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Public Transit Reform – Prior Research Review

Prepared for
Metropolitan Transportation Commission
Blue Ribbon Transit Recovery Task Force

April 2021

Project Purpose

- The purpose of this report is to present a comprehensive research review on the key public transit challenges faced by the public, with a particular focus on Bay Area-related transit research.
- Objectives:
  - Provide a comprehensive review of public opinion around public transit services in the Bay Area, focused on pre-pandemic perceptions.
  - Understand how the public perceived Bay Area public transit strengths and weaknesses, as well as opportunities for improvement.
  - Identify knowledge gaps that could be addressed with future research, including topic areas and populations studied.
  - Inform the work of the Blue Ribbon Transit Recovery Task Force.

Research Reviewed for this Report

- Approximately 90 different studies, articles, and reports were reviewed for this work, primarily covering the time period prior to the COVID-19 pandemic.
- The studies looked at a range of transportation issues, with much of the research focused on the Bay Area as a region, as well as some individual studies from specific operators or agencies, including AC Transit, BART, Caltrain, Golden Gate Ferry, Golden Gate Transit, SamTrans, SMART, VTA, and WETA.
- The research included studies focused on different regions of the Bay Area, as well as varying resident populations, including public transit riders, non-riders, the general resident population (riders and non-riders), and stakeholders.
- The reports reviewed were primarily based on surveys and qualitative research (focus groups, in-depth interviews, and public outreach sessions).

Data Notes

- While most of the survey research in this review employed strategies designed to obtain a random sample and/or be representative of the population being surveyed, some of the surveys were not designed with this intent. Instead, they were promoted to gather as many responses as possible to an opt-in online survey tool.
- Most of research represented in this report was conducted between 2018 to early 2020, with a few studies in the years prior. Statistics provided should be viewed with caution given that views today may have evolved since the research was conducted.
- Reviewing the studies in their totality gives a clear picture of strengths and challenges facing public transit overall and for some specific agencies. However, as a result of differing research methodologies, question wording, timing, and other factors, we advise that this report be considered only for **general sense of sentiment and issue areas** rather than be interpreted as a singular voice speaking to public opinion regarding public transit in the Bay Area or among each operator.
- A complete list of each piece of research used in this report is provided in the appendix.

Summary of Findings

Summary of Findings

- **The factors influencing use of public transit are universal across the research**: time/speed, reliability/predictability, frequency, ease of use, safety, accessibility, cost, cleanliness/comfort, and ability to connect to first/last mile modes.
- **Convenience-related factors are the most consequential in deciding whether to ride public transit,** with time/speed, reliability (on time and as scheduled), frequency, first/last mile connectivity, and ease of use all adding up to a general perception of "convenience."
  - A perceived lack of convenience in any of these areas is most likely to undermine use of public transit—more so than cost, cleanliness/comfort, and, to some extent, safety.
- **Factors that influence the speed of a trip (how long it takes) are where residents consistently want to see improvement most.** Frequency is generally the most often mentioned area of improvement across all modes and operators; improved reliability is an equally strong consideration, particularly on bus systems.

Summary of Findings

- **Transfers and connections are an area of frustration and a disincentive to use public transit.** Connections often do not line up, which leads to long wait times, sometimes at stations/stops where riders may not feel safe. Furthermore, these connections require riders to keep track of different and sometimes confusing fare structures and operators' payment policies and systems.
- **Better connectivity and coordination across modes and agencies stands out in the research** as a way to improve convenience and ease of travel and increase ridership. Connectivity and coordination include the following:
  - Better transit connections between modes and agencies.
  - Better coordination between agencies on fares and schedules.
  - Better coordination with other forms of transportation, such as on-demand ride services, bike and scooter share, paratransit, and other first/last mile options.

Summary of Findings

- The research revealed that **cost is a lower-level consideration, except for among those who it most impacts: lower income residents.** Cost is measured as a value proposition: For those without other options, is it affordable enough; for those with other options, are lower fares worth reduced convenience?
- **Better use of technology to coordinate travel**, particularly though apps, is seen as a way to improve predictability (by providing real-time arrival information), speed (by reducing waiting time, speeding up fare purchasing/payment, etc.), and first/last mile issues (by coordinating with bikeshare, ride hails, paratransit, etc.).
- There is some perception that **some improvements that could attract new riders could also burden the transit-dependent,** including people with lower incomes and underserved communities. Some of the concerns raised included:
  - More direct and faster service could mean less geographic coverage.
  - Smartphone-dependent apps could exclude those who cannot access that technology.
  - Increased peak-hour frequency could reduce off-peak, impacting shift workers who are more likely to be lower income and have fewer transportation choices.

Detailed Report

Sections

- Factors/Barriers to Transit Use
  - Cost/Affordability
  - Time/Speed
  - Coordination/Connectivity
  - Safety
  - Understanding
  - Inclusion and Equity
- Individual Transit Operators
- Future Research: Gaps and Opportunities
- Appendix: List of Research Reviewed

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Factors/Barriers to Transit Use

Factors Influencing Decision to Ride Transit

- **Understanding**
  - Knowledge/awareness of figuring out fares
  - Complexity/ease of planning rides
  - Fear of the unknown
- **Cost**
  - Affordability; Is the value-proposition positive?
- **Time/Speed**
  - Waiting times
  - Frequency of vehicles
  - Ease of transfers/connections
  - Time spent on vehicle
  - Real-time arrival information
- **Reliability**
  - On time and as scheduled

"Consumers adopt services that are efficient, effective, and right priced."[1]

Factors Influencing Decision to Ride Transit

- **Safety**
  - Safety/personal well-being as travel to and from station/stop, while waiting, and on the vehicle
  - Concerns about other passengers and homeless riders
  - Includes cleanliness or upkeep of vehicles and stations/stops
- **Accessibility**
  - Ability to get to/from the stop/station, access to the vehicle or station
- **First/last mile experience**
  - An easy way to get to first stop and from final stop to destination, including mobility on demand
  - Relates to other factors including affordability, accessibility, safety, time/speed
- **Cleanliness/comfort**
  - Clean
  - Not overcrowded/having a place to sit
  - Operator/driver helpfulness
  - Modern

Factors Influencing Decision to Ride Transit

- **"Convenience" is a powerful determinant for riding public transit—often called the most important factor. Convenience includes (and is undermined by) many of the factors most important in choosing public transit:**
  - **Time/speed**: Getting to a destination quickly, saves time/avoids traffic, adequate frequency of vehicles, low waiting times.
  - **Reliability**: Gets me to where I want to go on time and predictably.
  - **Accessibility**: Includes first/last mile issues, ability to physically navigate the station/stop and vehicles.
  - **Understanding**: Trip planning is easy, navigating the system is easy.

