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Mobility on Demand Sandbox Demonstration: Adaptive Mobility with Reliability and Efficiency (AMORE) *Final Report*

PREPARED BY

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U.S. Department of Transportation
Federal Transit Administration

JANUARY
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Federal Transit Administration
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U.S. Department of Transportation
1200 New Jersey Avenue, SE
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Metric Conversion Table

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liter	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C

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14. ABSTRACT

This report documents the background, implementation, and evaluation of Regional Transportation Authority of Pima County's Mobility on Demand (MOD) Sandbox Demonstration project, Adaptive Mobility with Reliability and Efficiency (AMORE). AMORE sought to test a flexible service for commuting or first/last-mile connections to fixed-route service in the relatively high-income, high-vehicle-ownership communities of Rita Ranch, Civano, and Vail. Developed in partnership with private sector partners RubyRide and Metropia, the transit hailing solution was designed to meld the flexibility of a Transportation Network Company (TNC) with the efficiency of a fixed-route bus by grouping customers traveling in similar patterns and allowing quicker connections to the core transit system.

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Abstract

This report documents the background, implementation, and evaluation of Regional Transportation Authority of Pima County's Mobility on Demand (MOD) Sandbox Demonstration project, Adaptive Mobility with Reliability and Efficiency (AMORE). AMORE sought to test a flexible service for commuting or first/last-mile connections to fixed-route service in the relatively high-income, high-vehicle-ownership communities of Rita Ranch, Civano, and Vail. Developed in partnership with private sector partners RubyRide and Metropia, the transit hailing solution was designed to meld the flexibility of a Transportation Network Company (TNC) with the efficiency of a fixed-route bus by grouping customers traveling in similar patterns and allowing quicker connections to the core transit system.

Executive Summary

The Adaptive Mobility with Reliability and Efficiency (AMORE) project aims to test a flexible service for commuting or first/last-mile connections to fixed routes. The project team recognizes that barriers to transit use outside of core transit service areas often stem from potential customers believing that transit does not come close enough to them or run often enough or go to destinations they want to reach. A goal of the AMORE project is to meld the flexibility of a Transportation Network Company (TNC) with the efficiency of a fixed-route bus by grouping customers traveling in similar patterns and allowing quicker connections to the core transit system than the existing neighborhood fixed route. Another goal is to support demographic groups with limited transportation options (teens, older adults). The final goal is to test the demand for alternative transportation models. Through initial market research conducted in July 2017, the study area was found to be a high-income, high-vehicle-ownership, vibrant community, characteristics that could pose a challenge for later deployment.

The team, composed of the Regional Transit Authority (lead transit agency, Pima County, Arizona), Metropia (technology provider), and Ruby Ride (service operator), selected the Rita Ranch, Civano, and Vail neighborhoods (collectively referred to as Rita Ranch) in Tucson and proximate developments for project development and pilot testing. The service was based on the concept of transit-hailing, a sub-set of the general micro-transit or demand-responsive transit system framework but with more clearly-defined operating characteristics. In the transit-hailing concept, pre-scheduled trip requests are assigned to vehicles provided by transportation service providers (TSP) through solving the class of the widely-known Vehicle-Routing-with-Time-Window-and-Capacity-Constraint Problem. Because the objective function of this optimization aims to minimize both user travel cost and TSP operating costs, multiple pick-up and drop-off requests are pooled together in the final solution.

Pilot Program: June 2018–December 2018

The purpose of the pilot program was to go through iterations of smartphone application releases, service and operations rules, driver training, and collecting user feedback to prepare for a full-scale launch. Service was free during the pilot program period. The pilot program consisted of two-week cycles of user testing, feedback, and refinements before a new app version was released. The AMORE website had over 1,000 unique visitors during the initial pilot signup phase, with 125 individuals completing the signup form to join the program.

During the pilot program, the app was not made available via an app store; instead, the team used Crashlytics, a popular app delivery system for beta and restricted app downloads. The download process for Crashlytics, however, is far more cumbersome than a typical app download and registration process

from an official app store. Extensive supporting documentation and phone support were necessary to assist pilot participants with the installation process. This proved to be a more substantial time commitment than expected for both participants and program staff, and at least one individual bowed out of the program at this stage due to the technical requirements and installation issues encountered.

Once the app was fully installed on participant phones and service was launched, a great divide was observed between pilot member expressed interest and actual activity and participation in the program. Despite rides being free for the duration of the pilot, very few participants took advantage of the service, including those who had expressed their great need for the service. The handful of participants who did begin taking trips were very active and provided a great deal of feedback. Bi-weekly surveys were sent out to all participants covering topics ranging from timeliness and quality of service to functionality and user-friendliness of the app.

Just as passengers required a great deal of assistance early on, so did some AMORE drivers because they were locally-recruited drivers, not commercial drivers. Instances of drivers inadvertently canceling a trip or failing to notice a reservation assigned to them resulted in several no-shows for service early on. Updates to the AMORE Drive app were made to prevent drivers from various driver errors.

Official Launch: December 2018–June 2019

The AMORE team went through extensive preparation for the official launch, including marketing and outreach, app store readiness, and pricing model preparation. With the apps ready for download, the AMORE website was significantly updated, shifting the focus from signing up for the pilot program to downloading the app. In addition to pilot participants, parties who had expressed interest in the program, key stakeholders, and other supporters were invited to download and try the app. As a lure to try out the services, it was decided that all new users would receive unlimited free service for their first two weeks after downloading the app to serve as a “hook” in the promotional materials and outreach.

After the pilot and official launch programs, it was learned that passengers who indicated that they were facing economic hardships overwhelmingly used AMORE for necessary and essential quality-of-life trips such as doctor appointments, emergency room visits, and trips to the grocery store. Without the program, these necessary, routine trips would have been a much more significant burden, in terms of both cost and time.

Several participants were routine public transit users. For them, AMORE services bridged the first/last mile gap between their homes and the two main park-and-

ride stations within the service area at the University of Arizona Tech Park and Pima Community College campuses. Limited service times and days of service for the circulator route left transit riders without a means to connect to those transit hubs for one or both legs of their trips depending on their schedule. At those times, AMORE saved them a significant walk or bike ride.

From this project, it was concluded that the key to success for a service such as AMORE is to gauge the potential demand before launching the service to the market. Transportation is needed for residents to fulfill various daily obligations, and before any new service is introduced, it should be recognized that community residents have already determined their transportation solution regardless of whether that solution is desirable or not.

Future research could develop a community qualification methodology to gain a better understanding of the state of the community's current transportation choices, primarily factors that influence those choices and where a new service concept stands with respect to current choices. This high-level assessment would be beneficial for an agency such as RTA in selecting one or several pertinent and promising communities for deployment during the planning stage. This methodology can help increase the chance of success and reach a sound investment decision among multiple service options.

For the short term, redeployment of the technology and experience developed during the AMORE project has already begun. One of RTA's largest public transportation services, Sun Shuttle ADA Dial-a-Ride, provides complementary and premium optional Americans with Disabilities Act (ADA) services throughout the greater Tucson urbanized area. Daily operations of the Sun Shuttle are managed through a contract with Totalride, Inc., which began in July 2017. This report's findings will contribute to the collection of resources needed to successfully determine if an AMORE-inspired service is a viable replacement for RTA's underperforming fixed shuttle routes.

