as a band-aid for continued functionality or replace the entire system with a new vendor. Often, constraints on staff time and limited funding forces transit providers to opt for the short-term solution of component replacement rather than a potentially superior and more sustainable option either from a different vendor or through an entire system replacement.

Safety and security technology tends to be the "least common dominator" for the current technologies used by transit providers, regardless of provider size or geographic service area. | Nearly all providers surveyed reported using some type of technology which falls into the safety and security category. Smaller and more rural providers tended to use on-board cameras, whereas the larger and more urban transit providers also employed traffic signal priority technology. The emphasis on safety technology also reflects that transit providers see riders' perception of safety – or the lack thereof – when using their services as a barrier to choosing transit, a view confirmed in discussion responses in the transit provider webinar.

There is a correlation between the size of a transit provider and the layers of their transit technology stack. | Larger transit providers often have more resources than their smaller peers and are more likely to self-identify as having "some" or "significant" procurement resources, which may make these agencies more likely to invest in additional and standalone technologies. Qualitative feedback from the transit provider webinar also indicated that small providers struggle to access the staff, funding, and talent required to "stay on top of" technology. Providers see technology as a "non-traditional" focus area for transit when compared to their core focus of delivering reliable service. To that end, smaller providers tend to invest in more "basic" transit technology stack layers, often settling for cash collection given their relatively small ridership and decision not to prioritize operator data collection which may have



supported the efficiency of service but did not directly contribute to rider experience until contactless was available. Investments in fare collection technologies and operator data technology tended to increase with the size of the provider.



Providers are looking ahead to innovative technologies to improve their service but recognize they must establish a strong technology base to do so effectively. | When asked about which technologies they were curious to learn more about, providers jumped to artificial intelligence (AI) and autonomous vehicles. They also expressed interest in seeing buses match the level of technology now commonplace in personal vehicles (ex., lane departure warnings, blind spot alerts). Providers recognized that some of the more advanced technologies required a strong technology base from which to build on, emphasizing that while curious about forward-looking technologies, the next few years and near-term technology investments will be focused on more "low-hanging fruit" such as digitizing record-keeping systems, APCs, updated fare collection systems, scheduling and CAD/AVL systems, and real time operations monitoring. Many stakeholders also expressed concern about and interest in cybersecurity, due to the proliferation of internet and cloud-based technology services. Still others are focused on the upcoming zero-emission transition, focusing on supporting technology like battery electric bus (BEB) charge management software. Both providers and vendors agree that interoperability is critical to success. | As new transit technology is added to the bus environment, it increasingly needs to interact with other systems. Interoperability between newer technologies, and seamless integrations with legacy systems, is increasingly recognized as a hallmark of successful implementation. Not only does interoperability help new technology work more





mechanisms. The most notable solutions from both vendors and transit providers were the use of data standards and open APIs. Vendors see standardization and open APIs as reducing the cost of having to create a custom solution for each transit provider and each layer of the technology stack. At the same time, transit providers see standards and APIs as allowing for easier integration with legacy systems and a less complex procurement process. Note, however, that while both transit providers and vendors agreed on the importance of integration through standardization and open APIs, transit providers cited frequent problems with integrations being more difficult than they anticipated which caused delays in implementation. As there is only one data standard in transit today, GTFS, and it is relatively new, interoperability of technologies producing and/or using it is still emerging – often requiring custom integrations. Most other transit technology is either custom or proprietary to the vendor and APIs are not always able to achieve a straightforward integration, stressing the capacity of agencies to manage custom integrations.

California can help bridge the gap between transit providers' operational priorities and passengers' interest in outcomes. | Transit providers identified "improving customer experience (CX)" as the most important factor driving new technology adoption, and thus that this goal should be their "north star." The industry literature cites frequency and reliability as main drivers to ridership increases¹⁰ and transit providers report the same, yet providers' technology purchased is a compromise based on available funding and existing vendor products, causing transit providers to purchase products that may not best support the CX experience. Moreover, there is a trade off in resource allocation: funds used to purchase technology to improve operations or back office effectiveness cannot necessarily also be used to improve CX and spur ridership growth. Understanding this tension, California could assist in mapping how different technology solutions (potentially working in tandem) can support desired CX outcomes while simultaneously improving operations.



6. Next Steps

The findings of this report indicate that there is a critical role for California to play in the transit technology ecosystem, particularly when it comes to supporting transit providers and in supporting standards. This role may take several forms but should at a minimum focus on providing key technical support prior to, during, and after technology procurement(s).

The next stage of work will focus on how California can implement this support role and tailor it to different transit technologies that may be at differing levels of development and market maturity.



7. Appendix



7.1 Data Sources

This report combined multiple sources. Each source is described in the table below.

Source Name	What it is	How we are using it	Sample Size
Cal-ITP Provider Map	Database created in 2019 and updated in 2024. Designed for vendors to see the market potential in CA.	Identify a baseline number of California transit providers.	413 (of which 233 has NTD ID)
NTD 2022 Database	National Transit Database – repository of data about financial, operating, and asset conditions of American Transit Systems.	Retrieve funding and vehicle fleet information in order to categorize transit providers.	 218 providers from the Funding Sources, and 219 providers from the Vehicles (Type Count by Agency) report.
Funding Sources	List of providers historically receiving 5311, 5307, or both 5311 & 5307 funds.	The lists provide insights into who has historically received federal funds, allowing us to start building out transit provider funding sources.	189 providers.
Contract Database	A data set of contracts collected by its owner (Compiler) focusing on onboard technology.	Provides an overview of contract and contract terms related to transit technology and vendor for contracts collected to date from transit providers.	Limited: reflects a larger proportion of medium, large, and extra-large transit providers (total 29 transit providers).
UCD Survey	Survey administered by UC Davis targeting California transit providers.	Attempts to fill essential knowledge gap and serve as an extra layer of redundancy for other data sources.	Limited: currently reflects larger proportion of larger transit providers (total 42 transit providers)
Follow-up interviews to UCD Survey	Follow-up interviews with providers that expressed willingness in having follow-on conversations in the UCD survey.	Using the UCD survey results to determine areas that warrant further investigation and interviewing providers to provide a deeper understanding.	Limited: currently reflects larger portion of rural transit providers (total 6 transit providers)
CTA & CalACT Transit Provider Webinar	Webinar hosted by CTA and CALACT targeting transit providers.	Prime transit providers for the UCD survey, gain preliminary data to shape the survey, and distribute it following the event to boost response rate.	Limited: anonymous responses ranging from 15-30 webinar participants.
CTA Vendor Webinar	Webinar hosted by CTA targeting transit vendors	Gain insights vendors to cross-reference with transit provider findings	Limited: anonymous responses from 3-4 webinar participants
SB125 Survey	Complementary to the accountability aspect	Tailored survey covering majority of questions on	Limited: reflects a larger proportion of larger



	of the <u>SB 125 Transit</u>	this project. Helps	providers located in
<u>P</u>	rogram, completion of	address concern of	Northern California (30
	the survey is a	transit provider response.	transit providers)
	prerequisite to access		
	program funding.		

Due to the nature of each source, the sample size varies. This variation is summarized in the data map below.





Contract database









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7.2 Methodology

The following section describes the methodology used to obtain the data for each source, as well as any modifications and/or data cleansing and enriching applied to the source.

7.2.1 2019 and 2024 Cal-ITP Provider Map

The Cal-ITP Provider Map is a product from Cal-ITP. In its 2019 iteration, the Provider Map represented as wholistic as then possible snapshot of the transit provider landscape, including fixed and on-demand services and both public and private providers. This dataset was uploaded to the Cal-ITP website in 2019 and downloaded by the research team on August 9, 2023. The first update to the 2019 Provider Map occurred in early 2024 and was downloaded by the research team on March 17th, 2024. The 2024 Provider Map published a smaller sample of transit providers, limiting those included to be "all publicly-funded transit providers in California that provide fixed-route service that is available for the general public to ride without advance reservations."¹¹

The research team used the 2019 Cal-ITP Provider Map as the base dataset. The dataset went through data cleansing and enrichment. The log is found below:

- Deletion of duplicates (Paratransit, Inc.)
- Deletion of NTD ID duplicates while keeping both entries and only one with the NTD ID (90147, 90087, 90194)
- Adding "Non-Government Entities" and "Discontinued" label based on manual assessment conducted by Cal-ITP for separate workstream.
- Hawaiian Gardens Public Transportation: added NTD ID (A0003-99450)
- Calaveras Transit: replaced NTD ID from 9R02-91063 to 9R02-99442
- Mission City Transit: added NTD ID (A0003-99451)
- El Segundo Lunchtime Shuttle: added NTD ID (A0003-99449)
- Sierra Madre Gateway Coach: added NTD ID (A0003-99447)
- Playa Vista Shuttle: added NTD ID (A0003-99446)
- La Habra Heights Dial-a-Ride: added NTD ID (A0003-99445)
- South El Monte Senior Transportation: added NTD ID (A0003-99443)
- Desert Roadrunner: added NTD ID (9R02-99454)
- Metropolitan Transportation Commission: added NTD ID (90094)
- San Diego Association of Governments: added NTD ID (90095)
- Santa Barbara County Association of Governments: added NTD ID (90303)
- When NTD 2022 reports were published, "9R02-" was replaced by ""; and "A0003-" was replaced by "" in the dataset to match with 2022 NTD IDs.
- Stanislaus Regional Transit: NTD ID was corrected from 90236 to 90306
- Dinuba Area Regional Transit: deleted from the dataset based on research
- Duarte Transit: deleted from the dataset based on research
- e-Tran: deleted from the dataset based on research
- Folsom Stage Line: deleted from the dataset based on research
- Modesto Area Express: deleted from the dataset based on research
- Susanville Indian Rancheria: deleted from the dataset based on research
- Tulare InterModal Express: deleted from the dataset based on research
- Woodlake Dial-A-Ride: deleted from the dataset based on research

¹¹ Cal-ITP Mobility Marketplace - <u>https://www.camobilitymarketplace.org/provider-map</u>



- Tahoe Transportation: NTD ID 91092 added based on UCD response
- Added the following 12 providers when the new (2024) version of the Cal-ITP Provider Map was published:
 - SACRAMENTO AREA COUNCIL OF GOVERNMENTS FINANCING CORPORATION
 - City of Huntington Park
 - California Department of Transportation
 - Tulare County Regional Transit Agency
 - o San Joaquin Council
 - o Elk Valley Rancheria
 - City of Palmdale
 - o Quechan Indian Tribe
 - City of Lincoln
 - o Riverfront Joint Powers Authority
 - o Bob Hope Airport
 - San Francisco Bay Area Water Emergency Transportation Authority
 - Excluded the following 7 providers, where a second NTD ID was present in the Cal-ITP 2024 Provider Map:
 - Humboldt Transit Authority (A0009)
 - Kern Regional Transit (A0008)
 - Los Angeles County Metropolitan Transportation Authority (A0003)
 - Metropolitan Transportation Commission (A0013)
 - Redding Area Bus Authority (A0016)
 - San Luis Obispo Regional Transit Authority (A0022)
 - Ventura Intercity Service Transit Authority (A0005)
- Added the following columns (based on same NTD ID/name) to 215 providers based on the new (2024) version of the Cal-ITP Provider Map: caltrans_district_id; caltrans_district_name; is_public_entity; is_publicly_operating; funding_sources; on_demand_vehicles_at_max_service; vehicles_at_max_service; gtfs_schedule_uris
- California Vanpool Authority: NTD ID 90230 added based on UCD response
- Bishop Paite Tribe: added NTD ID 99268
- Chemehuevi Indian Tribe: added NTD ID 99316
- Karuk Tribe: added NTD ID 90025
- Riverside County Transportation Commission: added NTD ID 90218
- San Bernardino County Transportation Authority: added NTD ID 90302
- San Luis Obispo Council of Governments: added NTD ID 90297
- Tule River Tribe: added NTD ID 99370 and removed "Indian" from the provider name
- Deleted "Huntington Park Express" (no NTD ID) and kept "City of Huntington Park" (NTD ID 90267)
- Deleted "Agoura Hills Dial-A-Ride" and kept "City of Agora Hills" (NTD ID 90246), also, corrected the name from "Agora" to "Agoura"

7.2.2 NTD 2022 Reports

The National Transit Database (NTD) generates annual reports on individual transit provider funding, ridership, and vehicle data. Transit providers which receive federal funds are required to report this annual data to NTD.



The 2022 NTD data set was downloaded on January 26th, 2024. The following data cleansing was done by the research team:

- Loaded Vehicle Age Distribution without any cleansing or transformation (link)
- Loaded Vehicle Type Count by Agency without any cleansing or transformation (link)
- Loaded Funds Expended by Type (Operating and Capital) without any cleansing or transformation (link)

7.2.3 Funding Sources

This dataset was created by Cal-ITP and – for the transit providers included – groups providers by which type of federal grants historically received. The dataset focuses specifically on FTA 5311 and 5307 funds. The categorization in this dataset provide insights into both the funding sources of transit providers but also the type of service area in which they operate. Transit providers are categorized in four tiers:

- Tier 1: 5311 only;
- Tier 2: both 5311 and 5307;
- Tier 3: 5307 only;
- Tier X: no federal funds.