In a 2020 study of Bay Area transit riders, the highest proportion volunteered *convenience* as the *main* reason they choose an alternative transportation method rather than drive alone.[2]

- **Payment: While Clipper generally makes payment more convenient,** the research shows some Clipper challenges detract from this convenience, including issues with loading fares for different systems and delayed availability of funds after loading them onto Clipper. Other studies showed frustration with tapping on and off.

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Cost/Affordability

Cost: Affordability

- Cost is a barrier for those who need or depend on public transit most—low-income people.
- For potential and non-riders in particular, cost is a lower priority concern and most often not a notable barrier. They do prioritize affordability, but are less likely to say cost is a primary issue.
- Cost is an equity issue; for example, on Caltrain where the cost of taking the train is sometimes higher than the cost of driving.

"$16.50 round-trip fare from EPA to SSF is a barrier for moderate income people and insurmountable for low-income riders, many of whom are frontline service workers who commute during off-peak hours. Only when the cost of this 50-mile round-trip commute on Caltrain ($16.50) is cheaper or at least competitive with 50 miles worth of gas ($7) can low-income people consider using Caltrain."[3] -Stakeholder

In a 2018 San Francisco resident survey, 47% said "cost" is a very important factor in choosing their mode of transportation in San Francisco—far lower than the 73% to 82% who gave this response about ease of use, travel time, and convenience. Overall, however, cost is at least "somewhat" important to 85%.[4]

Cost: Affordability

In a 2020 study of Alameda County residents, 44% agreed *riding transit is affordable,* and 75% called *improving the affordability of public transit* a priority (41% a "major" priority). While affordability was a greater concern to lower income residents in this study, it did not supersede frequency and reliability or safety and cleanliness.[3]

- In a 2021 Bay Area study, cost concerns were balanced with concerns about frequency and availability; cost was rarely the most important factor alone—even among those in the lowest income bracket (< $25,000). However, **as a respondent's income increased, there was a greater importance placed on frequency and quality over cost**.[5]
- There is support and the perception of need for discounted fares for seniors, students, and low-income residents.

Cost: Value Proposition

- **Cost of travel is often measured as a value proposition.**
- A 2021 Bay Area study concluded that cost is also measured in terms of value, which combines "the question of 'is transit a good use of my money' with other demands such as 'it takes me where I want to go, it treats me with respect, it's a good use of my time, etc.'" The value of the cost is evaluated in light of the stages of the rider's journey.[5]
  - For example, paying more to ride transit than it costs to drive may be worth it to avoid traffic and a long commute, while saving money may not be worth it if public transit is perceived to take too long.
- These findings are supported by research conducted by various agencies.

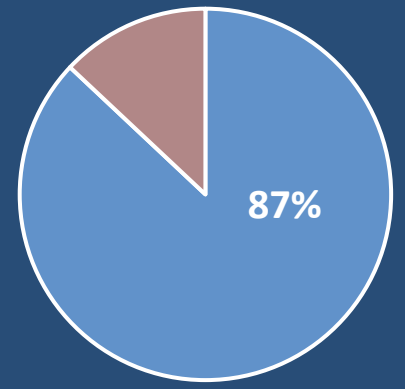
In 2019 San Mateo County focus groups, some said they would take the bus even if it is slower because it costs less than driving and parking or dealing with other car issues.[6]

Time/Speed

Time/Speed

- **Fast, efficient transit is one of the prime factors influencing the use of public transit.**
- One of the most often reported issues with public transit is how long it takes to reach a destination—that it is "not competitive with driving."[7]
- Optimal speed of transit requires:
  - Reliability
  - More frequent service
  - More direct service
  - Seamless transfers/connections
  - Transit close to home/work
  - Real-time arrival information
  - Easy payment/fare coordination

87% of Alameda County residents call *improving the frequency and reliability of public transit* a priority.[3]



- Together these attributes lead to less waiting times at stations and less time in transit—and the "convenience" which is critical to transit use.

Time/Speed

"It's not the true speed that matters; it's the relative speed."[1]

- When it comes to assessing speed, it is "relative speed that matters."[1]
  - A Los Angeles study showed that transit market share was high when travel time using transit was 50% or better than the time it would take by auto.[1]
  - San Mateo County focus groups also showed riders would drive when the difference in time between driving and public transit would be too large.[6]
  - The Los Angeles study also showed that, when it comes to evaluating time, better frequency matters more for short trips (to reduce wait times) compared to longer trips where in-vehicle speeds are important.[1]

Time/Speed: Waiting

- "Waiting" reflects a number of factors: the amount of time to get to/from a stop/station, at that stop/station, on the vehicle, and making connections. Inadequate frequency of vehicles produces longer wait times.
- Waiting elicits concern about personal well-being or safety when waiting for transit—especially at night.
- A number of studies show frustration with buses not being on time or reliable—leading to longer wait times.
- Studies consistently found a strong desire for real-time updates—and at every stage of one's travel to reduce waiting time.

60% of non-Caltrain riders in a Peninsula region study agreed *it really bothers me to have to wait for a train or a bus.*[8]

Time/Speed: Frequency

- A lack of frequency is a major barrier to public transit use and is an issue across all modes of public transit. Research consistently found a desire for trains/buses to run more often.
- Not only do residents want more frequency at peak commute times, but also early morning, late evening, mid-day, and weekends.
- Increased frequency during off-peak hours is particularly important for low-income riders and students who often depend on public transit at non-traditional commuter hours. As a result, frequency is an equity issue as well.

In a 2018 San Francisco resident study, 62% said that, if Muni ran more frequently, they would take it more often.[4]

- Infrequent buses and trains cause stress and lead many to fear that missing a bus or train will lead to the rider waiting up to an hour for the next vehicle or missing the last train or bus of the evening.