Section 1 Introduction

Project Goals

The goal of the Adaptive Mobility with Reliability and Efficiency (AMORE) project is to test a flexible service for commuting or first/last-mile connections to fixed routes. The project team recognized that barriers to transit use outside of core transit service areas often stem from potential customers feeling that transit does not come close enough to them or run often enough or go to destinations they want to reach. A goal of the AMORE project is to meld the flexibility of a Transportation Network Company (TNC) with the efficiency of a fixed-route bus by grouping customers traveling in similar patterns and allowing quicker connections to the core transit system than the existing neighborhood fixed route. Another goal is to support demographic groups with limited transportation options (teens, older adults). The final goal is to test the demand for alternative transportation models.

Project Background

The Rita Ranch, Civano, and Vail neighborhoods (collectively referred to as Rita Ranch) and proximate developments in Tucson, Arizona, comprise a community almost exclusively composed of single-family homes built mainly on non-connecting subdivision-style road networks. Development patterns such as those in Rita Ranch create challenges for traditional transit services. Additionally, both school bus service and taxi/TNC services such as Uber and Lyft are limited and sporadic. The lack of viable alternative modes means most trips are served mainly by private vehicles often traveling with a single occupant (SOV).

The Neighborhood Circulator component of the Regional Transportation Authority (RTA) Plan Transit Element provides funding for a system of fixed routes serving rural and outlying suburban communities around Tucson. One of those routes, Sun Shuttle Route 450, operates within the Rita Ranch community in the southeastern part of the Tucson region. The route currently runs on a 1.5+-hr headway. The low frequency of the route places it in the category of transit providing essential service for those who need it but not extremely useful for spontaneous travel or travel between times on the low-frequency schedule. Additionally, Route 450 does not operate on weekends.

RTA funds additional transit service in the Rita Ranch community through the Express Service component of the RTA Plan. Sun Express Route 110X provides morning and afternoon reverse commute service to the Old Vail Road park-and-ride lot in the southern part of the community, but this service provides connections only to Downtown and does not run on weekends.

Due to the low frequency of the existing transit and transit access issues caused by the structure of the road system in Rita Ranch, public transit likely does not have high appeal to members of the community who have the means to use a private vehicle. Additionally, market research combined with a AAA report[1] has shown that private car users tend to favor continued use of a car over other modes even when it is not in their economic best interest due to various other considerations such as sense of control, security, safety, and convenience. Coupled with the fact that the Tucson metro area does not experience periods of extended high-traffic volumes, the challenge of attracting riders to any public transit system becomes more apparent. However, complete homogeneity rarely exists across an entire population.

To explore this, the project team conducted a stated-preference survey in July 2017 asking respondents to describe their perceptions of the current transportation mode they used and to provide an opinion regarding potential new services similar to those contemplated by the project team. The survey aimed to understand respondent (1) socio-demographic information, (2) travel activity patterns, (3) use of technology and attitude toward various transportation modes, and (4) current mobility options and needs by assessing their responses to available modes of travel and the burdens they face. Also obtained was valuable information on the potential demand for this project as well as insight into users and families who might be target users of AMORE services. Also gained was valuable insight into what users would want from the service, what is most important to them, and how much they would be willing to pay for such a service.

The stated-preference survey revealed a picture of a community whose needs may not be served well by private cars. For example, the survey results found that:

- Nearly ⅓ of respondents ranked satisfaction with current mode choices at 5/10 or below.
- Nearly ½ of respondents had situations in the past month for which a trusted ride was needed.
- Nearly ¼ used a means other than driving themselves to reach school/work.
- Over ¼ of parents approved of an AMORE-like service for their teenage children.
- Nearly ¾ of adult children approved of an AMORE-like service for aging parents.

[1] Owning either an electric vehicle or combustion engine vehicle costs more than $7,000 per year (excluding parking); using public transit costs only 20–30% of the driving option. (See https://www.oregon.aaa.com/2020/01/aaa-research-electric-vehicles-cost-about-the-same-as-gas-powered-vehicles/).

Building on the results from the stated-preference survey, an early hypothesis of the project team was that the Rita Ranch area contained populations whose needs were not being met by either traditional automobiles or the limited public transit services available. The team identified these populations as older adults who could no longer drive and who would be dependent on family or social services for transportation and young adults and older children who might not yet have access to their own vehicle. Although these two groups seemed to be the most likely candidates for the shared-use ride-hailing service envisioned, it was also recognized that commuters to local businesses currently using SOV travel may also be good candidates for the service. If commuters could be encouraged to use a convenient carpool service rather than make an SOV trip, then potential reductions in vehicle miles traveled (VMT) might be recognized.

The initial iteration of the service concept included multiple modes that would be introduced into the community, including transit-hailing, carpooling, and bikeshare. Following the Mobility as a Service (MaaS) concept, project partner Metropia developed a smartphone app to seamlessly integrate trip planning, scheduling, trip management, and trip payment. Project partner RubyRide hired a fleet of local drivers to provide a reliable vehicle fleet as the core of the service offering.

Concept of Transit-Hailing

This project proposed the concept of transit-hailing (TH), a sub-set of the general micro-transit or demand-responsive transit system framework but with more clearly defined operating characteristics. In the TH concept, pre-scheduled trip requests are assigned to vehicles provided by transportation service providers (TSPs) through solving the class of the widely-known Vehicle-Routing-with-Time-Window-and-Capacity-Constraint Problem. Because the objective function of this optimization aims to minimize both user travel cost and TSP operating costs, multiple pick-up and drop-off requests are pooled together in the final solution.

Because the TH system aims to accommodate nearly all requests, pre-scheduled requests are termed “priority trips”; trips requested on the same day as travel are termed “standard trips.” Priority trips are deemed more cost-effective than standard trips because the TH system optimizes the pooling function, thereby increasing vehicle utilization efficiency.

Figure 1-1 shows the timeline for scheduling priority trips. At 8:00 PM each night, the TH system takes known ride requests and driver availability and performs a trial run. The trial run determines if all the ride requests can be met by the existing driver schedule; if not, the TH system determines which 30-minute time slots need to add additional drivers to meet demand and shares those scheduling needs with the TSPs by 8:30 PM. The TSP has 30 minutes (8:30–9:00

PM) to call in more drivers and enter their schedules into the system. At 9:30 PM, the system performs the final run (run time is capped at one hour so as to notify both passengers and drivers) before bedtime. Passengers are given the name of their driver and a pick-up time, and the drivers are given their complete manifest for the entire day, including the names of the passengers to be picked up and dropped off at each location.

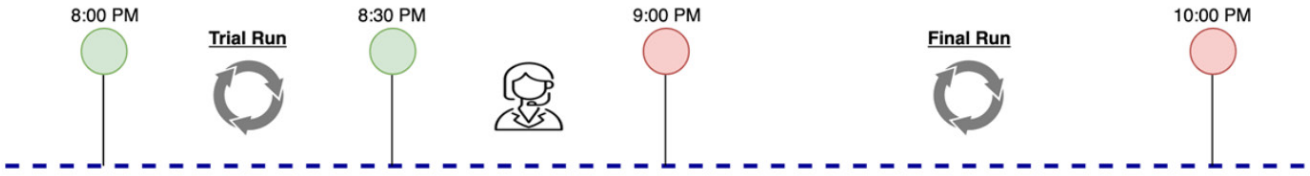


Figure 1-1 *Priority Trips Solution Timeline*

Once all priority ride requests have been assigned to drivers, driver manifests are locked in for the upcoming day. From there, the TH system works to minimize unpaid miles and driver idle time by accepting standard trip requests and filling available seats with passengers in real-time so long as those trips do not disrupt service for existing priority reservations. In this way, priority reservations are used to establish the supply of vehicles and their routes for the upcoming day, and operational efficiency is increased by accommodating additional demand in the form of standard trips. Should the established schedule and routes not allow for an upcoming standard trip to be serviced, TSPs have the option to to pull in additional vehicles to serve that request.