The research team downloaded the dataset on Oct. 25, 2023. The dataset went through data cleansing due to duplications. NTD IDs were added to agencies where applicable. The following duplications were deleted from tier 3 (and kept in tier 2 only):

- Antelope Valley Transit Authority
- Butte County Association of Governments
- Central Contra Costa Transit Authority
- City of Santa Maria
- City of Visalia
- Eastern Contra Costa Transit Authority
- El Dorado County Transit Authority
- Imperial County Transportation Commission
- Kings County Area Public Transit Agency
- Livermore / Amador Valley Transit Authority
- Marin County Transit District
- Monterey-Salinas Transit
- Napa Valley Transportation Authority
- North County Transit District
- Placer County
- Redding Area Bus Authority
- Riverside Transit Agency
- San Diego Metropolitan Transit System
- San Joaquin Regional Transit District
- San Luis Obispo Regional Transit Authority
- San Mateo County Transit District
- Santa Clara Valley Transportation Authority
- Santa Cruz Metropolitan Transit District
- Sonoma County
- SunLine Transit Agency
- Transit Joint Powers Authority for Merced County



- Ventura County Transportation Commission
- Victor Valley Transit Authority
- Yolo County Transportation District
- Yuba-Sutter Transit Authority

7.2.4 Contract Database

The Cal-ITP Contract Database is a data set of contractual documents for onboard technology. The transit providers included are those who responded to Cal-ITP's requests for contract information, and collectively are neither a fully representative sample of California transit providers nor their technology stacks.

300 documents were received, although 10 were too redacted to be evaluated. 290 contractual documents were reviewed, which include 103 contracts, 119 contract amendments, 55 purchase orders, and 14 "other" documents.¹² This data source was used to support findings related to contract support needs and contractual features used by transit providers and to identify any patterns or trends in contractual document usage.

Given the goal of the analysis, the research team focused on the contracts, as opposed to the other document types. In total, 29 transit providers submitted data in response to the Cal-ITP request. 5 transit providers who submitted documents did not include any contracts and were removed, bringing the sample to 24. The contracts were associated with the following agencies, by size and service area¹³:

Size	Providers
Small	2 (8%)
Medium	3 (13%)
Large	8 (33%)
Extra-Large	11(46%)
<u>Total</u>	24

Each contractual document was categorized into one of the following labels:

- Connectivity technologies | SIM cards, routers, passenger Wi-Fi, radio, etc.
- Fare collection technologies | EMV pads, fareboxes, TVMs, tap on phone, QR code/mobile app payment, etc.
- Integration technologies | APIs, integration with other transit services, etc.
- Location technologies | scheduling, GTFS-RT, GTFS static, dispatch, CAD/AVL, etc.
- Onboard rider communication | head, side, and onboard signs, annunciator, etc.
- **Operator data technologies** | APCs, performance dashboard, charging management, fleet management, etc.
- **Regular buses** | traditional fossil-fuel powered buses¹⁴
- Zero-emission buses | battery-electric buses and fuel cell-electric buses
- Safety technologies | camera, traffic priority, etc.

¹² "Other" documents include invoices, RFP documents, etc.

¹³ Percentages in the table may not add up to 100% due to rounding.

¹⁴ Buses were included in this analysis, as it is very common for transit providers to procure buses "bundled" with a suite of transit technology add-ons.



- Transit operations¹⁵
- Multiple | if a contractual document includes multiple technology categories

A small number of remaining contracts lacked enough information to be able to categorize it, and they were left unlabeled ("blank"). A breakdown of the contracts reviewed are as follows:

	Technology Category	Contracts
1	Connectivity	1
2	Fare Collection	14
3	Integration	2
4	Location	16
5	Onboard Rider Communications	2
6	Operator Data	10
7	Regular Bus	18
8	Transit operations	13
9	Zero-Emissions Buses	13
10	Multiple	9
11	Blank	5
	Total	103

The contract review process focused on analyzing the occurrence of 12 major contract terms and features. These features are most found in the base contract and are unlikely to be altered in an amendment process. By review for these 12 facets in each contract, it was possible to analyze the frequency to determine a minimum common denominator of contract terms for transit technology.

- 1. Bundled (i.e. was the product or service in question packed with other products and/or services?)
- 2. Pricing model
- 3. Use of LPAs
- 4. Autorenewal options
- 5. Extension options
- 6. Automatic annual price increases
- 7. Extended warranty options
- 8. Type of termination clauses
- 9. Inclusion of FTA terms
- 10. Inclusion of DBE requirements
- 11. Penalty mechanisms for under performance
- 12. Performance requirements

7.2.5 UCD Survey

The University of California, Davis (UC Davis) supported the research time by developing, distributing, and analyzing a survey focused on how transit providers adopt, obtain, and update their onboard technologies. The following sections includes

¹⁵ Transit operations are included in this analysis because they are tangentially related to the use of transit technologies.



overviews of the survey itself, the distribution of the survey, and the analysis of the survey.

Survey Overview

The survey had six sections. The full survey text can be found at the end of this document. Each section is described below as well as the survey logic for skipping questions and/or carrying forward into other sections, if applicable.

- Section 1: Introduction and background of the transit provider; the NTD ID, the provider name and state, and the participants level of knowledge of the topics covered in the survey.
- Section 2: A single general question about the technologies in use by the provider.
- Section 3: This section is shown to respondents indicated being knowledgeable on "my agency's procurement process" and/or "my agency's purchasing process" in Section 1 and covers the resources for, features of, and challenges with contracts.
- Section 4: This section is shown to respondents who indicated being knowledgeable on "how my agency selects new technologies" and/or "how my agency currently uses technology" in Section 1; it covers how transit providers evaluate new technologies prior to adoption, the technology types currently in use, and which technologies are being prioritized for near term acquisition and/or update. It also covers the importance of different factors when considering updating technologies as well as satisfaction and barriers to use of technologies not in use.
- Section 5: This section is shown to respondents who indicated being knowledgeable on "rider feedback" and "rider preferences and satisfaction" in Section 1. This section covers the importance of passenger needs in improving their technologies and barriers for non-passengers.
- Section 6: This section covers the resources provided by Cal-ITP and asks the participants whether they have used the resources and how interested they are in the programs offered through Cal-ITP.
- Section 7: This is a thank you section of the survey and provided an open-ended opportunity for additional feedback, as well as an option to opt in to participating in follow up activities.

Distribution Process

The distribution strategy incorporated several approaches to garner responses from transit agencies. This included distribution through numerous issuances of the CAL-ITP newsletter, direct outreach, use of an existing transit provider contact list developed for a previous survey distribution, as well as developing an additional sample of transit agencies through NTD records and provider website research.

Analysis Overview

Data Download and Pre-processing



The most recent data was downloaded from Qualtrics on April 2, 2024 and contained 59 rows of data. This data was exported as an excel file and modified before importing into the statistical software R (R Core Team 2021).¹⁶

The downloaded data contains three header rows, describing the survey question, the internal Qualtrics reference, and the question name. These are removed from the data and replaced with a single header row that contains shortened variable names for ease of use in analysis. The original fields, and the new names, as well as the values each variable can take on are found in the Transit Technologies Codebook Microsoft Excel file. In addition, one variable was mis-named by Qualtrics in the download process; this is for the provider's name. It is exported as "text" but should say "agency name." This is noted in the codebook.

No other changes were made to the data before importing into R.

Remove Test Cases

Once imported into R, the data were reviewed and cleaned.

Among the 59 cases are several survey tests conducted by the research team. These all occurred prior to February 13, 2024 at 8am, when the survey invitation was sent out through the Caltrans Mobility newsletter. These test cases are removed by using the "year day" to convert days into the numeric day of the year, and retaining only cases that have a year day of 44 or greater.

This resulted in the removal of six cases and reduced the sample to 53.

Merge with Respondent Information

Next, the data are merged with respondent information, including NTD ID, provider size, and provider service area.

Prior to merging, the Qualtrics data was cleaned. Using the respondent information as a reference, the NTD IDs and provider names were updated wherever possible so that the two files were consistent, and to allow the data to be merged correctly (using NTD ID as a key for merging). This information was drawn from the NTD's Transit Agency Profiles search tool¹⁷. The following respondents' NTD IDs were manually corrected:

- Fresno Area Express (90027)
- Glenn Transit Service (91088)
- Monterey-Salinas Transit (90062)
- San Mateo County Transit District (90009)
- The Eastern Contra Costa Transit Authority (90162)
- Omnitrans (90029)
- Humboldt Transit Authority (91036)

¹⁶ R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/. ¹⁷ See <u>https://www.transit.dot.gov/ntd/transit-agency-profiles</u>



- County of Madera (91005)
- City of Simi Valley (90050)
- City of Corona Transit Service (90052)
- City of Chowchilla (91071)
- Modoc Transportation Agency (91008)

One respondent, Capitol Corridor Joint Powers Authority (CCJPA), is ineligible for an NTD ID, but was included in the dataset as its own unique size and service area category of "Regional Rail". Additionally, one respondent, "Clovis Transit", was removed from the respondent pool as no NTD ID was provided and no NTD information could be located using NTD's resources.

Remove Duplicate Areas

Some agencies had multiple participants, and/or a single participant take the survey (all or in part) more than one time. These are identified by counting the occurrence of each provider in the data. The set of responses for any provider with more than one entry was reviewed. The agencies and the response details, as well as the resolution of the duplicate cases are provided below. All cases are retained in the raw data.

- Capitol Corridor Joint Powers Authority (CCJPA)
 - Both the director and the head of planning participated. The case of the director was retained.
- Fresno Area Express
 - There are two cases; it is not clear if they were completed by the same person, though both indicated "director" as their role. Information contained in the earlier response that is missing from the later response is imported into the later response. The later (most recent) response was retained.
- City of Corona Transit Service
 - There are two cases; it is not clear if they were completed by the same person, though both indicated "director" as their role. Information contained in the earlier response that is missing from the later response is imported into the later response. The later (most recent) response was retained.
- Livermore Amador Valley Transit Authority
 - There are two cases, completed by two different people. Information contained in the earlier response that is missing from the later response is imported into the later response. The later (most recent) response was retained.
- San Luis Obispo Regional Transit Authority
 - Two people took the survey one of these took it twice so there are three cases. The single response from the second person was removed. The



other two were the same person and were combined. Information contained in the earlier response that is missing from the later response is imported into the later response. The later (most recent) response is retained.

Combining cases resulting from more than one participant from individual agencies resulted in the removal of an additional 6 cases in the data; bringing the sample to 46 cases.

Data Summaries

The 46 cases are retained in the data and are used in all subsequent analyses. However, there are cases that are missing on many fields, or on a few; or were appropriate skips for some questions. These are noted briefly here and are also described in the "survey" section.

Largely, there are about 4 cases that are removed from most analysis as they did not match to a size or a service area type. This results in 42 cases in most analyses, though there are a few additional cases missing on each item. Sample sizes are noted throughout the analysis.

Other reasons that there are smaller sample sizes are because some sections were appropriately skipped – in general "appropriate skips" means that those participants that did not report they are knowledgeable about a particular section of information did not see the survey questions related to that topic (i.e., only those participants that said they are knowledgeable about contracts and procurement were not asked questions about that topic).

7.2.6 Follow-Up Transit Provider Interviews

The team conducted 6 follow-on interviews with providers that indicated they would be willing to participate in additional conversations related to the survey. The purpose of these interviews was to create a deeper understanding of providers' experiences and to gauge the level of support that would be most helpful to them, and to understand the barriers that might prevent them from implementing a desired technology. Each follow-on interview lasted ~30 minutes. The team used that time to investigate any survey responses showing dissatisfaction with their current technologies or vendors and the procurement practices used to procure.

The questions fell into three major categories:

- 1. Procurement: preferred methods of procurement, knowledge of procurement options, and the methods that are utilized in forming a scope of work.
- 2. Tech Stack: Current and future technology needs
- 3. Support: The level of state agency technical assistance and technology provision

Questions for each provider were prioritized depending on their survey responses. For example, providers that displayed interest in some of the tools offered by Cal-ITP but haven't used them yet were asked why they had not yet engaged with them and how they would prefer to receive communication on these topics.

Follow-on interviews were conducted with the following providers:



- 1. Stanislaus Regional Transit Authority (04/02/2024) Notes
- 2. Yuba-Sutter Transit (04/03/2024)- Notes
- 3. Humboldt Regional Transit Authority (04/05/2024) Notes
- 4. Trinity Transit Authority (04/05/2024) Notes
- 5. Lake Transit Authority (04/09/2024) <u>Notes</u>
- 6. Glenn Ride (04/10/2024) <u>Notes</u>

Below is the base list of questions the team used to prepare for each interview. Note that this list served as a foundation, but the interviews were tailored to each provider based on their survey response. Due to the limited time assigned to each interview, questions were prioritized based on pain points and adapted to the provider's response during the interview.