Time/Speed: Frequency/Speed vs. Coverage

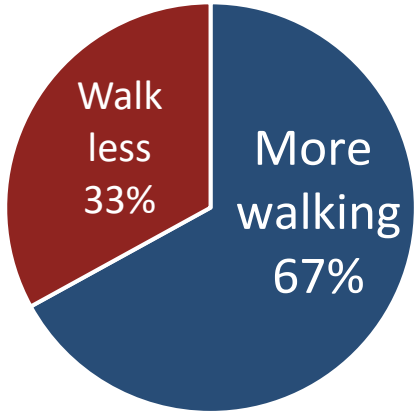
- **The design of coverage-based networks provides residents with a bus route close to where they live or work, but, as a result, not a direct or frequent route.**
- This design serves the most people with the least resources, but impedes fulfilling the desire for frequent, direct, and fast service.[9]
  - As explored in a NVTA needs assessment, maximizing coverage results in multiple transfers that can confuse, circuitous routes, indirect routes, service hours aligned with traditional work hours that do not match non-peak work hours, and timed transfers that lead to uncertainty for passengers.[9]
- **The desire for more frequency does not overwhelm the desire for more coverage.** In a 2015 AC Transit study, 59% prefer new resources to be used to add buses to routes with high ridership, while 41% prefer new resources to be used to increase coverage to areas without existing service.[10]

Time/Speed: Frequency

- **Across numerous surveys, respondents prefer faster/more frequent buses with a longer walk to a bus stop over shorter walks and slower/less frequent buses.**

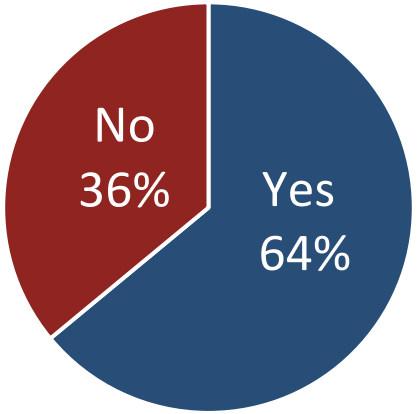
SamTrans[11]

Would you prefer: Routes serve fewer stops spaced further apart, requiring more walking in order to speed up the trip OR routes that serve many stops close together to minimize walking, even if it slows down the route.



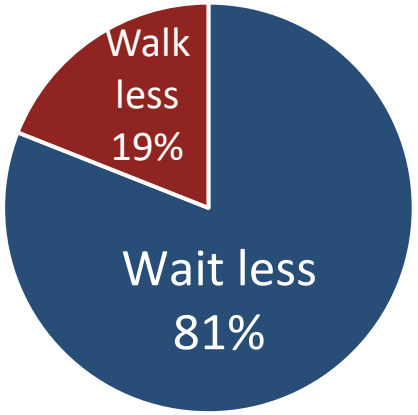
NVTA Vine [9]

Would you be willing to travel farther from your house to a bus stop if the service was more frequent and/or direct?



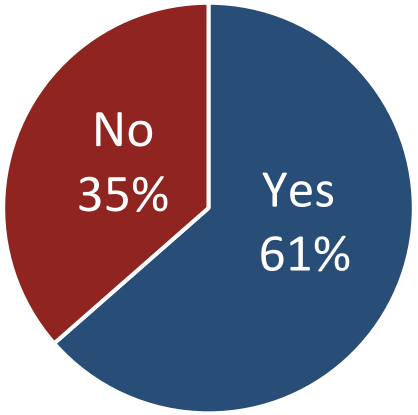
AC Transit[10]

In general, which option best describes the type of transit you prefer to use: walk less, but wait longer OR wait less, but walk further



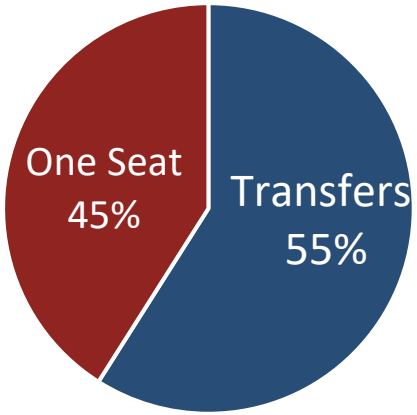
Muni[12]

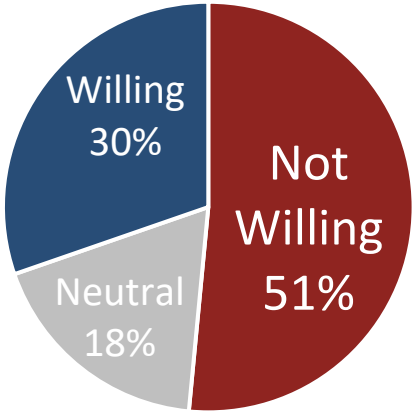
Would you consider walking a longer distance to your Muni stop if you knew it would reduce your overall travel time?



Time/Speed: Transfers

- While residents want more frequency, the research suggests that they are more divided over if a network of more frequent service that relies on transfers is the way to do that—perhaps because transfers suggest more time and inconvenience.
  - In a 2015 AC Transit study, 55% preferred a network of more frequent service that relies on transfers between routes, while 45% preferred a one seat ride, with less frequent and less direct service.[10]





  - In a 2017 study of Transbay riders, 51% are not willing to transfer from another mode onto Transbay service even if there were faster and more frequent service.[13]

Time/Speed: Real-Time Information

"The impacts of real-time information on passenger wait times are the most common positive finding in the literature. Accessing real-time information from a passenger's place of origin (e.g., home or work) enables the rider to 'time' his or her arrival to a stop to reduce his/her actual wait time."

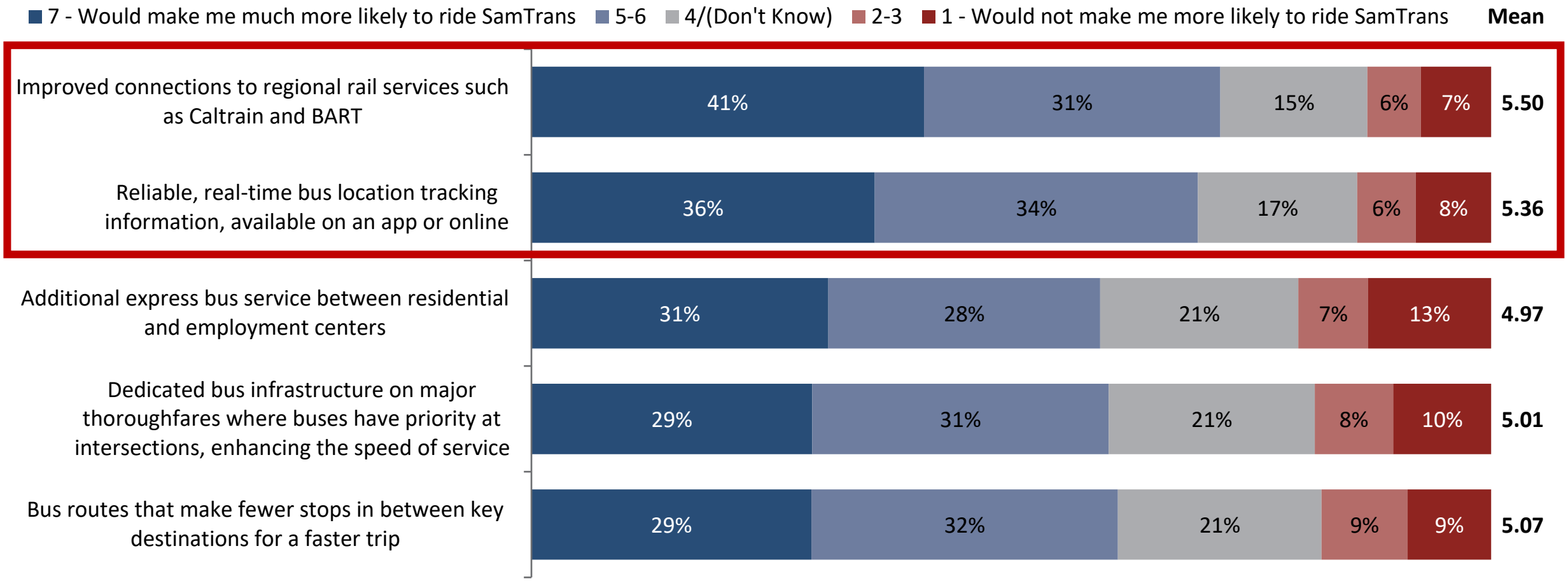
- A Literature Review of the Passenger Benefits of Real-Time Transit Information (Brakewood & Watkins) [14]