As priority reservations increase TH efficiency through optimal route planning and the potential for shared rides, those trips are encouraged through the promise of guaranteed service and a reduction in trip price. Standard trips can be charged a higher fare due to the fact that they are challenging to pool and are less efficient from a system utilization and efficiency standpoint and a higher fare encourages users to book a priority trip whenever possible. Figure 1 2 illustrates how standard trips are accommodated in the priority trip itinerary. Because the proposed system takes priority trip requests and forms a dynamic transit-like route and itinerary for each vehicle the following day and the system further allows standard trips to be accommodated on-demand whenever possible, the blended concept is called transit-hailing.

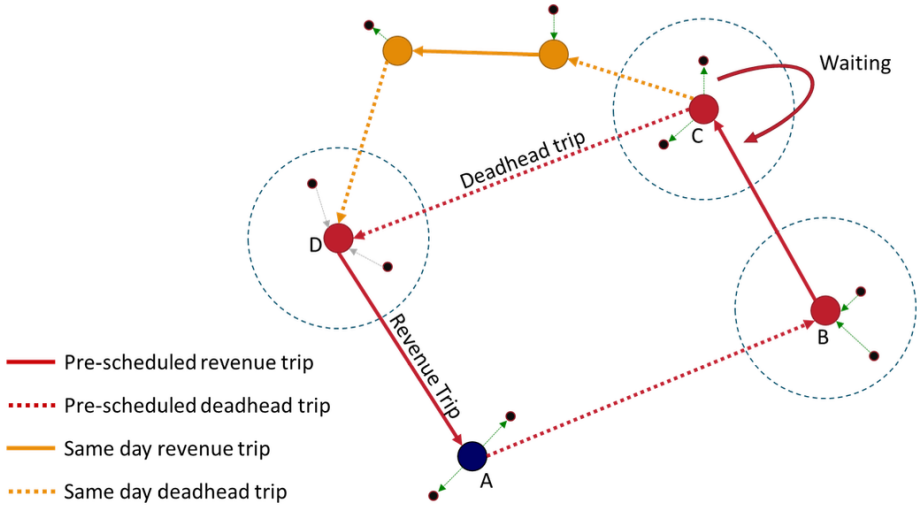


Figure 1-2 *Priority and Standard Trips for Transit-Hailing*

Expected and Actual Outcomes

Several outcomes were anticipated at the beginning of this project and are briefly noted in Table 1-1.

Table 1-1 *Anticipated Project Outcomes*

Expected	Actual
Develop and deploy new transit-hailing platform and service	Mostly achieved. TH platform successfully applied to all use cases in AMORE project and adopted by RTA's existing paratransit contractor to help improve operating efficiency of paratransit services.
Introduce new modes into community	Partially achieved. Initially, other modes such as electric bikes planned for pilots at University Tech Park, but after several meetings with Tech Park, attempt was ended due to challenging logistics and change in Tech Park leadership. Tech Park continued supporting project, but change in leadership led to delays in advancing and propelling partnership forward more significantly.
Use incentives to sway mode change	Partially achieved. Project primarily used different pricing structures as incentives for adoption; price breaks tied to priority trip reservations, a key component of operational efficiency (some results) and heavy use (no result).
Provide alternative modes to work/ school	Partially achieved. Not able to gain ground with these use cases; most work trips go outside service area, and although some trips serviced local schools, service was not able to achieve larger numbers of passengers anticipated.
Provide first/last-mile connections to existing transit service	Achieved. Many AMORE users used service to connect to Sun Tran bus terminal, which proved to a widespread use case among AMORE users.
Provide new options for mobility impaired and older adults	Partially achieved. Wheelchair Accessible Vehicle (WAV) available for full length of program; several use cases, but no sizeable older adult community in service area, so limited sustained use of AMORE service from [targeted] older adult population.

Section 2

Project Evolution

Market and User Research

User research is the first step to any service design, such that assumptions can be verified and initial service parameters established. For this purpose, a stated preference survey was conducted because the service was yet to be made available. Specifically, the survey goal was to gain a basic understanding of Rita Ranch resident travel patterns, mode choice, and preferences/attitudes toward various AMORE-like services.

Questions were developed with three primary focuses in mind: (1) travel needs, types, and patterns, (2) preferences and choices about potential AMORE service offerings, and (3) socio-demographic data. The survey data collection period was July 13–31, 2017, and the survey was distributed through the following channels:

- Five Rita Ranch Facebook forums (closed groups available to local residents only)
  - https://www.facebook.com/groups/RitaRanchAndVailCommunityForum/
  - https://www.facebook.com/groups/1437563116562237/
- Vail School District email list
  - https://vailschooldistrict.org/
- Vail Parent Network
  - http://www.vailparentnetwork.org/
- Vail Voice online
  - http://www.thevailvoice.com/might-love-amore/
  - http://www.thevailvoice.com/rta-launches-amore-pilot-program-for-rita-ranch-civano-and-vail/
  - http://www.thevailvoice.com/theres-a-new-ride-in-town-amore-expands-vail-service-area-and-lowers-fares/
- Civano Neighborhood Association
  - https://civanoneighbors.com/
- Greater Vail Area Chamber of Commerce
  - https://www.greatervailchamber.com/
- RTA's Trip Reduction Group's email list for Rita Ranch residents
- University of Arizona Parking Department's survey group (Rita Ranch residents) email list
  - https://parking.arizona.edu/

In total, 179 individuals took the survey, of which 107 provided complete and valid responses. Survey results are summarized in the following sections.

Sociodemographic

Gender –Respondents were equally distributed in gender.

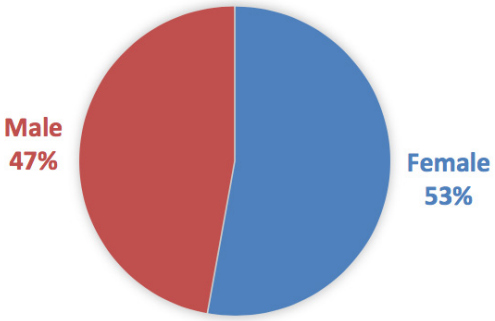


Figure 2-1 *Gender*

Age – Age distribution was rather diversified; more than half of respondents were in the 36–55 age group, and fewer than 10% were older adults.

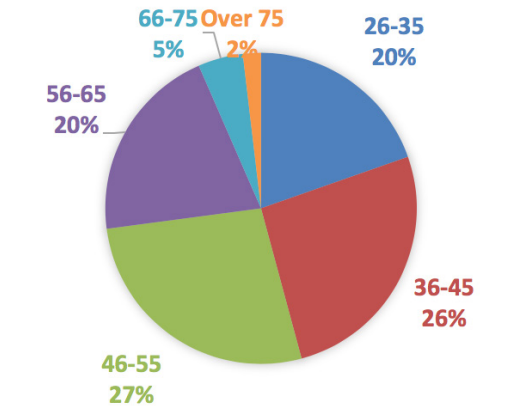


Figure 2-2 *Age*

Household Size – Only 14% of respondents lived alone, implying that they mostly have families, with 56% likely to have children.