1. Challenges

- a. Can you speak in greater depth about the challenges you indicated facing in the survey?
- b. Could you provide specific examples of these challenges?
- c. Are there specific transit tech types that epitomize these challenges, or is it a more general problem?
- d. To what extent is your agency trying to address these challenges?
- e. What would you like to see in terms of a state agency role or support in order to ease these challenges?

2. Cal-ITP support

- a. What are the most important types of support that you would like/want to receive (2-3)?
- b. Are there other forms of support or assistance that you would like to see which is not currently being offered?
- c. Are there forms of support or assistance which are being offered which you do not find useful? What would need to change about them for it to better benefit your agency?
- d. How would you like to receive information about Cal-ITP offerings and support?

3. Procurement

- a. How does your level of resourcing inform the procurement method you use?
- b. How do you normally specify or scope an inhouse procurement?
- c. Do you feel that your agency is well equipped to conduct procurements?
- d. Is it difficult to understand, find, and/or use MSAs and LPAs?
- e. Do you feel your needs are reflected in a standardized agreement? If not, why?

4. Prioritization of Technology

- a. How do you decide which technologies to update or obtain?
 - i. Achieving cost savings or operational efficiencies



- ii. Needed replacement (e.g., current solution is not working or is obsolete)
- iii. Requirements or mandates
- iv. Strategy to increase ridership, increase customer satisfaction, increase equity, etc.
- v. Availability of funding for certain types of investments but not others
- vi. Extent to which technologies are "proven" or that their peers have adopted or recommended
- vii. Recommendations from vendors or industry groups
- viii. Ease of procurement, transition, and implementation
- b. What are the technologies you anticipate procuring / purchasing in the next 1-3 years? Why?

5. Bundling

- a. Do you bundle transit technology purchases into bus procurements? If yes, how often?
- b. Is this your preferred way to purchase transit technology? Why or why not
- c. Are there any challenges with purchasing in bundles?
- d. Are there any benefits with purchasing in bundles?
- e. How does a bundled technology purchase impact, if at all, your ability to update & maintain the product/service

7.2.7 Transit Provider / Vendor Webinar

Two interactive webinars were leveraged to share out information about CIM's efforts and the (then-upcoming) UCD survey as well as collect more qualitative and openended feedback from both providers and vendors to complement the other quantitative data sets in this study. Separate webinars were offered for the distinct stakeholder groups of transit providers and vendors to allow for improved candor and to develop deeper conversations specific to the experience and needs of each group. Both webinars were hosted by CTA, in partnership with CALACT for the transit provider webinar.

The webinars employed the Mentimeter interactive presentation platform to allow facilitators to pose questions and participants to share their responses anonymously on the screen in real-time. Many questions and discussion points allowed responses that were free-form and facilitated discussion to elaborate, clarify, and share key examples and details. Facilitators would then comment on trends in the responses and invite participants to comment further or offer examples. Participants could also offer written comments in the meeting chat or request to be unmuted to offer verbal comments. Anonymous data was recorded, examined, and compared with other data sources and potential follow-up questions or areas of surprise or contradiction were identified.

Provider webinar

The goal of the provider webinar was to gain a deeper understanding of transit providers' experience with adopting new technology, the features or technologies that



they want in the future, and how CIM can help providers transition to using these tools successfully. The webinar provided an introduction to CIM and its ethos that the transit industry needs solutions that are modular, scalable, competitive. Facilitators also explained the importance of participating the upcoming UCD survey. The webinar had over 100 registered participants and garnered participation from between 15 and 30 unique participants at any one time. Interactive discussions and Q&A were focused on garnering provider views on the following topics:

- Barriers to ridership and the relative importance of each
- Services or features desired by riders and by operators
- Current use of transit technologies and satisfaction with these technologies
- Interest in future deployment of transit technologies and prioritization of these future deployments
- Barriers to implementing transit technologies
- Challenges working with vendors and the private sector
- Identification of transit technologies that providers were curious to learn more about
- How California could better support providers in implementing transit technologies

Vendor webinar

The goal of the vendor webinar was to better understand the gaps between provider needs and vendor solutions, particularly related to vendors' experience in providing technology to transit providers, features or technologies they may be able to provide in the future, and how CIM can help vendors and providers successfully deploy technologies. To help identify these gaps and generate conversation about the vendor audience, the team shared the results from the transit provider webinar with the vendors. In addition, participants were asked about their views on specific topics related to their experience as part of the deployment ecosystem. The webinar had 20 registered participants prior to commencement, and garnered active participation from three to four participants at any given time. The webinar inquired about views from vendors on the following topics:

- Types of transit technologies offered
- Most-requested products or services by transit riders and transit providers
- How transit providers prioritize different types of transit technologies
- Main barriers faced by transit providers in deploying transit technologies
- Barriers faced in engaging on transit technology innovation
- Challenges working with transit providers and state agencies on transit technology
- Experiences with state master service agreements and state-led MVP pilots
- Technologies that vendors believe California should focus on
- Other market players that vendors think state agencies should engage with
- The role that vendors want state agencies to play in the transit technology sector



7.2.8 Senate Bill 125 Google Form Response

Senate Bill 125 allocated ~\$5B in funds to transit providers for the Transit and Intercity Rail Capital Program (TIRCP) and Zero Emission Transit Capital Program (ZETCP). To receive funds, transit providers submitted applicable projects to their respective Metropolitan Planning Organizations (MPOs). MPOs reviewed and prioritized the project submissions before submitting the top projects to CalSTA for consideration. Submissions to CalSTA were required to meet all legislatively mandated requirements. Given the timeframe from legislative approval to submission deadline, there was little time for concrete guidance to be created.

The research team supported CalSTA in developing a set of submission templates for SB125 funding which both met the legislative requirements and collected additional information on transit technology. These templates were piloted with 32 transit providers and MPOs. Data was collected via a Google Form and exported in .xls format. The questions utilized for this dataset were:

Торіс	Questions
General purchase & procurement	 Are you able to procure goods and services (ex. vehicles, technology, etc.)? Do you have the resources to easily / regularly procure whenever needed? Do you use state procurement agreements (i.e., California Multiple Award Schedules, Master Service Agreements, State Purchasing Schedules, DGS contracts, etc.)? Do you purchase cooperatively (i.e., jointly with other transit providers or government departments)?
Technology: Fare payments	 Fare payment instruments currently used: Fare payment instruments planned to be used by the end of 2024: Name of fare payment instrument technology vendor(s), if applicable Purchase mechanism for fare payment instrument technology Contract length (# of years) Contract amount (\$ per year) Funding source for contract
Technology: Scheduling & real time location	 Name of GTFS /scheduling technology vendor, if applicable Purchase mechanism for GTFS / scheduling technology Contract length (# of years) Contract amount (\$ per year) Funding source for contract

The team cleaned the exported data to match the NTD IDs with the existing dataset. The following changes were made.

- Dixon Readi-Ride: NTD ID 91041 changed/added
- Humboldt Transit Authority: NTD ID 91036 changed/added
- Marin County Transit District: NTD ID 90234 changed/added
- Rio Vista Delta Breeze: NTD ID 91014 changed/added

No follow up was conducted with the transit providers which submitted the SB125 Google Forms.



7.3 RFP Questions and Answers

- Question #1 - Which/how many California transit services have the capacity to procure?

86% of survey respondents (36 transit providers) have demonstrated the capacity for inhouse procurement (i.e., have acquired hardware and/or software solutions through this procurement method).

- **Question #2** - Which/how many California transit services can only purchase? Only 29% of survey respondents (12 transit providers) utilized traditional purchases; survey respondents did not indicate that they are exclusively able to purchase hardware and/or software solutions, but rather that they can purchase (potentially in addition to other procurement methods).

Question #3 - Which/how many California transit services exclusively use Federal funds to purchase technology and equipment, including buses?
 Sixteen (16) transit providers in California exclusively use federal funds, out of 218 transit providers reporting to NTD in 2022 their funding sources.

- **Questions #4 -** Which/how many California transit services cooperatively purchase technology and equipment, including buses?

52% of survey respondents (22 transit providers) have demonstrated the capacity cooperatively purchasing (i.e., have acquired hardware and/or software solutions through this procurement method).

- Question #5 Which/how many California transit services rely exclusively on local funds to purchase technology and equipment, including buses?
 Fifty-nine (59) transit providers in California exclusively use local funds, out of 218 transit providers reporting to NTD in 2022 their funding sources. However, the research team notes that this number is likely to be higher given this subset of transit providers would not be held to any federal or state reporting requirements. The data, therefore, is not available.
 - **Question #6** Which/how many California transit services use California Multiple Award Schedules, MSAs, State Purchasing Schedules or other leveraged procurement agreements through the Department of General Services or other State Purchasing Departments?

50% of survey respondents (21 transit providers) have demonstrated the capacity for California Multiple Award Schedules, MSAs, State Purchasing Schedules, or other leveraged procurement agreements (i.e., have acquired hardware and/or software solutions through this procurement method).

Question #7 - What are the contracts and contract terms of California transit services including but not limited to their main technology vendors?
 The Contract Database revealed the most common contract features to be, on the whole, the usage of fixed price as a pricing model, the use of "cause and convenience" termination clauses, performance requirements, the inclusion of FTA terms, and the use of extension options. Those features or terms that were the least used include automatic renewal of contracts at the end of their term, automatic annual



price increases, option (nor purchase if offered) of an extended warranty, and DBE requirements.

Bundled contracts were found to be a somewhat common occurrence, though there is not clear evidence suggesting the majority of transit technologies are included with another component (O&M services, other technologies, and/or something else). However, there are likely more contract types that are not bundled. Of those contract types that are bundled, ZEBs are most likely to be bundled with other technologies, while other transit technologies, if bundled, most often are included with O&M support. The use of leveraged procurement agreements (LPAs) to acquire a product or service was found to be uncommon. Most contracts we had insight into are not acquired using an LPA. Products that are acquired using an LPA are more likely to be buses themselves (which in many instances may be bundled with transit technologies).

To see disaggregated findings from the Contract Database, see "Detailed Results".

Question #8 - What is California's transit provider market share today, including private carriers offering contracted service?

UCD Survey respondents indicated which technologies - both at a category level and individual technology type level – they are currently leveraging in their services. This is only a segment of the larger transit provider ecosystem but, as discussed in previous sections, does represent a reasonable sample for the larger California ecosystem. This data is highly time consuming and individualized to collect as there is not currently a standardized method by which transit providers report their transit technology stacks.

Transit technology category type	% of respondents with said technology
Safety and security	95%
Connectivity	75%
Onboard rider communications	84%
Fare collection	80%
Operator Data	67%
Location	89%
Other ¹⁸	7%
Safety & Security transit technology	# of respondents with said technology (n=47)
Safety & Security transit technology Cameras	<pre># of respondents with said technology (n=47) 47</pre>
Cameras	47
Cameras Traffic Priority	47 10
Cameras Traffic Priority	47 10
Cameras Traffic Priority Other ¹⁹	47 10 2
Cameras Traffic Priority Other ¹⁹ Connectivity transit technology	47 10 2 # of respondents with said technology (n=35)

¹⁸ Answers provided: two-way radios, mobile app validator, ride scheduling app for on-demand.

3 31

¹⁹ Answers provided: badge readers, SCADA, telemetry.

Satellite antenna

2-way radio



Connectivity transit technology	# of respondents with said technology (n=35)
Other ²⁰	2
Onboard rider communications transit	<pre># of respondents with said technology (n=41)</pre>
technology	
Head signs	35
Side signs	29
Onboard signs	28
Annunciators	33
Other ²¹	1
Fare collection transit technology	# of respondents with said technology (n=39)
EMV payment acceptance devices	10
(open-loop payments)	
Ticket vending machines (TVMs)	15
Tap on phone	13
QR / barcode	3
Mobile app for payments	24
Other ²²	12
Operator data transit technology	# of respondents with said technology (n=33)
APCs	24
Performance dashboard	21
Charging management	18
Fleet management	21
Other ²³	1
Location data transit technology	# of respondents with said technology (n=46)
Scheduling	27
GTFS-RT	35

o chi o con i g	21
GTFS-RT	35
GTFS static	29
Dispatch	30
CAD/AVL Other ²⁴	31
Other ²⁴	1

- **Question #9 -** Which other portions of the market (States, any similar industries, other countries) could California partner with to drive innovation in transit technology and equipment, including buses?

Stakeholders believe that opportunities for California to partner with other portions of the market primarily exist in other states and third-party groups, such as those involved in data standards. Strategies specifically mentioned by stakeholders include identifying the best existing deployments of a given technology and expanding that model



²⁰ Answers provided: navigation and driver ignition locks, tablet based voice and data.

²¹ Answers provided: infotainment screens.

²² Answers provided: cash, closed loop cards, farebox.

²³ Answers provided: exploring ML/AI insights.