Throughout the research, there is a strong desire for "cohesive real-time information for passengers."

- Real-time information is routinely mentioned to improve predictability/reliability and trip planning, reduce waiting times, overcome frequency/schedule issues and, therefore, increase ease and speed of travel.
- A literature review of studies over the past two decades of real-time information through signage and personal devices on bus systems, light rail, heavy rail, and commuter rail found that real-time information has both real and perceived benefits of reducing waiting time and increasing transit use. It also leads to increased perception of personal security and increased satisfaction with transit overall.[14]
- In one study among Clipper Card customers, 85% reported being interested—with 72% very interested—in real-time arrival information. This was the most compelling feature tested.[15]

Real-time Information

- **A 2019 SamTrans resident survey found that the improvements most likely to lead to more transit use focused on connections and real-time information.**[16]



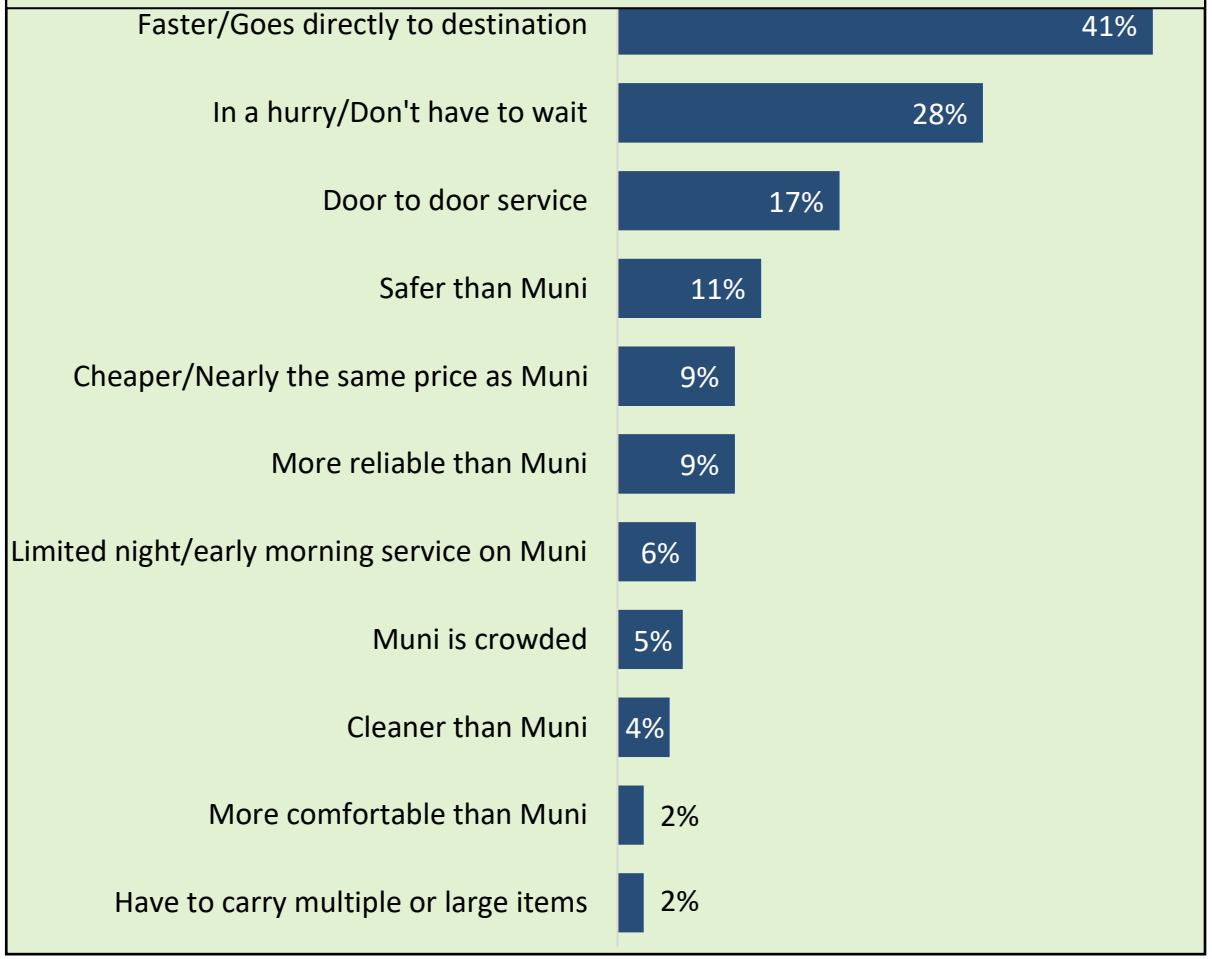
The following are service changes that SamTrans may consider implementing in the future. For each, please indicate how likely you would be to ride SamTrans if that service change were implemented locally.