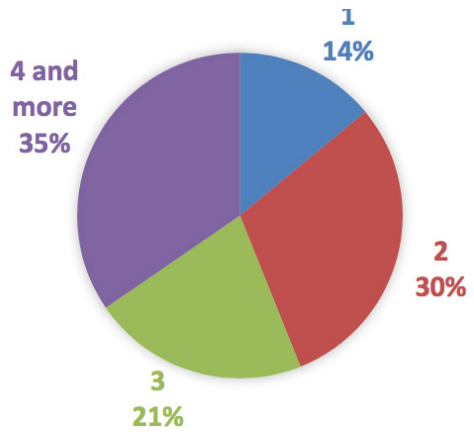


Figure 2-3 *Household Size*

Number of Commuters in the Household – Respondents represented mostly a community cohort who are active commuters.

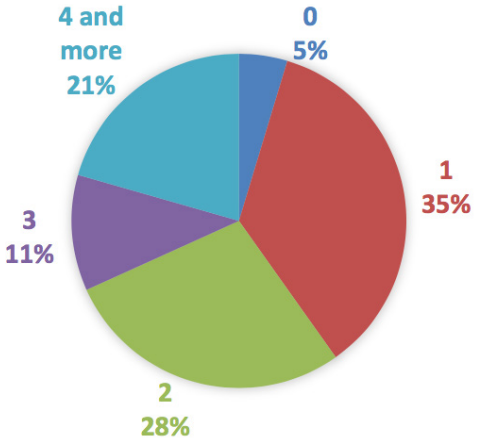


Figure 2-4 *Number of Commuters*

Education – The community was a high education community, with 75% having at least a bachelor's degree.

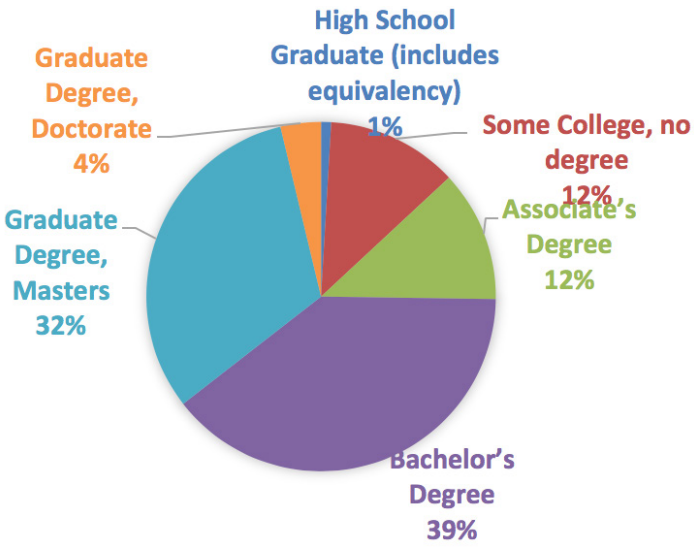


Figure 2-5 *Education*

Car Ownership – Respondents owned at least one car, with nearly 40% owning 3+ vehicles; some may be families with teenagers with a driver's license.

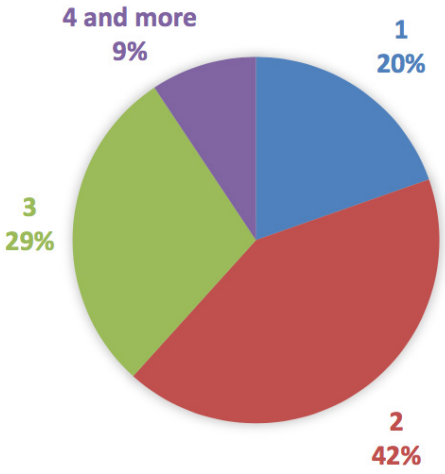


Figure 2-6 *Car Ownership*

Number of Cars Used Daily –Less than 1% of respondents did not use a car; nearly all used cars every day, indicating a heavily car-dependent community.

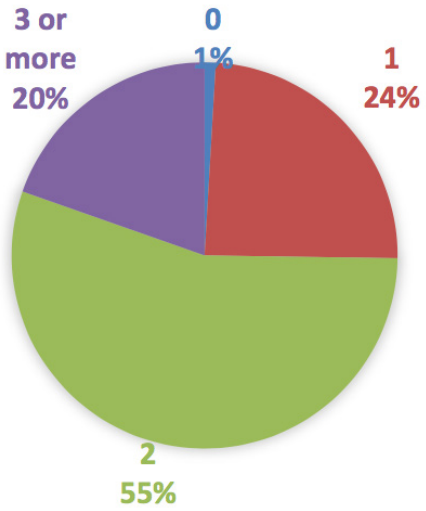


Figure 2-7 *Number of Cars Used Daily*

Household Income – About 44% of respondents made more than $100,000 annually, and 50% made more than $60,000 annually, much higher than the national and regional averages. Combined with 100% car ownership and a high percentage of children in after-school activities, these respondents appeared to be rather affluent and relatively young.

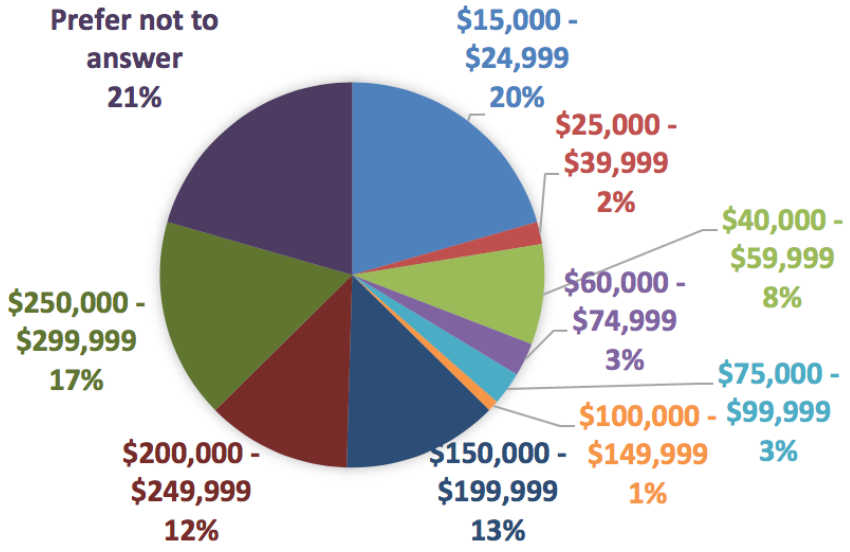


Figure 2-8 *Household Income*

Community – Results confirmed that most respondents were from the general target area, indicating geographic representation of the survey.