²⁴ Answers provided: GPS.
statewide, working with a third party (e.g., non-profit or university) to administer statewide procurements, observing existing regional consortia that have successful with group purchasing of technology, engaging with organizations like ITxPT, creating or engaging with a vendor-free group for technologists in the industry, and tapping into the expertise of those that develop the systems being procured.

- **Question #10** - In addition to more frequent, predictable, and reliable scheduled service, what are the desired features and disliked barriers to using transit services in California, by Caltrans District?

Although this data was not available by Caltrans district, there are a number of clear barriers to using transit services and features that both transit operators and riders want, in addition to known priorities related to frequent, predictable, and reliable service. Key additional barriers include:

- The challenge of competing with other modes of travel based on cost and convenience,
- Low "legibility" that requires local knowledge and time to figure out how to use services,
- Lack of integration of service across systems and service areas,
- Perceptions related to safety and cleanliness, and
- (To a lesser extent) a lack of convenient payment options.

In terms of desired features, stakeholders perceive a strong demand for:

- "Agnostic", non-proprietary systems and open APIs,
- Features that facilitate easy connections and real-time coordination between transit systems,
- Transit signal priority,
- Real time location (at a reasonable price), and
- Cashless payment systems.
- **Question #11** What types of standards are missing in public transit technology and equipment, including buses, that effect or prevent the private sector investing in research and development of public transit and micromobility?

The most common "missing links" identified by stakeholders revolve around the need for open APIs and tools for integration and standardization across vendors, technologies, and systems. There are multiple versions of integration challenges, from expensive and slow integration with legacy systems, interoperability issues between different technologies, and a lack of a repository (similar to GitHub) for shareable and common reporting needs and APIs or code solutions. In general, stakeholders strongly support California's engagement with open standards.

In addition to these standards, other key supporting "infrastructure" for innovation in public transit and micromobility technology could be a focus for California. First, stakeholders recognize the importance of streamlined procurement process that allows new vendors and innovative technologies to compete (e.g., by carefully considering the weighting of price versus other factors, relying on open standards, ensuring transit providers have sufficient expertise to be informed customers, and allowing vendors to demonstrate unique value propositions). Second, the lack of a committed customer or minimum purchase, particularly in the context of extensive customization, can mean that innovation is a riskier or less lucrative venture than it might otherwise be. Finally, gaps may exist between largely capital-focused funding programs and innovation around service-based technologies, with the effect that software-as-a-service (SaaS)



may present challenges for vendors and transit providers alike based on "color of money" issues.

Question #12 - Which transportation services accept debit/credit cards/are merchants, either directly or indirectly?

67 transit providers accept cards for payment; however these may be closed loop cards onto which funds are loaded. Only 10 California transit providers operate with open loop systems. 54 transit providers only accept cash.

7.4 Detailed Results

7.4.1 Contract Database **Bundled Contract**

Service Product Category	Blank	No	Yes (with O&M)	Yes (with O&M and tech)	Yes (with other)	Yes (with tech)	Total
(Blank)	2	1	2				5
Connectivity		1					1
Fare Collection	5	3	3	1	1	1	14
Integration		2					2
Location	3	6	3	4			16
Multiple	1	3	2	1		2	9
Onboard Rider Communications		1		1			2
Operator Data		4	2	3		1	10
Regular Bus	4	14					18
Transit Operations	2	7	3			1	13
Zero-Emissions Bus	1	5	1	1		5	13
Total	18	47	16	11	1	10	103

Bundled contracts are somewhat common. There is not a clear majority suggesting contracts are or are not bundled with any other component (O&M, technology, both, or something else). However, there are likely more contract types that are not bundled. Of those contract types that are bundled, ZEBs are most likely to be bundled with other technologies, while other transit technologies, if bundled, most often are included with O&M support.

Leveraged Procurement Agreement (LPA)

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2	2	1		5
Connectivity	1				1





Fare Collection	1	5	8		14
Integration	1		1		2
Location	3	7	6		16
Multiple		2	6	1	9
Onboard Rider Communications		2			2
Operator Data	1	5	3	1	10
Regular Bus	3	5	1	9	18
Transit Operations	1	9	3		13
Zero-Emissions Bus	1	3	4	5	13
Total	14	40	33	16	103

LPAs are not common. Of the transit technology contracts we have insight into, most are *not* acquired using an LPA. Products that are acquired using an LPA are more likely to be buses themselves (which in many instances may be bundled with transit technologies).

Service Product Category	Blank	Fixed Price	Max Price	Other	T&M	Total
(Blank)	2	2		1		5
Connectivity	1					1
Fare Collection	2	9	1	2		14
Integration		2				2
Location	3	9	4			16
Multiple		7	1	1		9
Onboard Rider Communications		1			1	2
Operator Data		3	5	2		10
Regular Bus	3	7	8			18
Transit Operations	1	7	2	1	2	13
Zero-Emissions Bus		8	5			13
Total	12	55	26	7	3	103

Pricing models vary in likelihood. Fixed Price models are most common followed by Maximum Price, while Time and Materials (T&M) models are very uncommon. At least half of the contracts available utilize a fixed price model, suggesting it is the dominant model. Uptake of this model is roughly proportionate across all categories. Maximum price likely occupies a quarter of the remaining price models, with bus products disproportionately representative.

Autorenewal at End of Term



Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2	2]		5
Connectivity		1			1
Fare Collection	2	5	5	2	14
Integration		1	1		2
Location	3	10	2	1	16
Multiple	2	3	2	2	9
Onboard Rider Communications		2			2
Operator Data		5	3	2	10
Regular Bus	5	9	3	1	18
Transit Operations		7	5	1	13
Zero-Emissions Bus	1	8	3	1	13
Total	15	53	25	10	103

Contracts that renew automatically at the end of their term are not common. At least half of the contracts we have insight into *do not* include automatic renewal at the end of a contract term, while only ~10% of all contracts explicitly contain this contract feature.

Extension Option Offered

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2	1		2	5
Connectivity	1				1
Fare Collection	1	2	4	7	14
Integration	1			1	2
Location	2	5	2	7	16
Multiple	2	1	1	5	9
Onboard Rider Communications			1	1	2
Operator Data		1	3	6	10
Regular Bus	6	8	3	1	18
Transit Operations		1	7	5	13
Zero-Emissions Bus	4	1	4	4	13
Total	19	20	25	39	103

Extension options are commonly offered in contracts. Discounting the significant number of unknown entries in this category, extension options are offered nearly twice as often as they are not offered.



Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2	1	2		5
Connectivity	1				1
Fare Collection	1	4	6	3	14
Integration		1		1	2
Location	4	7	2	3	16
Multiple		3	4	2	9
Onboard Rider Communications	1		1		2
Operator Data		5	3	2	10
Regular Bus	3	13	2		18
Transit Operations	1	8	3	1	13
Zero-Emissions Bus	2	10		1	13
Total	15	52	23	13	103

Automatic Annual Price Increases

Contracts are not commonly automatically renewed at the end of their term. At least half of the contracts we have insight into *do not* include this term, while a small minority explicitly contain this contract feature.

Extended Warranty Offered as Option

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2		1	2	5
Connectivity		1			1
Fare Collection		3	11		14
Integration		2			2
Location	4	6	1	5	16
Multiple		3	2	4	9
Onboard Rider Communications		1	1		2
Operator Data	2	4	2	2	10
Regular Bus	3	6	9		18
Transit Operations	1	9	3		13
Zero-Emissions Bus		7	1	5	13
Total	12	42	31	18	103

Extended warranties are not commonly offered as an option on contracts. Discounting the significant number of unknown entries in this category, a contract is twice as likely to *not include* an option to purchase an extended warranty on the product in question.



Of those that do offer them, ZEBs and Location Technologies are the most likely categories.

Extended Warranty Purchased

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2		3		5
Connectivity		1			1
Fare Collection		3	11		14
Integration		2			2
Location	4	6	5	1	16
Multiple		4	2	3	9
Onboard Rider Communications		1	1		2
Operator Data	1	6	2	1	10
Regular Bus	3	6	9		18
Transit Operations		10	3		13
Zero-Emissions Bus	1	5	4	3	13
Total	11	44	40	8	103

Less than half of the contracts with extended warranties offered are purchased.

Termination Clauses

Service Product Category	Blank	Cause	Cause & Convenience	Convenience	Other	Total
(Blank)	2	1	2			5
Connectivity					1	1
Fare Collection	2		10	2		14
Integration	1	1				2
Location	2	5	9			16
Multiple	1	3	4	1		9
Onboard Rider Communications		1	1			2
Operator Data	1	1	7		1	10
Regular Bus	6		11	1		18
Transit Operations	1	1	11			13
Zero-Emissions Bus	1	1	10	1		13
Total	17	14	65	5	2	103



The prevalence of termination clauses vary. Cause & Convenience is very common, while Cause and Convenience, respectively, are uncommon. The majority of contracts include a clause for termination based on cause & convenience.

FTA Terms Included

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	1	2		2	5
Connectivity			1		1
Fare Collection	1	3	6	4	14
Integration		2			2
Location	4	9		3	16
Multiple	1	3	2	3	9
Onboard Rider Communications		1	1		2
Operator Data	1	4	2	3	10
Regular Bus	4	5	2	7	18
Transit Operations		5	5	3	13
Zero-Emissions Bus		1	1	11	13
Total	12	35	20	36	103

FTA Terms are a common contract term. Contracts are roughly split between those that included FTA terms with those that did not. Because FTA terms are required when using federal funding, this suggests that half of the contracts utilized federal funding - or were remnants (e.g. copy and pasted) from a previous contract. ZEBs skew these numbers, as almost all ZEBs had FTA terms, with regular buses as a close second; interestingly, without the buses, most transit tech do not likely have FTA terms.

DBE Requirement

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2	1		2	5
Connectivity			1		1
Fare Collection	1	5	6	2	14
Integration			2		2
Location	5	6	3	2	16
Multiple	1	4	4		9
Onboard Rider Communications		1		1	2
Operator Data		4	4	2	10
Regular Bus	7	3	8		18
Transit Operations		2	7	4	13
Zero-Emissions Bus		7	1	5	13



DBE requirements are not common. Discounting the significant number of unknown entries in this category, contracts with no DBE requirements are almost twice as likely as those that do have DBE requirements.

Penalty Mechanism

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	2	1	2		5
Connectivity			1		1
Fare Collection	1	4	8	1	14
Integration	1	1			2
Location	4	7	3	2	16
Multiple	2	1	1	5	9
Onboard Rider Communications	1			1	2
Operator Data	1	3	5	1	10
Regular Bus	5	6	5	2	18
Transit Operations		3	3	7	13
Zero-Emissions Bus		3	4	6	13
Total	17	29	32	25	103

Penalty mechanisms appear to be somewhat common. Discounting the significant number of unknown entries in this category, there is a roughly even split between contracts with penalty mechanisms and those without, leaning slightly towards no penalty mechanisms. Transit Operations and ZEBs are very likely to have this feature.

Performance Requirements

Service Product Category	Blank	No	Unknown	Yes	Total
(Blank)	1	2	2		5
Connectivity			1		1
Fare Collection	1	4	8	1	14
Integration	1	1			2
Location	3	3	3	7	16
Multiple	1	1	2	5	9
Onboard Rider Communications				2	2
Operator Data	1	3	4	2	10
Regular Bus	6	6	3	3	18
Transit Operations			3	10	13





Zero-Emissions Bus	1 1	3	8	13
Total	15 21	29	38	103

Performance requirements are likely a very common feature. Discounting the significant amount of unknown entries in this category, contracts are nearly twice as likely to have performance requirement terms than to not have a performance requirement terms. Transit Operations and ZEBs are very likely to have this feature.



7.4.2 Full UCD Survey Text Transit Technologies Survey Survey Flow

Standard: Welcome (1 Question) Standard: Screening Questions (5 Questions) Standard: General Questions (1 Question)

Branch: New Branch

lf

If This survey has questions about transit technologies, procurement and purchasing, and passenger r... My agency's procurement process Is Selected

Or This survey has questions about transit technologies, procurement and purchasing, and passenger r... My agency's purchasing process Is Selected

Standard: Procurement Specialist (4 Questions)

Branch: New Branch

lf

If This survey has questions about transit technologies, procurement and purchasing, and passenger r... How my agency selects new technologies Is Selected

Or This survey has questions about transit technologies, procurement and purchasing, and passenger r... How my agency currently uses technology Is Selected

Standard: Technical / Operations Specialist (11 Questions)

Branch: New Branch

lf

If This survey has questions about transit technologies, procurement and purchasing, and passenger r... Rider feedback (through any means) Is Selected

Or This survey has questions about transit technologies, procurement and purchasing, and passenger r... Rider preferences or satisfaction Is Selected

Standard: Passenger Experience and Feedback (3 Questions)

Standard: Cal-ITP (3 Questions) Standard: Thank You (4 Questions)

Page Break



Survey Text

Start of Block: Welcome

Q1.1 Welcome to the Transit Technologies Survey!