Time/Speed: TNCs

Transportation Network Companies (TNCs) provide fast, efficient transportation

- In a 2018 survey of Muni riders, the top three reasons riders volunteered for choosing to use ride hailing services instead of Muni related to time or speed of transit: 41% because it is faster or goes directly to their destination, 28% when they are in a hurry and do not have to wait, and 17% for door-to-door service.[12]
- A NVTA study reported that TNCs have influenced a decline in Vine bus ridership, among other factors.[9]
- In a 2018 survey of San Francisco residents, 44% said they use on-demand ride-hail like Uber or Lyft for trips that I used to take Muni for.[4]

What is the main reason you choose a ride hailing service like Uber or Lyft rather than Muni?[12]



Coordination/Connectivity

Coordination/Connectivity

- **Research shows that a lack of coordination and connectivity across agencies makes it difficult to plan trips and creates equity issues.**
  - Focus groups of Bay Area residents in 2020 found that "users find it difficult to plan journeys that require more than one operator."[17]
- **Studies show a desire for agencies/systems to coordinate.**
  - 88% support requirements for Bay Area public bus and train agencies to coordinate schedules, fare structures, and payment systems throughout the Bay Area.[18]
  - 71% believe there should be a regional plan guiding all transportation improvements in the Bay Area, rather than believing transportation planning should be done by individual counties and local transportation agencies (25% choose this option).[18]

"There should be one integrated transit system in the region with connections and adjunct transportation to make it the fastest and most reliable system."

- Sonoma County Resident [7]

Coordination/Connectivity

Residents want seamless transit connections.

- In an Alameda County resident survey, 83% called improving connections between different public transit services a priority (45% a major priority). And 80% said more convenient connections between different transit services (e.g., AC Transit and BART) is a top three priority.[3]
- Of all service changes tested in a 2019 survey of San Mateo County residents, the highest proportion, 72%, said they would be likely to ride SamTrans if it had improved connections to regional rail services such as Caltrain and BART.[16]
- When non-Caltrain riders on the Peninsula were asked what is the single most important thing Caltrain could do to increase the number of trips you take on Caltrain, 21% volunteered more connectivity/locations.[8]

> "The potential for a fully seamless single transit ride—even within Sonoma County—is limited by the fragmented nature of transit and other service providing organizations, each one with their own service area, service boundaries, hours of operation, coordinated agreement, fare policy, funding reserve policy, and key performance indicators."
>
> - Sonoma County Area Agency on Aging Discovery Report[19]

Coordination/Connectivity: Payment convergence

- Research supports the idea that **"fares are inconsistent and confusing across multiple agencies with invisible service boundaries."**[19]
  - **Payment Convergence Benefits:** One study showcased the value of payment convergence with private parties, including parking lots; car, bike, scooter sharing accounts; and ride hailing companies. A study of 36 transit agencies found that most agencies expect payment convergence to lead to "an increase in transit ridership; reduced transit boarding time;" "decrease in waiting time for purchasing and topping-up fare media;" and "the ability to offer cross-program incentives across customer groups such as seniors, students, and those with disabilities." It will provide a more seamless experience.[20]
  - **Payment Convergence Challenges:** Payment convergence is challenged to provide equity for those without access to electronic payment, smartphones, credit cards, and those who are under- or unbanked. Multiple studies show limited access to internet and mobile information for underserved communities and seniors. It also raises issues of customer privacy and protection of data.

Coordination/Connectivity: A Multimodal, Multi-Agency App

- **Bay Area residents are eager for online tools, in particular apps, to help manage and coordinate all aspects of their trip—particularly one that is integrated across modes and agencies.**
  - A Sonoma County study explained how "a person hypothetically traveling from central Guerneville to southeastern Petaluma via paratransit would need to consult multiple online paratransit rider's guides across multiple websites to make a fully informed travel decision." The study explained, "There is also demand for a centralized online resource location with consistent standards/services which would help with confusion between agencies and local transit providers."[19]
  - Related, there is a strong interest in apps to manage multi-modal and multi-system trips that provide a coordinated way to receive real-time arrival information; make payments; and trip plan, including first/last mile planning (including parking, micro-mobility options such as bike, scooter as well as carpool and TNCs).
  - Apps and other new technology can produce issues around equity and inclusion for those without access to Smartphones and the Internet.

The integration of fare media and trip planners into real-time information apps allow passengers to consult one app for all their transit needs. Multimodal information – including private and public transportation options—in real-time trip planners is another interesting area for future research.

- A Literature Review of the Passenger Benefits of Real-Time Transit Information (Brakewood & Watkins) [14]

Technology: MOD Sandbox Case Studies

Case Study: Valley Metro Pass2GoApp®[21]

- Provided a robust trip planning experience; produced a mobile ticket for bus and rail; and provided a single payment solution for both public transit and a TNC project partner.
- The average planning and wait times of Pass2Go® users decreased. Users reported greater connectivity with public transportation using information augmented in Pass2Go®. User behavior showed greater use of connecting first-mile and last-mile modes through measured activity. Pass2Go® users with disabilities found that trip planning methods were improved.

Case Study: TriMet: OpenTripPlanner[21]

- Designed to expand the OpenTripPlanner with shared mobility, implement an improved geocoder, help TriMet customers make informed mobility decisions to bridge first- and last-mile gaps, prioritize low stress routing for active transportation, provide enhanced accessibility information for travelers.
- Forty percent (40%) said the addition of shared mobility options moderately or greatly improved their mobility. Fifty-five percent (55%) said that the real-time information provided was very useful. A majority of respondents believed that the trip planner improved first- and last-mile connections to transit and the ability to make multimodal trips.

Safety

Safety

"But also more needs to be done to make public transit a pleasant and safe experience. Hearing stories about people getting stabbed or having it smell like urine every time you step on makes people want to drive their car instead for their own safety and enjoyment. In Portland, Oregon, public transit is actually kind of delightful. How can we make ours similar?"[22]

- **A negative perception of safety is a barrier to public transit use**, although it is not as high a priority as other issues. Safety issues include:
  - **On transit:** Awareness of rising crime, exposure to unsafe or unclean-presenting individuals, lack of obvious transit personnel makes riders feel they have to be on their guard when riding, even before the pandemic.
  - **While waiting:** Lack of lighting, not feeling protected from traffic at stops, and long wait times (again, related to frequency, transfers, coordination) all make riders feel vulnerable.
  - **First/last mile:** Sense of safety walking or biking to and from stations/stops, especially neighborhoods where there are no sidewalks, poor lighting, or lack of a safe environment.

Understanding

Understanding

- **Gaps in understanding pose barriers to public transit use.**
  - Not knowing how "to do it"—how to figure out the buses or fear of ending up in the wrong place.
  - How to pay for a multi-modal ride; how to navigate different fare structures; how to use a Clipper Card.
  - Low awareness of existing apps and other tools to help plan a public transit trip.