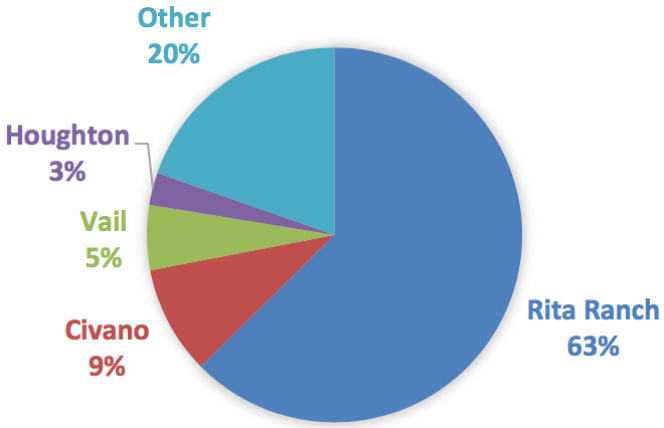


Figure 2-9 *Community*

Travel Needs, Types, and Patterns

Commute Flexibility – Respondents were asked if they had flexible work hours; nearly half did not, and 40% had some.

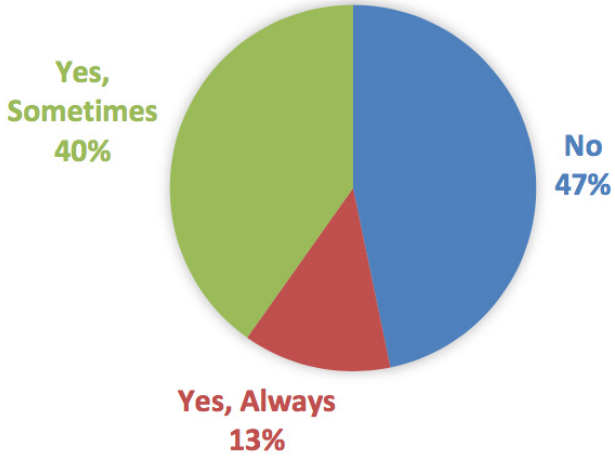


Figure 2-10 *Commute Flexibility*

Commuting Time – Respondents were asked about their commute time; about half had commute times of 20–35 minutes, implying that most respondent work locations may be outside the Rita Ranch area. The AMORE project offered service solely inside the Rita Ranch area, which may have limited its appeal to anticipated users.

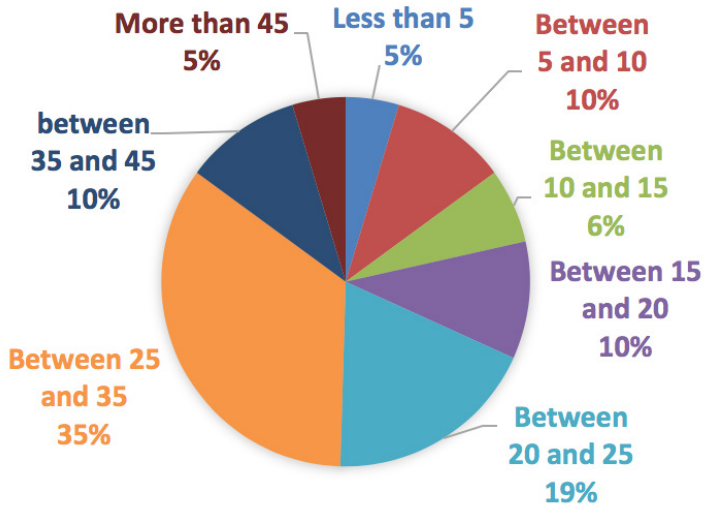


Figure 2-11 *Commuting Time (in min)*

Modes Taken to Work in Last Month – Nearly 60% drove alone to work, 13% used public transit, and 18% carpooled as either a passenger or driver, indicating that respondents were relatively multimodal, with SOVs much lower than the national average of 76%.

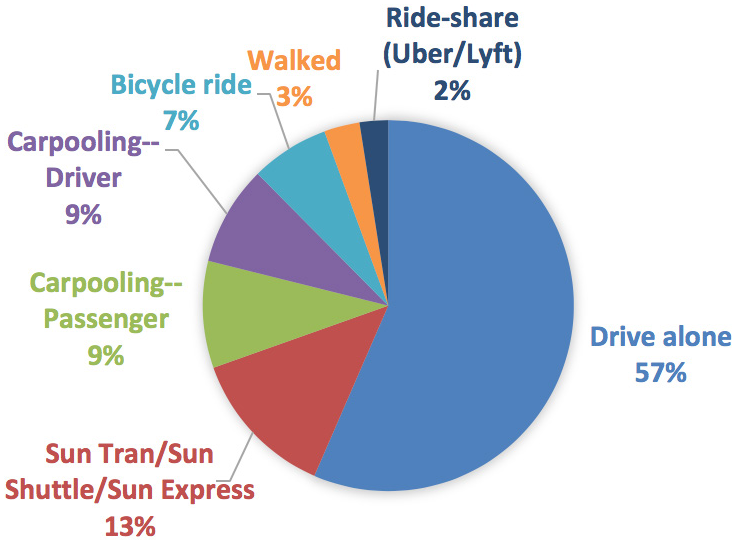


Figure 2-12 *Modes Taken to Work in Last Month*

Tried Carpooling to Work? – Overall, 43% of respondents had tried carpooling to work in the past, compared to 18% recent carpooling indicated in the previous question.

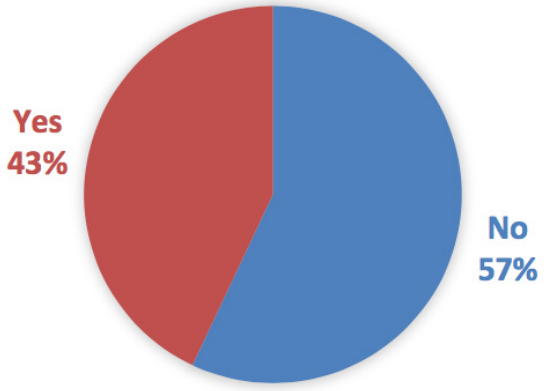


Figure 2-13 *Tried Carpooling to Work?*

Number of Times per Week Extra Stops Made During Commute – Respondents tended to run errands often during morning or afternoon commutes.

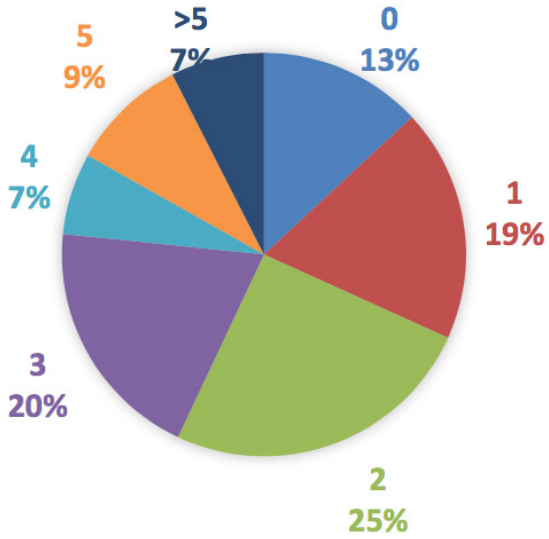


Figure 2-14 *Number of Times per Week Extra Stops Made*

When Do Routine Stops Take Place? – More than 60% of errands occurred in the 2:00–8:00 PM period, followed by 14% on Wednesday mornings. These patterns could be related to school-age children and extracurricular activities, but given the smaller sample size, it is possible they do not reflect the community at large.