This survey is part of a study being conducted by the University of California, Davis Institute of Transportation Studies (ITS-Davis), in partnership with Caltrans Integrated Mobility (CIM) and the California Integrated Travel Program (Cal-ITP). We are interested in learning how your agency adopts and updates technologies used on board your transit vehicles such as APCs, CAD/AVL, and fareboxes (hardware and software). Your responses will contribute to improving how CIM and Cal-ITP programs and initiatives support transit providers.

This survey will take approximately 15 minutes to complete. Only people 18 years of age and above are eligible to participate in this study. By participating in this survey, you are indicating that you meet this criterion. If you have any questions or would like more information, please contact Dr. Susan Pike at scpike@ucdavis.edu.

Thank you for your participation! Your responses are important to us.

Q2.1 What is the name of your transit agency?

Q2.2 What is your agency's NTD ID?

Q2.2A In which state is your agency located?



- O California (7)
- Alabama (1)
- Alaska (4)
- Arizona (5)
- Arkansas (6)
- Colorado (8)
- Connecticut (9)
- O Delaware (10)
- Florida (11)
- O Georgia (12)
- O Hawaii (13)
- Idaho (14)
- Illinois (15)
- Indiana (16)
- o lowa (17)
- Kansas (18)
- O Kentucky (19)
- Louisiana (20)
- Maine (21)
- Maryland (22)
- Massachusetts (23)
- O Michigan (24)
- Minnesota (25)
- Mississippi (26)
- O Missouri (27)
- Montana (28)
- Nebraska (29)
- Nevada (30)
- New Hampshire (31)



- New Jersey (32)
- New Mexico (33)
- New York (34)
- North Carolina (35)
- North Dakota (36)
- Ohio (37)
- Oklahoma (38)
- Oregon (39)
- Pennsylvania (40)
- Rhode Island (41)
- South Carolina (42)
- South Dakota (43)
- Tennessee (44)
- Texas (45)
- Utah (46)
- Vermont (47)
- O Virginia (48)
- Washington (49)
- West Virginia (50)
- Wisconsin (51)
- Wyoming (52)



Q2.3 What is your role or position at your agency?

Q2.4 This survey has questions about transit technologies, procurement and purchasing, and passenger requests and feedback.

We are interested in your expertise in technologies used on board your transit vehicles such as APCs, CAD/AVL, and fareboxes.

So that we ask you only questions relevant to you, please indicate the areas you are knowledgeable about from the list below. For areas you are not knowledgeable in, please consider sending this survey to someone in your agency who can speak to them *after* you submit your responses. (Select all that apply)

	How my	aaencv	selects	new	technol	oaies	(6))
		0.90.107	00.00.0			9.00	1 - 1	I

How my agency currently uses technology (8)

□ My agency's procurement process (4)

□ My agency's purchasing process (5)

Rider feedback (through any means) (9)

□ Rider preferences or satisfaction (10)

Q3.1 Which of the following technological tools does your agency currently use? (Select all that apply)

- Safety and security (e.g., camera, traffic priority, etc.) (12)
- Connectivity (e.g., SIMS, routers, passenger wifi) (13)
- Onboard rider communications (e.g., head/side/onboard signs, annunciator) (14)
- Fare collection (e.g.,EMV pads, fareboxes, TVMs, tap on phone, QR code/mobile app payment) (15)
- Operator data (e.g., APCs, performance dashboard, charging management, fleet management) (16)
- Location (e.g., scheduling, GTFS,-RT, GTFS static, dispatch, CAD/AVL) (17)
- Other (please write in) (9) _____



Q4.1 How does your agency typically acquire hardware and software solutions? (Select all that apply)

- Traditional purchase (off the shelf with no procurement processes) (1)
- \Box In-house procurement (2)
- Contracted procurement services managed by third party (3)
- Collective/Joint procurement with another agency(ies) (4)
- Leveraged Procurement Agreement [ex. California Multiple Award Schedules, MSAs (Master Service Agreements), State Purchasing Schedules, etc.] (7)
- Other (please specify) (5) _____

Q4.2 What level of resources does your agency have for procurement of hardware and software? (Select the option that best fits)

- Few procurement resources: we have little or no dedicated staff for procurement and are unable to undertake procurement processes. (1)
- Some procurement resources: we have some dedicated staff for procurement processes but are limited to the number, complexity, and speed of procurements we can realize. (4)
- Significant procurement resources: we have a fully dedicated procurement department that can handle multiple procurements at any given time and ensures we could undertake a procurement process for all major investments. (5)



Q4.3 Which of the following features are included in contracts with your current vendors? (Select all that apply)

- Service Level Agreements (SLAs) (1)
- Automatic upgrades and maintenance (4)
- Data analytics and reporting (2)
- Technical support (5)
- Training programs (3)
- Performance monitoring and reporting (6)
- Extended warranties (8)
- □ Integration services (9)
- Cybersecurity solutions (10)
- FTA Terms (11)
- Termination for Convenience and Cause (7)
- Automatic contract renewal (12)
- □ Automatic price increases (13)
- Penalty mechanisms for performance failure (14)
- Other (please specify) (15) _____

Q4.4 Have you encountered any of the following challenges with your current contracts and vendors? (Select the best fitting option for each challenge)



	Not encountered (1)	Sometimes encountered (2)	Encountered often (3)
Proprietary software (1)	0	0	0
Data and security concerns (2)	0	0	0
Integration issues (3)	0	0	0
Vendor lock-in (4)	0	0	0
Inability to keep pace with evolving technology (5)	0	0	0
Lack of support (6)	0	0	0
Lack of standardization (7)	0	0	0
Regulatory compliance (8)	0	0	0
Product delivery discrepancies (9)	0	0	0
Lack of vendor reliability (10)	0	0	0
Other (please specify) (11)	0	0	0

Q5.1 Which of the following approaches does your agency typically take to test and pilot new technologies ahead of full-fleet implementation? (Select all that apply)

	Extensive	testing	and	piloting	(1)
--	-----------	---------	-----	----------	-----

	Limited	testing	and	piloting	(2)
--	---------	---------	-----	----------	-----

Research or discussions with agencies who have used it (4)

 \Box No testing, direct implementation (3)

Display This Question: If Q3.1 = Safety and security (e.g., camera, traffic priority, etc.)



Q5.2 Which of the following technologies do you currently use relating to safety and security? (Select all that apply)

Cameras (4)
Traffic priority (5)
Other (please specify) (9)
Display This Question: If Q3.1 = Connectivity (e.g., SIMS, routers, passenger wifi)
Q5.3 Which of the following technologies do you currently use relating to connectivity? (Select all that apply)
Cellular network SIM cards (4)
Routers (5)
Passenger Wifi (6)
Satellite antenna (7)
2-way radio (8)
Other (please specify) (9)
Display This Question: If Q3.1 = Operator data (e.g., APCs, performance dashboard, charging management, fleet management)
Q5.4 Which of the following technologies do you currently use relating to transit operator data management? (Select all that apply)

APCs (5)

- Performance dashboard (6)
- Charging management (10)
- \Box Fleet management (7)
- Other (please specify) (9)



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Display This Question: If Q3.1 = Fare collection (e.g., EMV pads, fareboxes, TVMs, tap on phone, QR code/mobile app payment)

Q5.5 Which of the following technologies do you currently use relating to fare collection? (Select all that apply)

EMV payment acceptance devices (open-loop payments) ((4)
---	-----

	Ticket	vendina	machines	(TVMs)) (5)
\square	nokor	vending	machines	1 1 1 1 1 3		1

	Tap	on	phone	(6)
--	-----	----	-------	-----

	QR/barcode	(7)
--	------------	-----

	Mobile	app	for	payments	(8)
--	--------	-----	-----	----------	-----

Other (please specify) (9)

Display This Question:

If Q3.1 = Onboard rider communications (e.g., head/side/onboard signs, annunciator)

Q5.6 Which of the following technologies do you currently use relating to onboard rider communications? (Select all that apply)

	Head signs	(4)
\square	noud signs	(-1)

- Side signs (5)
- Onboard signs (6)
- Annunciations (7)
- Other (please specify) (9)

Display This Question:

If Q3.1 = Location (e.g., scheduling, GTFS,-RT, GTFS static, dispatch, CAD/AVL)

Q5.7 Which of the following technologies do you currently use relating to transit vehicle location? (Select all that apply)

	Scheduling	(4)
--	------------	-----

- GTFS RT (5)
- GTFS Static (6)
- Dispatch (7)
- □ CAD/AVL (8)
- Other (please specify) (9)



Q5.8 How much of a priority is it to replace each of the following technologies in the next one to three years?

	Low priority (1)	Moderate priority (2)	High priority (3)
Safety and security (e.g., camera, traffic priority, etc.) (4)	0	0	0
Connectivity (e.g., SIMS, routers, passenger wifi) (5)	0	0	0
Onboard rider communications (e.g., head/side/onboard signs, annunciator) (6)	0	0	0
Fare collection (e.g., EMV pads, fareboxes, TVMs, tap on phone, QR code/mobile app payment) (7)	0	0	0
Operator data (e.g., APCs, performance dashboard, charging management, fleet management) (8)	0	0	0
Location (e.g., scheduling, GTFS,-RT, GTFS static, dispatch, CAD/AVL) (9)	0	0	0

Page Break



Q5.9 How important are the following factors to your agency when adopting new technologies?

	Not important (1)	Moderately important (8)	Very important (6)
Improve operational efficiency (1)	0	0	0
Improve passenger experience (8)	0	0	0
Improve passenger safety (9)	0	0	0
Improve on-time performance or reliability (10)	0	0	0
Improve environmental sustainability (11)	0	0	0
Reduce costs or increase revenue (13)	0	0	0
Ease of integration with existing systems (15)	0	0	0
Other (please specify) (6)	0	0	0

Carry Forward Selected Choices from "Q3.1"

 $X \rightarrow$



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	Not satisfied (1)	Somewhat satisfied (2)	Very satisfied (3)
Safety and security (e.g., camera, traffic priority, etc.) (x12)	0	0	0
Connectivity (e.g., SIMS, routers, passenger wifi) (x13)	0	0	0
Onboard rider communications (e.g., head/side/onboard signs, annunciator) (x14)	0	0	0
Fare collection (e.g.,EMV pads, fareboxes, TVMs, tap on phone, QR code/mobile app payment) (x15)	0	0	0
Operator data (e.g., APCs, performance dashboard, charging management, fleet management) (x16)	0	0	0
Location (e.g., scheduling, GTFS,-RT, GTFS static, dispatch, CAD/AVL) (x17)	0	0	0
Other (please write in) (x9)	0	0	0

Q5.10 For the technologies you currently use, how satisfied are you with their performance?

Display This Question:

If If Which of the following technological tools does your agency currently use? (Select all that apply) q://QID271/SelectedChoicesCount Is Less Than or Equal to 6

Carry Forward Unselected Choices from "Q3.1"

 $X \dashv$



Q5.11 For the technologies not used by your agency, which of the following are barriers to doing so? (Select all that apply)

	Maintenanc e capacity (6)	Funds to implemen t (8)	Staff Time to implemen t (9)	Lack of passenge r interest (10)	Lack of technic al know- how (11)	Othe r (12)
Safety and security (e.g., camera, traffic priority, etc.) (x12)	0	0	0	0	0	0
Connectivity (e.g., SIMS, routers, passenger wifi) (x13)	0	0	0	0	0	0
Onboard rider communications (e.g., head/side/onboar d signs, annunciator) (x14)	0	0	0	0	0	0
Fare collection (e.g.,EMV pads, fareboxes, TVMs, tap on phone, QR code/mobile app payment) (x15)	0	0	0	0	0	0
Operator data (e.g., APCs, performance dashboard, charging management, fleet management) (x16)	0	0	0	0	0	0
Location (e.g., scheduling, GTFS,- RT, GTFS static, dispatch, CAD/AVL) (x17)	0	0	0	0	0	0
Other (please write in) (x9)	0	0	0	0	0	0



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Q6.1 How does your agency currently receive or obtain rider feedback? (Select all that apply)

- □ Surveys conducted in-house (1)
- \Box Surveys conducted via contract (2)
- \Box Direct feedback from riders (3)
- Direct feedback from operations staff (4)
- \Box No rider feedback is collected (6)

Other (please specify) (5) _____



Q6.2 Considering rider feedback and requests for improvements, how important do you think the following are to your riders?

	Not important (1)	Moderately important (2)	Very important (3)
Shorter travel times (1)	0	0	0
More frequent headways (2)	0	0	0
On-time service (9)	0	0	0
Bus location information (GTFS-real time, AVL) (3)	0	0	0
Mobile ticketing (4)	0	0	0
Closed loop (agency specific card) (5)	0	0	0
Open payments(contactless tap credit/debit card to pay) (6)	0	0	0
Hours of operation (7)	0	0	0
Service areas (8)	0	0	0
Coordination between service routes (easy transfers) (10)	0	0	0
Additional routes / network expansion (11)	0	0	0
Safety (12)	0	0	0



Q6.3 For people who do not use your services, how important do you think the following barriers are in preventing them from using your service?