"That's another thing if we knew, at least for myself if I knew the right trains to get on and the right buses, if I knew more schedules, if it didn't take so much effort to try to figure it out."
- Potential rider woman[6]

"The bus to me, for whatever reason, is just one step too much for me. I feel like taking the bus has its own little way of doing things and culture and stuff, but I just don't know how to do it, and I feel too stressed doing it on my own . . . I just wouldn't mess with it in fear of ending up in the wrong place . . . If it's a route that I've done before, then sure, I'd whatever [but] finding out new ones is not my cup of tea." – Transit rider from San Francisco.[5]

Inclusion and Equity

Inclusion/Equity

- **Inclusion and equity issues emerge in virtually every aspect of the public transit experience, including understanding (such a language barriers), costs, payment systems, first/last mile issues, frequency (and schedules), coverage, and safety.**
  - Inclusion and equity issues create more significant barriers to transit use for seniors, people who are disabled, and the underserved—the very groups who often rely on public transit most.
  - To this point, a SamTrans paratransit survey found that issues related to access, reliability, routes, schedules, and time it takes to reach destination are more significant barriers for those with disabilities, including those who rely on paratransit services. Most do not use fixed-route SamTrans buses or Caltrain often as a result. However, they are satisfied with paratransit services.[23]

"Seniors and people with mobility issues need a transportation system that is reliable and meets a variety of needs from shopping to medical appointments to visiting with friends"– Livermore Resident[3]

". . . All these factors individually aren't a big deal, but collectively they create a negative rider experience. If. . . I'm older or with a severe disability, I might it extremely daunting."– Transit rider from San Francisco[5]

Inclusion/Equity

- **Examples of inclusion/equity issues among factors that influence the public transit experience:**
  - **Frequency**: Lower income residents are more likely to commute during non-peak hours, where there is more limited service. If they miss the last train or bus and are unable to afford a TNC or find another means, they could end up stranded.
  - **Speed and reliability**: Residents in low-income areas—like the Bayview neighborhood in San Francisco as one study discussed—often face longer travel times to get to jobs, health care, and other essential trips. This means they face more congestion, which impacts reliability. Addressing long and unreliable travel is a particular issue as a result.[24]
  - **Cost**: As mentioned earlier, cost is a particular barrier to using some modes of transit—such as Caltrain—or a more significant economic stressor for transit-dependent riders who are making the choice between getting to work or paying for groceries.
  - **Payment**: Those who use the Clipper Card are satisfied with it and satisfied with it across agencies.[15] However, there is less access to the Clipper Card for those who are unbanked or do not have access to the Internet or a smartphone.
  - **Understanding**: A Caltrain study reported that the "fragmented nature of public transit service in the Bay Area makes it difficult for riders, especially those from marginalized and limited-English-proficient backgrounds, to navigate myriad systems and agencies.[25]

Inclusion/Equity: First/Last Mile Issues

- **First/last mile challenges can lead to inequities in public transit opportunities.**
- Challenges in covering transportation for the first/last mile of one's trip are not only disincentives for many to ride public transit, but particular barriers for the most underserved.
- Research shows concern about the safety of sidewalks, walking, and biking, and safety from traffic in getting to or from stops/stations, particularly in Communities of Concern.
- In addition to safety concerns, some residents simply cannot walk to the closest bus or transit stop. Two in ten respondents in a Sonoma County survey focused on older residents gave this response when asked why they do not use public transportation.[19]

"Service workers and laborers often don't have cars and can't walk across town to get to Caltrain. They take the bus because the stops are spread throughout their neighborhoods."

- Stakeholder[25]

Inclusion/Equity: Caltrain

- **A Caltrain Business Plan Equity Assessment[25] highlighted how issues around equity emerge related to Caltrain. To improve equity, the study found that Caltrain should provide:**
  - More late night and early morning service
  - Better connected coordinating services during early morning and late evening hours
  - Better connecting bus service
  - Better bike and pedestrian connections
  - Discounted fares for low-income riders
- **Stakeholders also mentioned issues with inclusion.** One stakeholder who offered feedback in this study said he is more comfortable on BART than on Caltrain, because ridership is more diverse on BART. On Caltrain, he is nervous when the conductor comes for his ticket because he feels he does not "belong;" he thinks it is especially intimidating for non-English speakers. Someone else mentioned that Caltrain doesn't seem like it is intended for their use (their community), and another said his vision is that Caltrain would be a leader in celebrating the diversity and international population in the Bay Area. He said Caltrain could do this by making all signage in multiple languages.

EMC research

Individual Transit Agencies

Transit Agencies - Summary

There are different perceptions of strengths and weakness of transit agencies.

- While each agency is perceived differently in the areas influencing the use of transit, the research review generally shows modestly favorable reviews at best, even in each agency's strongest areas. This indicates that broad-based improvements are needed to meet the needs of those who can—and cannot—make a choice to take it.
  - **AC Transit:** AC Transit is seen providing broad coverage at a reasonable cost, with relatively less concern about safety. While it is valued for its accessibility, it is not seen as fast, reliable, or frequent—the most important convenience factors.
  - **BART:** BART is more positively reviewed for being reliable and frequent, but it is the most likely to be viewed as unsafe and poorly maintained across the transit systems.
  - **Muni**: Muni is well-regarded for being accessible and affordable. It gets its highest marks for being convenient and easy even though it gets its weakest reviews for reliability, frequency, and speed.

    Caltrain: Caltrain is seen as reliable, easy, safe, clean, comfortable (other than being overcrowded), and low stress. However, riders and non-riders would like more frequent service and better connection with other systems, such as SamTrans and VTA. It is also considered expensive—which may not be a barrier to those who ride Caltrain most often, but it is a barrier to people with lower incomes who may want to take it but find it less costly to drive.
  - **SamTrans:** SamTrans is generally viewed positively for being clean, safe, and affordable. As with other bus systems, it is less well-regarded for its speed, frequency, and reliability, but also its coverage and first/last mile needs. One of SamTrans' greatest weaknesses, however, is its low familiarity.

Stronger/Weaker Attributes by Agency

	AC Transit	BART	Muni	Caltrain	SamTrans
Frequency					
Speed					
Reliability/On-time performance					
Cost					
Safety					
Accessibility					
Cleanliness/Comfort					
Ease of use					
Friendly/helpful drivers/operators					

More positively perceived

Greater need for improvement

AC Transit

Strengths

- Cost
- Safety
- Accessibility
- Friendly/helpful operators
- Coverage

Challenges/Areas of Improvement

- Frequency
- Speed
- Reliability/On-time performance
- Cleanliness/Comfort
- Routes

BART

Strengths

- Frequency
- Reliability/On-time performance
- BART receives generally positive reviews, but higher unfavorables among resident populations than other transit

Challenges/Areas of Improvement

- Cost
- Safety
- Cleanliness
- Overcrowding
- Fare enforcement

"Sad to see trash all over the trains, lots of ripped out seats. No police or security. Active smoking and drug use on trains." – BART rider[28]

Muni

Strengths

- Cost
- Accessibility
- Helpful Operators
- Ease of use
- Convenience
- Coverage
- Muni receives modest ratings among San Francisco residents generally, but more positive reviews from riders.