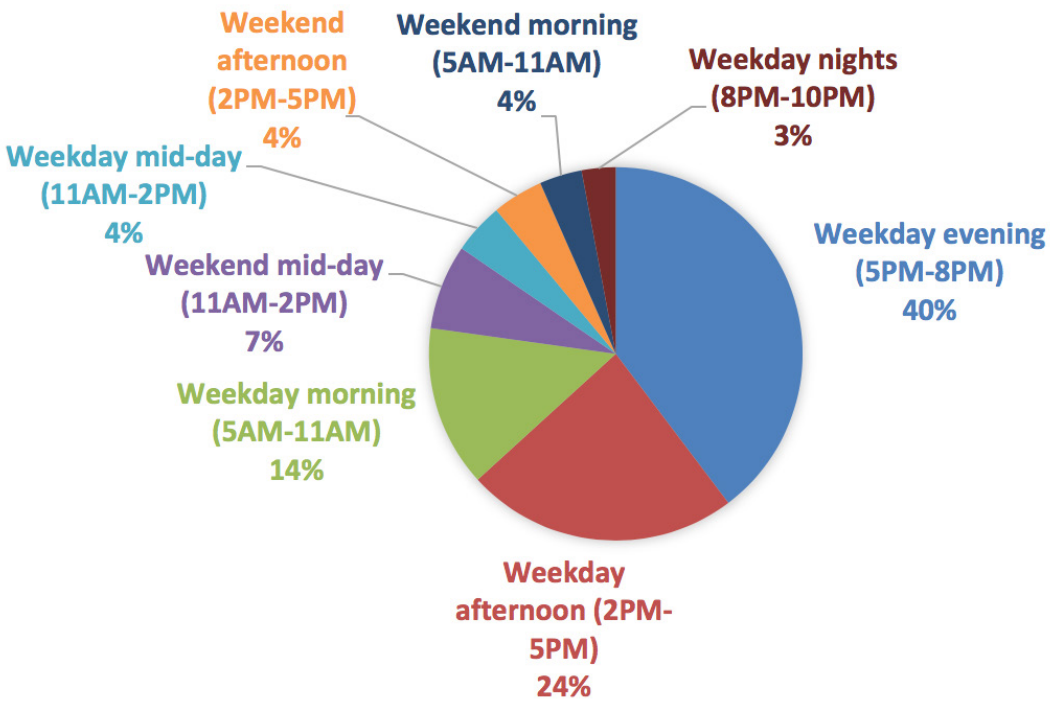


Figure 2-15 *When Do Routine Stops Take Place?*

Number of After-School Activity Trips per Week – Only 26% of respondents had no after-school activities, implying that most had young children who required parents to transport them to their respective activities; these respondents were likely to use their own vehicles for this purpose.

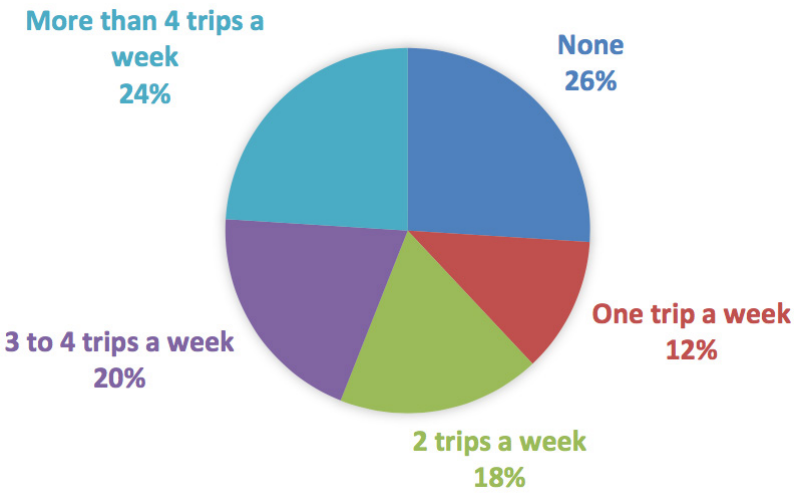


Figure 2-16 *Number of Child After-School Activity Trips per Week*

When Do After-School Activities Take Place? – In total, 29% of respondents had after-school activities that occurred 2:00–5:00 PM on weekdays and 27% 5:00–8:00 PM on weekdays.

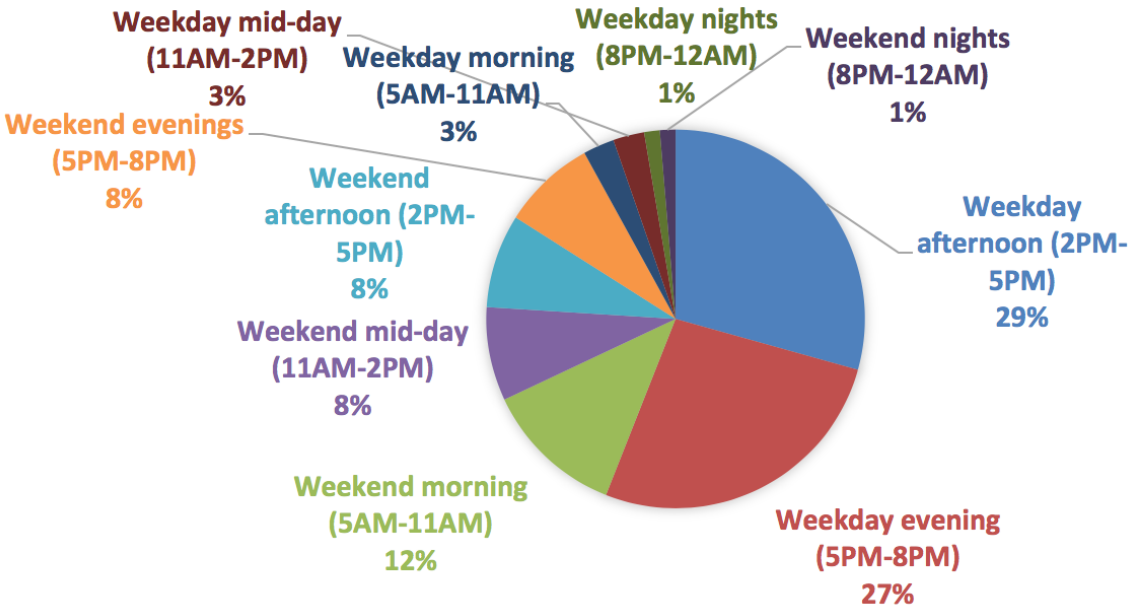


Figure 2-17 *When Do After School Activities Take Place?*

Acceptable Travel Options for Teenage Children – The top acceptable options identified were carpooling, driving alone, riding a bike, personal mobility device, or public transit. A third-party chauffeur service such as Uber/Lyft or taxi were the least acceptable to parents as a transportation mode option.