	Nor important (1)	Moderately important (2)	Very important (3)
Lack of time savings (1)	0	0	0
Infrequent service (8)	0	0	0
Lack of bus location information (9)	0	0	0
Complication (or unclear) fare system (10)	0	0	0
Legibility of service (2)	0	0	0
Fares are too high (3)	0	0	0
Inconvenient hours (11)	0	0	0
Difficult (or long) transfers (4)	0	0	0
No routes to desired destination (12)	0	0	0
Safety concerns (5)	0	0	0
Lack of cleanliness of vehicles, stops, etc. (6)	0	0	0
Other (please specify) (7)	0	0	0

Q7.1 The following questions are about ways CIM and Cal-ITP can help your agency...

Q7.2 How useful to your agency are each of the following ways that Cal-ITP, and/or Caltrans, CIM can support the adoption or updating of technological tools used by



your agency?

	Not useful/needed (1)	Somewhat useful / needed (2)	Very useful/needed (3)
Shared technological tools for data management (1)	0	0	0
Shared technological tools for payment management (14)	0	0	0
Procurement cost- sharing (18)	0	0	0
Procurement assistance (20)	0	0	0
Master Service Agreements (21)	0	0	0
Sample specifications to use in vendor contracts or agreements (15)	0	0	0
Quantifying operational benefits (16)	0	0	0
Pilot program funding (17)	0	0	0
Training resources (22)	0	0	0
Technical assistance (24)	0	0	0
Operational data standards (23)	0	0	0
Other (please describe) (5)	0	0	0



	Have used this service (1)	Have not used, but would like to (2)	Would like more information about (3)	Not interested in this service (5)	Am unfamiliar with this service (6)
Open-loop EMV technical assistance (6)	0	0	0	0	0
GTFS data analysis (1)	0	0	0	0	0
Eligibility verification for automated discounts (2)	0	0	0	0	0
Operational data standards (3)	0	0	0	0	0
Master service agreements (4)	0	0	0	0	0
Procurement assistance (5)	0	0	0	0	0

Q7.3 Have you used any of the assistance tools provided by Cal-ITP?

Q8.1 Thank you for taking the time to complete this survey. Your responses are greatly appreciated.

The following questions are intended to help us identify your agency and your role for further contact if necessary.

Q8.2 Please use the space below to tell us anything else about transit technologies (technologies themselves, procurement/purchase of technologies, implementation of technologies, etc.) that you would like to see considered in future research.





Q8.3 May we contact you in the future for any of the following?

- \Box Questions regarding your responses to this survey (1)
- \Box To participate in future phases of this project, such as surveys or interviews (2)
- $\supset \bigotimes$ No, I do not wish to be contacted in the future (3)

Display This Question:

If Q8.3 = Questions regarding your responses to this survey Or Q8.3 = To participate in future phases of this project, such as surveys or interviews

Q8.4 Please provide the following contact information

\bigcirc	Name (1)
\bigcirc	Telephone number (4)
\bigcirc	Email Address (5)

7.4.3 UCD Survey Results

In this section, key patterns in the data are described.

Agency Characteristics

- While agencies identifying as large (17) and extra-large (11) were the most represented, a more even distribution was seen across service area types, with rural, suburban, and urban each between 30-35%.
- All of small and the majority (nearly 80%) of medium agencies were comprised of rural agencies.
- Large and extra-large agencies also include rural agency representation (less than 20%) and the remaining are represented by suburban and urban.
- Extra-large agencies represented the most urban agencies (55%).

Technologies

- With some exception, the size of the agency or agency area type demonstrated patterns of technology use that commonly set small, medium, and rural agencies apart from large, extra-large, suburban, and urban agencies:
 - Large, extra-large, and urban agencies more consistently used (>70%) available technologies, including safety, connectivity, onboard rider info, fare collection, operator data, and location.

Safety Technology

- Safety technologies are predominant technology in use across all agencies (88% and above), regardless of size or area type, with medium size and rural agencies at the lower end of use.
- The primary safety technology used (across 100%) of agencies surveyed is cameras.



• Traffic priority technology is implemented by a smaller number (<20%) of medium, large, and suburban agencies and a larger number of urban (46%) and extra-large (60%) agencies.

Operator Tools

- The least prevalent technology types are operator data (e.g. APCs, performance dashboards, etc.) which are not represented in use in any agency categorized as small, and in less than 40% of rural agencies.
- Large, extra-large, suburban, and urban agencies survey predominantly use (>70%) APCs for operator technologies.
- Medium (60%) and rural (27%) agencies instead use performance dashboards or fleet management, as does regional rail.
- No small agencies surveyed use operator technologies.

Connectivity

- Connectivity technology is lower in medium and rural agencies versus all other sizes and area types.
- Of the connectivity technologies, satellite antenna is the least used across agencies, with no use demonstrated in rural agencies surveyed and less than 20% in all other agency sizes and types.

Fare Media

- The primary fare media used for medium to extra-large and all agency area types is mobile app for payments.
- The primary fare media used for small agencies surveyed is Ticket Vending Machines.
- Small, medium, rural, and regional agencies surveyed do not currently use QR or barcode payments and it is the least used method among all respondents (22% is the highest use among extra-large agencies).

Rider Information

- Head signs were the primary rider information technology used across all agency size and types.
- Annunciators were the secondary rider information technology, respectively, used for large, extra-large, suburban, and urban agencies.
- Small, medium, and rural agencies used side signs as their secondary method of rider information.

Location Information

- Location information technologies were represented across all agency size and area types, except for small agencies, which did not identify use of either dispatch or CAD/AVL.
- Suburban and extra-large (100%) agencies demonstrated the highest use of CAD/AVL

Contract Challenges

• Proprietary aspects of equipment and technology present the most often experienced challenge (34%) that agencies face with contracts.



- The most prevalent challenges experienced across agencies are integration, followed by lack of support and reliability. This is represented by challenges experienced often and sometimes, which combined represents 87%, 81%, and 81%, respectively.
- Contract compliance demonstrated the fewest challenges at combined 63% of agencies rarely or never having issues.

Purchase and Procurement

- The primary method of purchase and procurement across agency size and area is conducted through in-house procurement.
- The secondary of purchase and procurement for rural and medium agencies is conducted through leveraged procurement methods.
- The secondary of purchase and procurement for large, suburban, and urban agencies is conducted through collective/joint procurement methods.
- Traditional procurement and third-party procurement were the least used methods for purchase and procurement, except in the regional and capitol corridor where the former was a primary method.

Technology Testing

- The primary method of testing technologies across agency size and area is conducted through cross-agency research and discussion.
- The secondary method of testing technologies in each service area and small to large agencies is limited testing and piloting.
- Extensive testing and piloting is the secondary method of testing technologies for extra-large agencies
- Some rural (17%) and extra-large (20%) agencies conducted direct implementation of technologies without testing.

Planning and Priorities

- Similarly, with some exception, agency sizes and area type demonstrated patterns of technology interests and need that commonly set small, medium, and rural agencies apart from large, extra-large, suburban, and urban agencies:
 - Few technologies arise as priority future purchases for any agency area type or size, but the most common across all agencies surveyed are fare media and operator tools technologies. The latter technology was particularly salient for extra-large agencies with 70% identifying it as a high priority.
 - Predominant factors that inform technological upgrades include efficiency, rider experience, safety, and reliability across all area type and size agencies.
 - Large and extra-large agencies emphasized rider experience (100%) and safety (100%) as high priority.
 - Small agencies emphasized safety (100%) and reliability (100%) as high priority.
 - Very few factors were regarded as not important and the distribution across moderately or very important was even across agencies.



- Small, medium, and rural agencies (<80%) identified revenue as an important factor in technology adoption while 63% and less of other agency sizes and areas did.
- Moderate levels of satisfaction were expressed by nearly all agency respondents given that most responses of all technology types were "somewhat satisfied."

Rider Feedback and Influences

- Various methods of rider feedback are conducted across agencies with direct feedback from riders and direct feedback from staff the most predominant forms.
- Small agencies (83%) of small agencies also conduct in-house surveys.
- Surveys conducted via contract is the least used form of rider feedback, used most by extra-large agencies ((64%).
- The importance of factors for to improve the riders' experience, shared across agency types, includes on-time vehicle arrivals and safety.
 - Shorter routes were identified as of high importance for large, extra-large, suburban, and urban agencies.
 - Service area was identified as of high importance for small and rural agencies.
 - Closed loop payments were identified significantly as not important by 83% of medium-sized agencies.
- Important factors for medium to extra-large and suburban and urban agencies to support non-riders in using transit options included time savings and frequency of service.
- Small and medium agencies identified route location as the predominant concern of non-riders.
- An emphasis across all agency size and area types was on fare not being an important factor of non-riders.

Cal ITP/CIM Programs

- Responses regarding CAL-ITP services and interest were significant in the moderate interest across all agency area types and sizes. Most agencies surveyed identified "somewhat useful" as the response for nearly all programs.
 - Data, Costshare, and Data standard programs received the most "somewhat useful" responses across all agencies
 - Sample, Pilot, and Technology programs followed, which received fewer "somewhat useful" responses from small and rural agencies.
 - In fact, small agencies (100%) identified Pilot and Training programs as "not useful."
 - Operational Standards and MSA's programs were of greatest interest to all agencies, though less than 55% of each agency area type or service identified these as such.





Respondent Characteristics







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Q3.1 Which of the following technological tools does your agency currently use? (Select all that apply)







Q4.1 How does your agency typically acquire hardware and software solutions? (Select all that apply)





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Q4.2 What level of resources does your agency have for procurement of hardware and software? (Select the option that best fits)





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Q4.3 Which of the following features are included in contracts with your current vendors? (Select all that apply)





Q4.4 Have you encountered any of the following challenges with your current contracts and vendors? (Select the best fitting option for each challenge)

Challenge	Frequency	Small (N = 6)	Medium (N = 6)	Large (N = 11)	Extra Large (N = 8)	Regional Rail (N = 1)
Proprietary	nequency	(14 - 0)	(11 - 0)	(11 - 11)	(14 - 8)	(N = 1)
software	not-never	50%	33%	9%	13%	0%
	often	50%	17%	55%	38%	100%
	sometimes	0%	50%	36%	50%	0%
Data and						
security						
concerns	not-never	83%	83%	55%	50%	0%
	often	17%	17%	36%	25%	100%
	sometimes	0%	0%	9%	25%	0%
Integration						
issues	not-never	17%	17%	18%	0%	0%
	often	83%	67%	36%	50%	100%
	sometimes	0%	17%	45%	50%	0%
Vendor lock-in	not-never	67%	33%	64%	38%	100%
	often	33%	50%	18%	38%	0%
	sometimes	0%	17%	18%	25%	0%
Inability to keep pace with evolving						
technology	not-never	50%	33%	27%	0%	0%
	often	17%	50%	55%	50%	100%
	sometimes	33%	17%	18%	50%	0%
Lack of support	not-never	33%	33%	18%	0%	0%
	often	50%	50%	45%	63%	100%
	sometimes	17%	17%	36%	38%	0%
Lack of standardizatio						
n	not-never	33%	33%	18%	13%	0%
	often	50%	50%	45%	50%	100%
	sometimes	17%	17%	36%	38%	0%
Regulatory compliance	not-never	67%	83%	45%	63%	100%
	often	17%	17%	45%	25%	0%
	sometimes	17%	0%	9%	13%	0%



Challenge	Frequency	Small (N = 6)	Medium (N = 6)	Large (N = 11)	Extra Large (N = 8)	Regional Rail (N = 1)
Product delivery discrepancies	not-never	50%	67%	45%	0%	100%
	often	17%	33%	36%	75%	0%
	sometimes	33%	0%	18%	25%	0%
Lack of vendor reliability	not-never	50%	33%	9%	0%	0%
	often	33%	50%	55%	63%	100%
	sometimes	17%	17%	36%	38%	0%

		Regional Rail	Rural	Suburban	Urban
Challenge	Frequency	(N = 1)	(N = 11)	(N = 9)	(N = 11)
Proprietary software	not-never	0%	45%	11%	9%
	often	100%	45%	33%	45%
	sometimes	0%	9%	56%	45%
Data and security					
concerns	not-never	0%	82%	56%	55%
	often	100%	18%	22%	36%
	sometimes	0%	0%	22%	9%
Integration issues	not-never	0%	27%	11%	0%
	often	100%	64%	44%	55%
	sometimes	0%	9%	44%	45%
Vendor lock-in	not-never	100%	64%	56%	36%
	often	0%	27%	22%	45%
	sometimes	0%	9%	22%	18%
Inability to keep pace with evolving					
technology	not-never	0%	45%	33%	0%
	often	100%	36%	44%	55%
	sometimes	0%	18%	22%	45%
Lack of support	not-never	0%	27%	33%	0%
	often	100%	64%	33%	55%
	sometimes	0%	9%	33%	45%
Lack of					
standardization	not-never	0%	45%	22%	0%
	often	100%	36%	56%	55%
	sometimes	0%	18%	22%	45%



Challenge	Frequency	Regional Rail (N = 1)	Rural (N = 11)	Suburban (N = 9)	Urban (N = 11)
Regulatory compliance	not-never	100%	73%	78 %	36%
	often	0%	9%	22%	55%
	sometimes	0%	18%	0%	9%
Product delivery					
discrepancies	not-never	100%	45%	56%	18%
	often	0%	36%	22%	64%
	sometimes	0%	18%	22%	18%
Lack of vendor					
reliability	not-never	0%	36%	22%	0%
	often	100%	55%	44%	55%
	sometimes	0%	9%	33%	45%



























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Q5.8 How much of a priority is it to replace each of the following technologies in the next one to three years?