Challenges/Areas of Improvement

- Frequency
- Speed
- Reliability/On-time performance
- Safety
- Cleanliness/Comfort
- Overcrowding

Caltrain

Strengths

- Reliability/On-time performance
- Safety
- Cleanliness/comfort
- Helpful conductors
- Ease of use (low stress)
- Caltrain receives positive reviews from riders and non-riders who are familiar

Challenges/Areas of Improvement

- Frequency
- Speed (related to frequency)
- Cost
- Connections/coordination
- Overcrowding
- First/last mile
- Inclusion

SamTrans

Strengths

- Cost
- Safety
- Cleanliness/Comfort
- Helpful/Courteous operators
- Easy to use
- SamTrans receives favorable ratings from riders

Challenges/Areas of Improvement

- Frequency
- Speed
- Reliability/on-time performance
- Coverage/routes
- First/Last Mile
- Connections
- Lack of familiarity

Future Research: Gaps and Opportunities

Gap/Opportunity: Consistent Regional Data

- Existing research is fragmented and not uniform with respect to populations studied, survey language, and positioning.
- This makes it a challenge to generalize what the overall population of the Bay Area thinks about public transit, and what improvements would best attract more riders.
- Uniform regional research would help compare the perceived value of potential improvements, as well as concerns about how improvements might impact vulnerable populations.

Gap/Opportunity: Transit-Dependent Individuals

- How can we preserve public transit services for transit-dependent riders while also making improvements that attract new choice riders? Put another way, how can we make the kinds of changes needed to draw new riders while ensuring those who do not have other choice still have high-quality, timely, and affordable public transit services available to them?
- How can fares remain affordable for low-income riders who cannot afford other modes?
- How can technology be leveraged to improve transit for riders without leaving out transit-dependent populations, particularly seniors and lower income riders?
- For the transit-dependent, what is the value of peak-hour capacity improvements between significant origins & destinations versus expansion of service at off-peak times and/or to more locations?

Gap/Opportunity: Regional/Multimodal Commuters

- For people currently transferring between operators on their regular trips, which aspects of coordination and integration are most important to them?
  - How can transit reform make their trip easier?
  - Would these riders prefer a “one seat” ride, even if it may take longer to get there?
  - Is a “one fare” policy that reduces their total fare more or less important than reducing transfers between agencies for their trip?
- Research on “the trip not taken” for regional/multi-county commuters:
  - Why is transit not an option for some of those whose commute patterns can be served by a multi-modal trip?
  - Would better-coordinated transit across agencies encourage transit use among people who currently choose to drive because they feel taking transit would be too cumbersome?
  - How significant of a barrier is the cost of transfers/additional fares to transit riding for this group?

EMC research

Appendix:
List of Research Reviewed

Appendix – Reviewed Research – Cited

Refer-ence	Article/Study name	Agency/Sponsor	Report Date/Date of Survey/Focus Groups*	Population
1	Transit Market Research Powered by Customer Data		Oct. 2018	
2	Spare the Air Everyday Survey Report	BAAQMD	May-Sept. 2020	Bay Area driving age resident survey
3	Alameda Countywide Transportation Plan 2020: Outreach Summary Report	ACTC	Survey: May 2019; Outreach: Oct. 2019-Feb. 2020	Countywide resident survey (EMC); Community-based Transportation Plan Outreach: survey at pop ups, focus groups with community leaders and CBOs by phone, online survey
4	Mail, Phone, Web Survey of Adult Residents in the City of San Francisco (EMC)	SFMTA	Sept.-Nov. 2018	San Francisco resident survey
5	MTC Fare Coordination: Barriers to Taking Transit	MTC	Feb. 2021	14 IDIs of frequent transit riders & SenseMaker survey
6	SamTrans Rider and Non-Rider Focus Groups Fall 2019 (EMC)	SamTrans	Sept-Oct. 2019	2 focus groups, riders and potential riders
7	Sonoma Comprehensive Transportation Plan 2050 CTP Public Engagement Information for Blue Ribbon TRTF	Sonoma County	Aug.-Sept. 2019	Community outreach and surveys - various methodologies, including Transportation needs survey
8	Online/Address-Based Survey of Caltrain Non-riders, Peninsula Corridor (EMC)	Caltrain	Feb.-April 2019	Caltrain non-rider survey
9	Vine Vision: Comprehensive Operational Analysis (COA) Report	NVTA	2017	Includes a Napa County resident survey
10	AC Transit Staff Report Memo: Summary of Public Outreach for Comprehensive Operations Analysis	AC Transit	Jan. 2015	Includes resident survey
11	Reimagine SamTrans: Board of Directors Ad-Hoc Committee Meetings #3 Presentation	SamTrans	Jan. 2020	Countywide rider and non-rider survey and focus groups
12	San Francisco Municipal Transportation Agency Ridership Survey 2018	SFMTA	June-Aug. 2018	S.F. Muni rider survey
13	Transbay Tomorrow- Phase One Update on Existing Conditions and Outreach 2017	AC Transit	May-July 2017	Includes Transbay rider survey and Transbay operators survey
14	A Literature Review of the Passenger Benefits of Real-Time Transit Information (Candance Brakewood, University of Tennessee and Kari Edison Watkins, Georgia Institute of Technology		April 2018	
15	Clipper Customer Intercept Research Report 2019 (EMC)	MTC	Sept.-Oct. 2019	Bay Area transit rider onboard survey (multiple agencies)

*Dates reflect dates qualitative or quantitative research was conducted. If not available, dates reflect report publication date.

Appendix – Reviewed Research – Cited Cont.