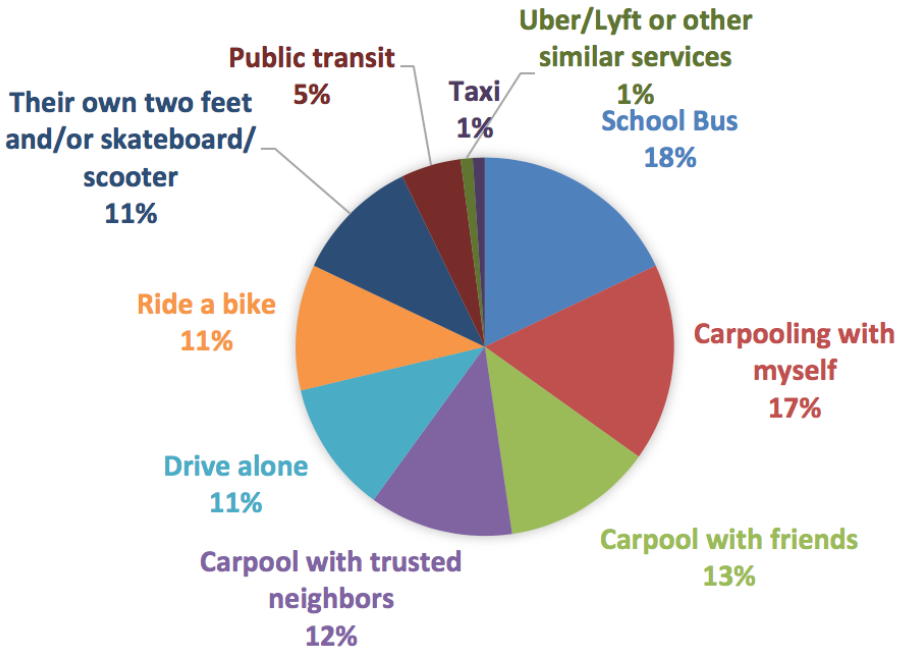


Figure 2-18 *Acceptable Travel Options for Teenage Children*

Have You Taken a Bus to/from the Study Area? – Over 80% of respondents had not taken public transit, with 20% not aware that the service existed and 60% considering the hourly frequency inconvenient; 14% of respondents used public transit regularly, higher than the national average.

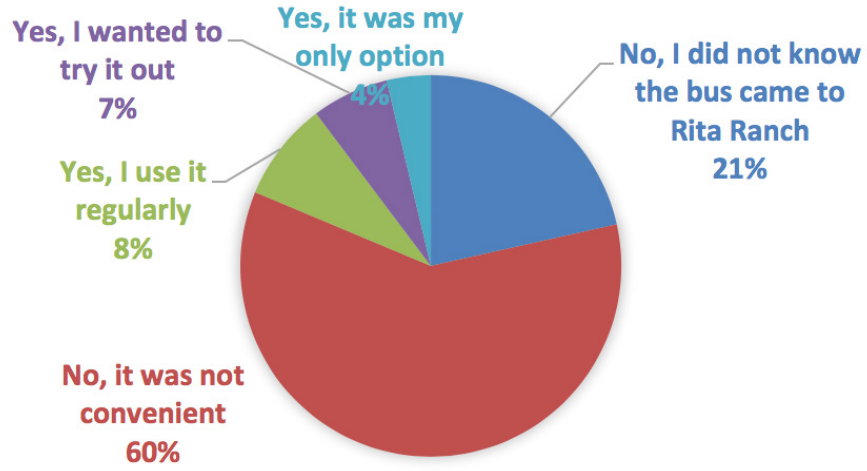


Figure 2-19 *Have You Taken a Bus to/from the Study Area?*

How Satisfied Are You with Your Current Transportation Options? – This question was asked as a Net Promoter Score (NPS) measure, a 10-point scale in which those who score the service 0–6 were Detractors, 7–8 were Passive Promoters, and 9–10 were Promoters. Overall, 41% of respondents gave the current transportation option (presumably mainly driving) 7–10 points—likely to passively or actively promote driving.

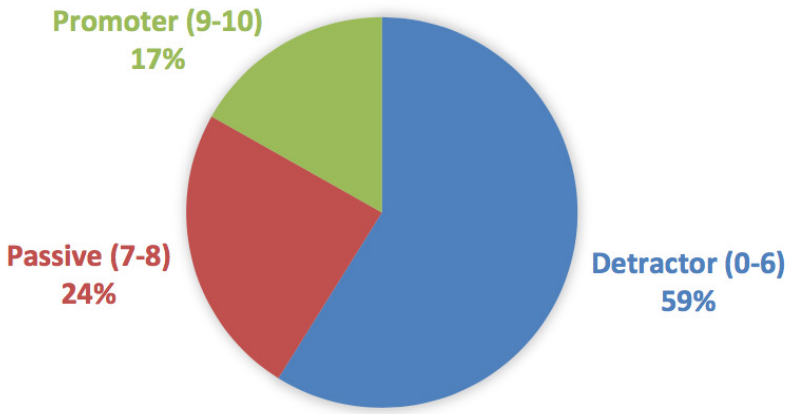


Figure 2-20 *How Satisfied Are You with Your Current Transportation Options?*

Rate the City Public Transit System (0-10) – Only 15% of respondent gave the local public transit system a score of 7 or above, and only 2% would be considered active promoters of the public transit system. This is not surprising, given that the existing Route 450 only runs on a 90-minute frequency.

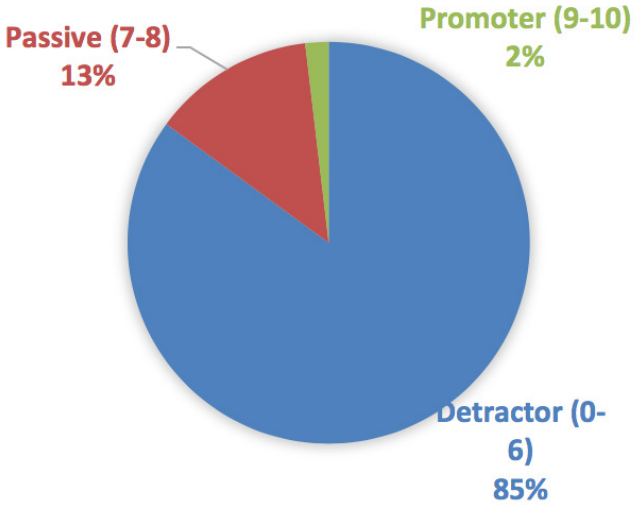


Figure 2-21 *Rate the City's Public Transit System (0-10)*

Have You Tried Alternative Modes in the Past Three Months – In total, 70% of respondents had not tried any alternative mode in the past three months, implying that they did not regularly use alternative modes.

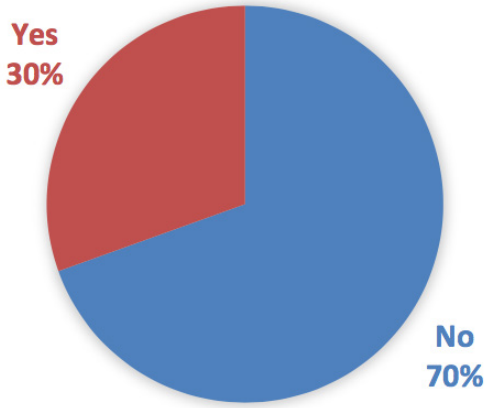


Figure 2-22 *Have You Tried Alternative Modes in the Past Three Months?*

What Would Motivate You to Try Alternative Modes? – The #1 motivation to try an alternative mode was cost-savings, followed by convenience and time savings. As shown in Figure 2-7, car ownership was 100%, implying that if an alternative mode was not competitive with driving in these three categories, respondents may not use an alternative mode to replace driving. Generally, driving is rather inexpensive (due to low gas prices and maintenance cost) and parking fees are low. Arizona consistently ranks as one of the more affordable states for drivers, ranking 11th in annual gasoline expenses, just below the national average for insurance rates, below the national average for overall ownership and operations costs for the first three years, and near the bottom for parking costs downtown. Tucson's traffic congestion is mild compared to similarly-size cities, ranking 32nd and 37th for commuter delays and Travel Time Index, respectively, so competing with driving in these categories is challenging.