Technology Type	Priority to Replace	Small (N = 5)	Medium (N = 9)	Large (N = 14)	Extra Large (N = 10)	Regional Rail (N = 2)
Safety	low	20%	33%	21%	10%	100%
	moderate	40%	33%	50%	60%	0%
	high	40%	33%	29%	30%	0%
Connectivity	low	40%	67%	50%	20%	50%
	moderate	20%	22%	36%	30%	0%
	high	40%	11%	14%	50%	50%
Rider						
Information	low	80%	44%	36%	40%	50%
	moderate	0%	33%	36%	10%	50%
	high	20%	22%	29%	50%	0%
Fare Media	low	20%	56%	36%	33%	50%
	moderate	40%	11%	21%	11%	0%
	high	40%	33%	43%	56%	50%
Operator						
Tools	low	40%	14%	7%	10%	100%
	moderate	20%	71%	36%	50%	0%
	high	40%	14%	57%	40%	0%
Location						
Tools	low	40%	13%	29%	10%	50%
	moderate	20%	63%	43%	20%	0%
	high	40%	25%	29%	70%	50%

Technology Type	Priority to Replace	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 13)	Urban (N = 13)
Safety	low	100%	25%	23%	15%
	moderate	0%	50%	54%	38%
	high	0%	25%	23%	46%
Connectivity	low	50%	50%	38%	46%
	moderate	0%	17%	31%	38%
	high	50%	33%	31%	15%
Rider Information	low	50%	67%	31%	38%
	moderate	50%	8%	46%	15%
	high	0%	25%	23%	46%



Technology Type	Priority to Replace	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 13)	Urban (N = 13)
Fare Media	low	50%	42%	31%	42%
	moderate	0%	25%	15%	17%
	high	50%	33%	54%	42%
Operator Tools	low	100%	27%	8%	8%
	moderate	0%	36%	54%	42%
	high	0%	36%	38%	50%
Location Tools	low	50%	33%	8%	25%
	moderate	0%	42%	46%	25%
	high	50%	25%	46%	50%



Q5.9 How important are the following factors to your agency when adopting new technologies?

Factors Important in Technology Updates	Level of Importance	Small (N = 5)	Medium (N = 9)	Large (N = 14)	Extra Large (N = 10)	Regional Rail (N = 2)
Efficiency	Not important	0%	0%	0%	0%	0%
	Moderately important Very important	20%	11% 89%	14% 86%	20%	100%
Experience	Not important	0%	0%	0%	0%	0%
Lypenence	Moderately important Very	20%	11%	14%	0%	0%
	important	80%	89%	86%	100%	100%
Safety	Not important	0%	0%	0%	0%	0%
	Moderately important Very	0%	22%	21%	0%	100%
	important	100%	78%	79%	100%	0%
Reliable	Not important	0%	0%	0%	10%	50%
	Moderately important Very	0%	22%	21%	10%	50%
	important	100%	78 %	79%	80%	0%
Sustainable	Not important Moderately important Very	20% 40%	11% 56%	14% 50%	0% 40%	0% 100%
	important	40%	33%	36%	60%	0%
Revenue	Not important	0%	0%	7%	0%	0%
	Moderately important Very	20%	11%	43%	50%	50%
	important	80%	89%	50%	50%	50%
Integrate	Not important	0%	0%	0%	10%	0%
	Moderately important Very	20%	44%	29%	30%	0%
	important	80%	56%	71%	60%	100%



Factors Important in Technology Updates	Level of Importance	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 13)	Urban (N = 13)
Efficiency	Not important	0%	0%	0%	0%
	Moderately				
	important	100%	8%	23%	15%
	Very important	0%	92 %	77%	85%
Experience	Not important	0%	0%	0%	0%
	Moderately				
	important	0%	8%	8%	15%
	Very important	100%	92 %	92 %	85%
Safety	Not important	0%	0%	0%	0%
	Moderately				
	important	100%	17%	15%	8%
	Very important	0%	83%	85%	92 %
Reliable	Not important	50%	0%	0%	8%
	Moderately				
	important	50%	8%	23%	15%
	Very important	0%	92 %	77%	77%
Sustainable	Not important	0%	8%	15%	8%
	Moderately				
	important	100%	50%	46%	46%
	Very important	0%	42%	38%	46%
Revenue	Not important	0%	0%	8%	0%
	Moderately				
	important	50%	17%	31%	54%
	Very important	50%	83%	62 %	46%
Integrate	Not important	0%	0%	8%	0%
	Moderately				
	important	0%	33%	23%	38%
	Very important	100%	67 %	69 %	62%



Q5.10 For the technologies you currently use, how satisfied are you with their performance?

Agency Size

Technology Type	Satisfaction Level	Small (N = 5)	Medium (N = 9)	Large (N = 14)	Extra Large (N = 10)	Regional Rail (N = 2)
Safety	Not satisfied	0%	13%	0%	10%	0%
	Somewhat satisfied	60%	38%	64%	80%	50%
	Very satisfied	40%	50%	36%	10%	50%
Connect	Not satisfied	0%	0%	8%	0%	0%
	Somewhat satisfied	100%	25%	50%	100%	0%
	Very satisfied	0%	75%	42%	0%	100%
Rider	Not satisfied	0%	0%	25%	22%	50%
	Somewhat satisfied	100%	38%	50%	78%	0%
	Very satisfied	0%	63%	25%	0%	50%
Fare	Not satisfied	50%	0%	21%	11%	0%
	Somewhat satisfied	50%	67%	57%	89%	50%
	Very satisfied	0%	33%	21%	0%	50%
Operator	Not satisfied	50%	0%	10%	0%	0%
	Somewhat satisfied	50%	75%	70%	100%	50%
	Very satisfied	0%	25%	20%	0%	50%
Locate	Not satisfied	25%	11%	21%	20%	0%
	Somewhat satisfied	50%	44%	50%	70%	0%
	Very satisfied	25%	44%	29%	10%	100%

Technology Type	Satisfaction Level	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 13)	Urban (N = 13)
Safety	Not satisfied	0%	0%	17%	0%
	Somewhat satisfied	50%	58%	58%	69 %
	Very satisfied	50%	42%	25%	31%
Connect	Not satisfied	0%	0%	8%	0%
	Somewhat satisfied	0%	71%	50%	89 %
	Very satisfied	100%	29%	42%	11%



Technology Type	Satisfaction Level	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 13)	Urban (N = 13)
Rider	Not satisfied	50%	0%	33%	9%
	Somewhat satisfied	0%	78 %	42%	64%
	Very satisfied	50%	22%	25%	27%
Fare	Not satisfied	0%	20%	25%	9%
	Somewhat satisfied	50%	70%	67%	64%
	Very satisfied	50%	10%	8%	27%
Operator	Not satisfied	0%	20%	11%	0%
	Somewhat satisfied	50%	80%	56%	100%
	Very satisfied	50%	0%	33%	0%
Locate	Not satisfied	0%	9%	23%	23%
	Somewhat satisfied	0%	64 %	54%	46%
	Very satisfied	100%	27%	23%	31%



Q5.11 For the technologies not used by your agency, which of the following are barriers to doing so? (Select all that apply)

There were very few responses because agencies only saw the technologies they did not select in Q3.1 which asked what technologies agencies use, and most agencies selected most of the technologies. The numbers were also limited (to an unknown extent) due to a survey error - the question was intended to select "all that apply", but actually did not allow more than one response - i.e. more than one barrier per technology type. Beyond the survey error, the fact that there were so few respondents who saw these questions makes them somewhat limited in their usefulness. As a result, the survey responses are not included.





Q6.1 How does your agency currently receive or obtain rider feedback? (Select all that apply)





Q6.2 Considering rider feedback and requests for improvements, how important do you think the following are to your riders?

Factor	Level of Importance	Small (N = 6)	Medium (N = 6)	Large (N = 12)	Extra Large (N = 10)	Regional Rail (N = 2)
	Not					
Shorter	important	0%	0%	0%	10%	50%
	Moderately					
	important [']	50%	33%	17%	10%	50%
	Very					
	important	50%	67%	83%	80%	0%
	Not					
Headways	important	17%	0%	0%	10%	0%
-	Moderately					
	important '	33%	33%	17%	20%	100%
	Very					
	important	50%	67%	83%	70%	0%
	Not					
On-time	important	0%	0%	0%	10%	50%
	Moderately					
	important [']	20%	0%	0%	10%	0%
	Very					
	important	80%	100%	100%	80%	50%
	Not					
Location	important	17%	0%	0%	0%	50%
	Moderately					
	important [']	50%	83%	50%	40%	0%
	Very					
	important	33%	17%	50%	60%	50%
	Not					
Mobile	important	50%	17%	33%	10%	50%
	Moderately					
	important [']	17%	67%	58%	70%	50%
	Very					
	important	33%	17%	8%	20%	0%
	Not					
Closed-loop	important	33%	83%	58%	40%	100%
-	Moderately					
	important [']	50%	17%	33%	50%	0%
	Very					
	, important	17%	0%	8%	10%	0%
	Not					
Open-loop	important	33%	17%	25%	0%	0%
	Moderately	, -				
	important	33%	67%	50%	50%	100%



Factor	Level of Importance	Small (N = 6)	Medium (N = 6)	Large (N = 12)	Extra Large (N = 10)	Regional Rail (N = 2)
	Very					
	important	33%	17%	25%	50%	0%
	Not					
Hours	important	0%	0%	0%	10%	0%
	Moderately					
	important	50%	33%	33%	40%	0%
	Very					
	important	50%	67%	67 %	50%	100%
	Not					
Area	important	17%	0%	0%	10%	50%
	Moderately					
	important	0%	33%	50%	20%	0%
	Very					
	important	83%	67%	50%	70%	50%
	Not					
Transfer	important	17%	0%	8%	0%	50%
	Moderately					
	important	33%	67%	25%	30%	0%
	Very					
	important	50%	33%	67%	70%	50%
	Not					
Expand	important	33%	0%	0%	0%	0%
	Moderately					
	important	50%	50%	67%	40%	100%
	Very					
	important	17%	50%	33%	60%	0%
	Not					
Safety	important	0%	0%	0%	0%	0%
	Moderately					
	important	0%	17%	17%	10%	50%
	Very					
	important	100%	83%	83%	90%	50%

Factor	Level of Importance	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 10)	Urban (N = 12)
Shorter	Not important Moderately important	50%	0%	0%	8%
	Very important	0%	42% 58%	70%	92%
Headways	Not important Moderately important	0% 100%	8% 25%	0%	8% 8%
	Very important	0%	67%	60%	83%



Factor	Level of Importance	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 10)	Urban (N = 12)
On-time	Not important Moderately	50%	0%	0%	8%
	important	0%	9%	10%	0%
	Very important	50%	91%	90%	92 %
Location	Not important	50%	8%	0%	0%
	Moderately important	0%	50%	60%	50%
	Very important	50%	42%	40%	50%
Mobile	Not important Moderately important	50%	33%	20%	25%
	Very important	0%	33%	10%	8%
Closed-loop	Not important	100%	50%	60%	50%
	Moderately	0%	33%	30%	50%
	Very important	0%	17%	10%	0%
Openloop	Not important	0%	25%	10%	17%
	Moderately important	100%	50%	50%	50%
	Very important	0%	25%	40%	33%
Hours	Not important	0%	0%	0%	8%
	Moderately important	0%	33%	50%	33%
	Very important	100%	67%	50%	58%
Area	Not important	50%	8%	10%	0%
	Moderately important	0%	8%	40%	42%
	Very important	50%	83%	50%	58%
Transfer	Not important Moderately	50%	8%	0%	8%
	important [']	0%	42%	50%	17%
	Very important	50%	50%	50%	75%
Expand	Not important	0%	17%	0%	0%
	Moderately important	100%	50%	50%	58%
	Very important	0%	33%	50%	42%
Safety	Not important	0%	0%	0%	0%
	Moderately important	50%	8%	20%	8%
	Very important	50%	92 %	80%	92 %





Q6.3 For people who do not use your services, how important do you think the following barriers are in preventing them from using your service?