Refer-ence	Article/Study name	Agency/Sponsor	Report Date/Date of Survey/Focus Groups	Population
16	SamTrans Comprehensive Operational Analysis Opinion Research (EMC)	SamTrans	Sept-Oct. 2019	San Mateo County resident survey (segmented to identify potential riders) and focus groups with riders and potential rides
17	Regional Transit Mapping and Wayfinding Project Focus Group Summary	MTC	Dec. 2020	Bay Area resident focus groups
18	Hybrid Telephone/Email-to-Web Survey of Bay Area Residents (EMC)		July-Aug. 2020	Bay Area resident survey
19	Sonoma County Area Agency on Aging: Discovery Report Version 1.1	Sonoma County Area Agency on Aging	Jan. 2021	Focus groups and survey with older adults and people with disabilities; interviews with stakeholders and practitioners; literature review
20	TCRP Synthesis 144 Multimodal Fare Payment Integration: A Synthesis of Transit Practice	Federal Transit Administration	2020	
21	Findings and Lessons Learned from the MOD Sandbox Trip Planning and Fare Payment Deployments	U.S. Dept. of Transportation	Feb. 2021	Case studies
22	Plan Bay Area 2050: Congestion and Crowding survey results	MTA- Association of Bay Area Governments	July- Aug. 2020	Not identified
23	Telephone Survey of Redi-Wheels/RediCoast Customers	SamTrans	Oct. 2020	Redi-Wheels/RediCoast Paratransit rider survey
24	Bayview Hunters Point Express Report	SFMTA	Feb. 2021	
25	Caltrain Business Plan - Equity Assessment (Review of various community plans from 2006-2019)	Caltrain	2006-2019	
26	Telephone Survey Among Adults in the AC Transit Service Area (EMC)	AC Transit	June 2017	AC Transit service area resident survey
27	AC Transit: 2017 Public Perception Survey by Ward (EMC)	AC Transit	June 2017	AC Transit service area resident survey
28	BART Customer Satisfaction Survey 2020	BART	Oct. 2020	BART onboard rider survey
29	BART Customer Satisfaction Survey 2018	BART	Sept.-Oct. 2018	BART onboard rider survey

Appendix – Reviewed Research – Cited Cont.

Refer-ence	Article/Study name	Agency/Sponsor	Report Date/Date of Survey/Focus Groups	Population
30	Online Survey of Caltrain Riders, Peninsula Corridor (EMC)	Caltrain	Feb.-April 2019	Caltrain rider survey
31	Muni Concept Testing Focus Groups 2019 (EMC)	SFMTA	May 2019	Muni potential rider focus groups
32	2019 Caltrain Customer Satisfaction Survey	Caltrain	May-June 2019	Caltrain onboard rider survey
33	Caltrain Rider and Non-Rider Focus Groups report (EMC)	Caltrain	Dec. 2018	Caltrain rider/non-rider focus groups
34	Caltrain Triennial Customer Survey 2019	Caltrain	Nov. 2019	Caltrain onboard rider survey
35	Caltrain Fare Survey Combined Report: Focus Groups, Go Pass Research (EMC)	Caltrain	May-June 2017	Focus groups with riders, survey of Go Pass Administrators, IDIs with Go Pass financial decision makers
36	2019 SamTrans Customer Survey: Systemwide On-Board Bus Survey	SamTrans	April-May 2019	SamTrans onboard rider survey

Appendix – Other Reviewed Research

Article/Study name	Agency/Sponsor	Report Date/Date of Survey/Focus Groups	Population
Redesign: Fremont/Newark	AC Transit	Oct. 2019	Rider and non-rider survey
COVID-19 Rider Survey Question and Response Analysis	AC Transit		AC Transit Rider survey
Survey of Likely November 2020 AC Transit Service Area (EMC)	AC Transit	May 2020	ACT transit service area resident survey
Alameda County Resident Survey: Countywide Transportation Update Plan	ACTC	May 2019	Alameda County adults survey
Alameda County Community-Based Transportation Plan	ACTC	Dec. 2020	Includes intercept survey
Survey of Likely November 2020 Voters Regarding A Potential Sales Tax for Caltrain (EMC)	Caltrain	June 2020	Voter survey
Contra Costa County Voter Survey 2019 (EMC)	CCTA	May 2019	Voter survey
Golden Gate Transit Rider and Non-Rider Focus Groups	Golden Gate Transit	May 2018	Sonoma/Marin County rider and non-rider focus groups
Public-Private Collaborations for Transforming Urban Mobility	McKinsey & Company	Nov. 2017	
NVTA Countywide Transportation Plan 2045: Community Input Summary Report	NVTA	Aug. 2019-Jan. 2020	Includes in-person and online engagement opportunities, including online survey
Napa Valley Community-based Transportation Plan 2018	NVTA	2018	Includes public outreach events and CBTP resident survey
2018 SamTrans Triennial Customer Survey Key Findings – Fare Working Group	Sam Trans	Oct.-Nov, 2018	SamTrans onboard rider survey
Reimagine Community Survey	SamTrans	date unknown	
SamTrans Covid-19 Rider Survey July 2020	SamTrans	June-July 2020	SamTrans rider survey
2019 Travel Decision Survey Presentation and Detailed Report	SFMTA	May-Aug. 2019	Bay Area resident survey
Large Building Study, Survey Findings – Demographics	SFMTA	Fall 2019	Survey of residents of multi-family buildings with 50+ units in certain neighborhoods

Appendix – Other Reviewed Research (Cont.)

Article/Study name	Agency/Sponsor	Report Date/Date of Survey/Focus Groups	Population
Sonoma Marin Area Rail Transit (SMART) Community Survey on Proposed Service Reductions, Survey Results	SMART	May 2020	SMART rider and non-rider survey
Transportation Authority of Marin (TAM) Transportation Sales Tax Renewal Expenditure Plan, Summary Input from Cities and Towns and the Public	TAM	March-April 2018	
US 101 Part-Time Transit Lane Feasibility Study - Round 1 Outreach Summary	TAM	Oct.-Nov. 2020	Online workshops and online surveys
VTA Transit Usage and Attitudes Survey: COVID-19 Service Recovery and Restoration (EMC)	VTA	May-June 2020	Santa Clara County resident survey
Survey of Adult Residents in Santa Clara County (EMC)	VTA	May-June 2020	Santa Clara County resident survey
Transit Passenger Surveying Services: WestCAT, Findings and Methodology Final Report	WestCAT (MTC)	February 2018	Onboard rider survey
2017 On-Board Passenger Survey Summary Report - San Francisco Bay Ferry	WETA	Nov. 2017-Jan. 2018	Onboard ferry rider survey
WETA San Francisco Bay Ferry Ridership Survey	WETA	June-July 2020	Online rider survey
Final Report from C+C Plan Bay Area 2050 Phase 3			
Five Mobility Trends to Watch out for in 2021, Intelligent Transport, By Carol Schweiger		Jan. 2021	
MTC Means-Based Discount Usability Testing/Unhoused Population		Aug.-Sept. 2019	
Assessing Public Transit Service Equity Using Route-Level Accessibility Measures and Public Data. Alex Karner, University of Texas, Austin		Jan. 2018	

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