Factor	Importance to Nonriders	Small (N = 6)	Medium (N = 6)	Large (N = 12)	Extra Large (N = 10)	Regional Rail (N = 2)
Time Savings	Not important	17%	0%	0%	10%	50%
	Moderately important	67%	17%	17%	40%	50%
	Very important	17%	83%	83%	50%	0%
Infrequent Service	Not important Moderately	17%	0%	0%		0% 100%
	important	50%	33%	17%		
Bus Location Information	Not important Moderately important	<u>33%</u> 33% 50%	67% 50% 33%	83%	40%	0% 0% 100%
	Very important	17%	17%	17%	10%	0%
Fare System	Not important Moderately important	67%	33% 67%	25%	10%	0% 100%
	Very important	17%	0%	0%	30%	0%
Legibility	Not important	50%	33%	25%	20%	100%
Legionity	Moderately important Very important	33% 17%	50% 17%	75%	80%	0% 0%
Fares	Not important	67%	100%	100%		50%
i dies	Moderately important	17%	0%	0%	20%	0%
	Very important	17%	0%	0%	10%	50%
Inconvenient Hours	Not important Moderately important	17% 67%	17%	8%	40%	0% 100%
	Very important	17%	33%	42%	30%	0%
Transfers	Not important Moderately	50%	17%	17%	20%	50%
	important Very important	17% 33%	33% 50%	67% 17%	50% 30%	0% 50%
Route Locations	Not important	17%	17%	25%	20%	0%



Factor	Importance to Nonriders	Small (N = 6)	Medium (N = 6)		Extra Large (N = 10)	Regional Rail (N = 2)
	Moderately important	33%	17%	42%	30%	50%
	Very important	50%	67%	33%	50%	50%
Safety	Not important	100%	20%	50%	30%	100%
	Moderately important	0%	60%	33%	30%	0%
	Very important	0%	20%	17%	40%	0%
Cleanliness	Not important	83%	50%	58%	20%	100%
	Moderately important	17%	33%	42%	50%	0%
	Very important	0%	17%	0%	30%	0%

Factor	Importance to Nonriders	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 10)	Urban (N = 12)
Time Savings	Not important	50%	8%	0%	8%
	Moderately important	50%	50%	30%	17%
	Very important	0%	42%	70%	75%
Infrequent Service	Not important	0%	8%	0%	8%
	Moderately important	100%	42%	40%	8%
	Very important	0%	50%	60%	83%
Bus Location Information	Not important	0%	25%	40%	33%
	Moderately important	100%	50%	50%	58%
	Very important	0%	25%	10%	8%
Fare System	Not important Moderately	0%	42%	40%	8%
	important '	100%	42%	60%	75%
	Very important	0%	17%	0%	17%
Legibility	Not important	100%	42%	30%	17%
	Moderately important	0%	42%	70%	83%
	Very important	0%	17%	0%	0%



Factor	Importance to Nonriders	Regional Rail (N = 2)	Rural (N = 12)	Suburban (N = 10)	Urban (N = 12)
Fares	Not important	50%	83%	90 %	83%
	Moderately				
	important [']	0%	8%	10%	8%
	Very				
	important	50%	8%	0%	8%
Inconvenient					
Hours	Not important	0%	8%	30%	25%
	Moderately				
	important	100%	58%	50%	33%
	Very				
	important	0%	33%	20%	42%
Transfers	Not important	50%	33%	20%	17%
	Moderately				
	important	0%	33%	60%	50%
	Very				
	important	50%	33%	20%	33%
Route Locations	Not important	0%	17%	20%	25%
	Moderately important	50%	33%	40%	25%
	Very important	50%	50%	40%	50%
C f - h -	•				
Safety	Not important	100%	67%	33%	42%
	Moderately important	0%	25%	44%	25%
	Very important	0%	8%	22%	33%
Cleanliness	Not important	100%	58%	60%	33%
Ciculiness	Moderately				
	important	0%	25%	40%	50%
	Very	0%	17%	0%	1 707
	important	0%	1/%	0%	17%



Q7.2 How useful to your agency are each of the following ways that Cal-ITP, and/or Caltrans, CIM can support the adoption or updating of technological tools used by your agency?

Program	Level of Usefulness	Small (N = 6)	Medium (N = 9)	Large (N = 14)	Extra Large (N = 11)	Regional Rail (N = 2)
Data	Not useful	17%	0%	0%	0%	0%
	Somewhat					
	useful	33%	56%	50%	45%	50%
	Very useful	50%	44%	50%	55%	50%
Payment	Not useful	17%	22%	21%	9%	0%
	Somewhat useful	17%	44%	29%	36%	50%
	Very useful	67%	33%	50%	55%	50%
Cost Share	Not useful	0%	22%	0%	9%	0%
	Somewhat useful	33%	33%	29%	45%	50%
	Very useful	67%	44%	71%	45%	50%
Procure	Not useful	17%	33%	0%	18%	0%
	Somewhat useful	33%	33%	21%	45%	50%
	Very useful	50%	33%	79%	36%	50%
MSA	Not useful	17%	11%	8%	9%	0%
	Somewhat useful	17%	44%	8%	45%	50%
	Very useful	67%	44%	85%	45%	50%
Sample	Not useful	17%	0%	0%	0%	0%
-	Somewhat useful	17%	50%	7%	36%	100%
	Very useful	67%	50%	93 %	64%	0%
Operational	Not useful	17%	11%	8%	0%	100%
	Somewhat useful	33%	44%	46%	20%	0%
	Very useful	50%	44%	46%	80%	0%
Pilot	Not useful	17%	0%	7%	0%	0%
	Somewhat useful	0%	56%	36%	18%	100%
	Very useful	83%	44%	57%	82%	0%
Training	, Not useful	17%	0%	0%	0%	100%
5	Somewhat useful	0%	44%	50%	45%	0%
	Very useful	83%	56%	50%	55%	0%



Program	Level of Usefulness	Small (N = 6)	Medium (N = 9)	Large (N = 14)	Extra Large (N = 11)	Regional Rail (N = 2)
Technology	Not useful	17%	11%	0%	0%	0%
	Somewhat useful	17%	44%	29%	36%	100%
	Very useful	67%	44%	71%	64%	0%
Data						
Standards	Not useful	0%	11%	14%	0%	0%
	Somewhat useful	33%	56%	29%	55%	100%
	Very useful	67%	33%	57%	45%	0%

Program	Level of Usefulness	Regional Rail (N = 2)	Rural (N = 13)	Suburban (N = 14)	Urban (N = 13)
Data	Not useful	0%	8%	0%	0%
	Somewhat useful	50%	38%	57%	46%
	Very useful	50%	54%	43%	54%
Payment	Not useful	0%	15%	14%	23%
	Somewhat useful	50%	31%	36%	31%
	Very useful	50%	54%	50%	46%
Cost Share	Not useful	0%	8%	14%	0%
	Somewhat useful	50%	31%	36%	38%
	Very useful	50%	62%	50%	62 %
Procure	Not useful	0%	15%	29%	0%
	Somewhat useful	50%	31%	29%	38%
	Very useful	50%	54%	43%	62%
MSA	Not useful	0%	8%	14%	8%
	Somewhat useful	50%	31%	36%	17%
	Very useful	50%	62 %	50%	75%
Sample	Not useful	0%	8%	0%	0%
	Somewhat useful	100%	17%	43%	15%
	Very useful	0%	75%	57%	85%
Operational	Not useful	100%	15%	8%	0%
	Somewhat useful	0%	38%	46%	25%
	Very useful	0%	46%	46%	75%



Program	Level of Usefulness	Regional Rail (N = 2)	Rural (N = 13)	Suburban (N = 14)	Urban (N = 13)
Pilot	Not useful	0%	8%	7%	0%
	Somewhat useful	100%	15%	43%	31%
	Very useful	0%	77%	50%	69 %
Training	Not useful	100%	8%	0%	0%
	Somewhat useful	0%	23%	50%	46%
	Very useful	0%	69 %	50%	54%
Technology	Not useful	0%	15%	0%	0%
	Somewhat useful	100%	23%	29%	46%
	Very useful	0%	62%	71%	54%
Data					
Standards	Not useful	0%	8%	0%	15%
	Somewhat useful	100%	38%	50%	38%
	Very useful	0%	54%	50%	46%



Q7.3 Have you used any of the assistance tools provided by Cal-ITP?

Program	Use of Program	Small (N = 6)	Medium (N = 9)	Large (N = 14)	Extra Large (N = 11)	Regional Rail (N = 2)
EMV	Not interested in					()
Assistance	this service	17%	33%	14%	18%	50%
	Am unfamiliar	,.			,.	
	with this service	17%	22%	14%	27%	0%
	Would like more					
	information about	33%	0%	29%	18%	0%
	Have not used					
	but would like to	17%	22%	7%	18%	0%
	Have used this					
	service	17%	22%	36%	18%	50%
GTFS Data	Not interested in					
Assistance	this service	17%	33%	0%	0%	50%
	Am unfamiliar					
	with this service	33%	11%	8%	0%	0%
	Would like more					
	information about	17%	11%	15%	18%	0%
	Have not used					
	but would like to	0%	0%	15%	36%	0%
	Have used this					
	service	33%	44%	62%	45%	50%
Eligibility	Not interested in					
Verification	this service	60%	22%	0%	9%	50%
	Am unfamiliar					
	with this service	20%	11%	29%	18%	0%
	Would like more					
	information about	20%	22%	29%	27%	50%
	Have not used					
	but would like to	0%	44%	36%	27%	0%
	Have used this					
	service	0%	0%	7%	18%	0%
Operational	Not interested in					
Standards	this service	17%	11%	7%	0%	0%
	Am unfamiliar					
	with this service	33%	11%	7%	18%	0%
	Would like more					
	information about	50%	44%	36%	36%	100%
	Have not used					
	but would like to	0%	33%	43%	18%	0%
	Have used this	~~	~~		~~~	~~
	service	0%	0%	7%	27%	0%



Program	Use of Program	Small (N = 6)	Medium (N = 9)	Large (N = 14)	Extra Large (N = 11)	Regional Rail (N = 2)
Master						
Service	Not interested in					
Agreements	this service	17%	22%	7%	9%	0%
	Am unfamiliar with this service	50%	22%	0%	9%	0%
	Would like more information about	17%	22%	43%	45%	50%
	Have not used but would like to	0%	22%	21%	18%	0%
	Have used this service	17%	11%	29%	18%	50%
Procurement Assistance	Not interested in this service	17%	33%	7%	18%	100%
	Am unfamiliar with this service	33%	0%	0%	18%	0%
	Would like more information about	50%	22%	43%	18%	0%
	Have not used but would like to	0%	44%	14%	18%	0%
	Have used this service	0%	0%	36%	27%	0%

Program	Use of Program	Regional Rail (N = 2)	Rural (N = 13)	Suburban (N = 14)	Urban (N = 13)
EMV	Not interested in				
Assistance	this service	50%	15%	7%	38%
	Am unfamiliar with this service	0%	8%	29%	23%
	Would like more information about	0%	15%	29%	15%
	Have not used but would like to	0%	23%	14%	8%
	Have used this service	50%	38%	21%	15%
GTFS Data Assistance	Not interested in this service	50%	15%	14%	0%
	Am unfamiliar with this service	0%	15%	0%	17%
	Would like more information about	0%	15%	21%	8%
	Have not used but would like to	0%	0%	29%	17%



Program	Use of Program	Regional Rail (N = 2)	Rural (N = 13)	Suburban (N = 14)	Urban (N = 13)
	Have used this				
	service	50%	54%	36%	58%
Eligibility	Not interested in				
Verification	this service	50%	33%	14%	0%
	Am unfamiliar				
	with this service	0%	17%	7%	38%
	Would like more		. – –		
	information about	50%	17%	50%	8%
	Have not used	077	007	0197	0.077
	but would like to	0%	33%	21%	38%
	Have used this	07	007	707	1 5 67
0	service	0%	0%	7%	15%
Operational Standards	Not interested in	007	007	1.407	007
Standaras	this service	0%	8%	14%	0%
	Am unfamiliar	007	0.007	707	1
	with this service	0%	23%	7%	15%
	Would like more	10097	E 107	1207	0.207
	information about Have not used	100%	54%	43%	23%
	but would like to	0%	8%	29%	46%
	Have used this	0/0	0/0	<u>کر /ہ</u>	40/0
	service	0%	8%	7%	15%
Master	3011100	070	070	770	1070
Service	Not interested in				
Agreements	this service	0%	8%	14%	15%
Agreements	Am unfamiliar	070	0/0	11/0	1070
	with this service	0%	38%	7%	0%
	Would like more	070	0070	, , , , , , , , , , , , , , , , , , , ,	070
	information about	50%	23%	43%	38%
	Have not used			,.	
	but would like to	0%	0%	21%	31%
	Have used this				
	service	50%	31%	14%	15%
Procurement	Not interested in				
Assistance	this service	100%	15%	21%	15%
	Am unfamiliar			,,	
	with this service	0%	15%	7%	8%
	Would like more				
	information about	0%	31%	43%	23%
	Have not used				
	but would like to	0%	23%	7%	31%
	Have used this				
	service	0%	15%	21%	23%