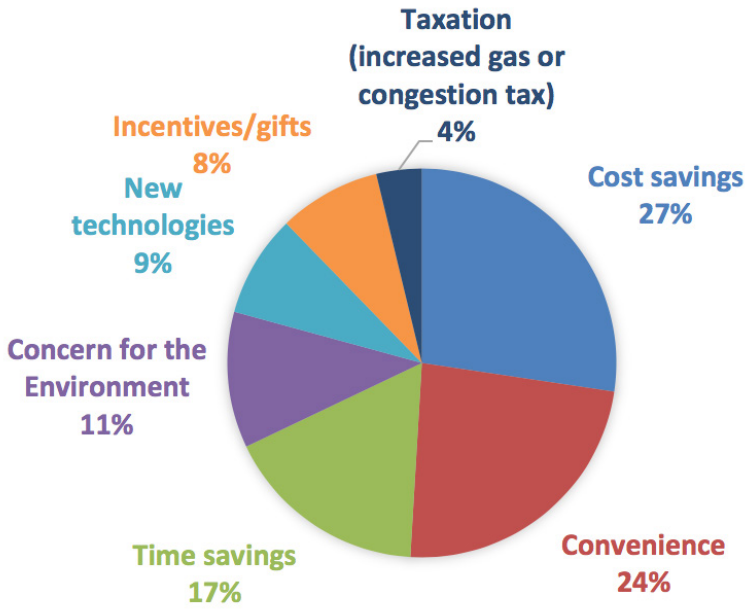


Figure 2-23 *What Would Motivate You to Try Alternative Modes?*

What Are the Most Important Travel Factors? – Safety, cost, convenience, and reliability were the top considerations for respondents. Driving was strong in these categories, potentially making offering other mode options challenging.

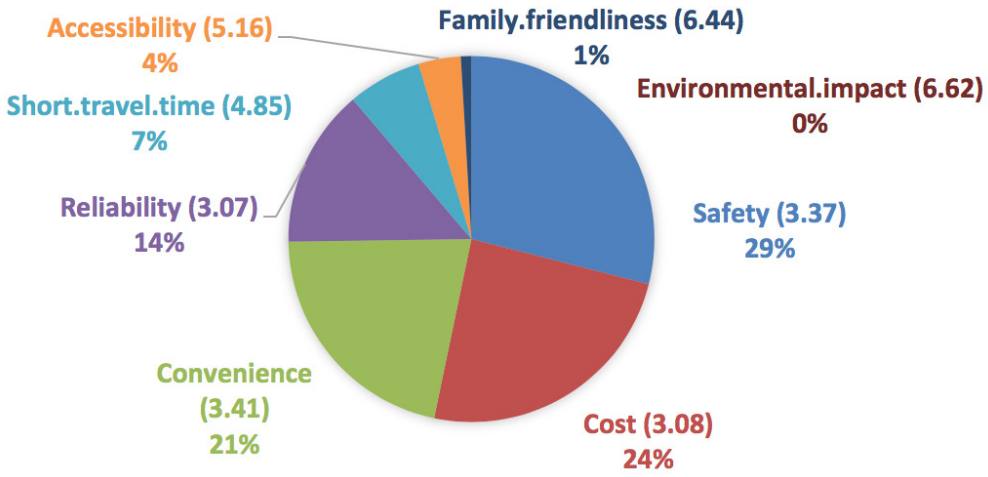


Figure 2-24 *What Are the Most Important Travel Factors?*

AMORE Service Preference

How Would You Like to Pay For the Service? – From Figure 2-25, it is clear that the majority (over 70%) of respondents preferred the pay-as-you-go option over all other subscription options.

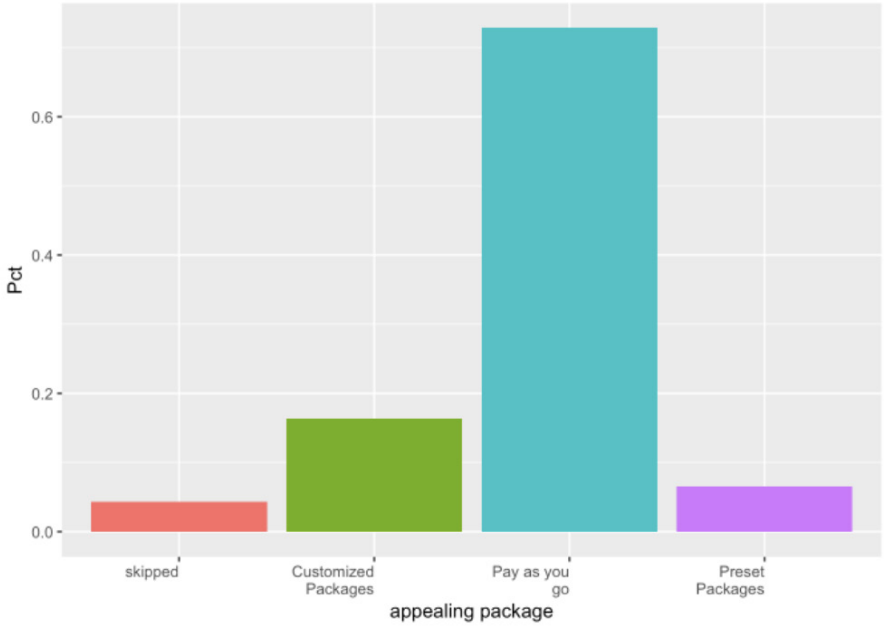


Figure 2-25 *Payment Preferences for AMORE Service*

Market Research Summary

From the results above, the service area includes generally highly-educated, high-income families with very high car ownership, and most have K–12 children. These characteristics mean a car-dependent lifestyle for work and shuttling children for after-school activities. Respondents also indicated a very low confidence level for taxi or TNCs as a commuting option for their children. Respondents were open to alternative modes; however, their general assessment of local transit services was negative, indicating that they are less likely to use the AMORE service to boost their public transit use. Respondent workplaces were generally outside the AMORE service area, such that they are less likely to use AMORE service for their work commute.

Based on the survey, it became clear that launching AMORE services to work, school, and areas populated with older adult use cases could be a challenge; however, the AMORE team continued to prepare and deploy the technology platform, fleet operations, and marketing and outreach with the goal of learning useful lessons from the deployments.

Stakeholder Engagement

Early on, the AMORE team identified the importance of securing the support and endorsement of prominent local community stakeholders. In addition to leveraging their network and outreach channels as a means of reaching their constituents and conserving the project marketing budget, the support of community leaders would help further distance AMORE from similar TNC operations and emphasize its role as a community resource and public service. Stakeholder groups were centered primarily around the three main use cases identified through the initial survey and additional outreach–older adults, employees, and students.

To reach older adults, several key groups were identified and contacted prior to and throughout the program's official launch. These organizations were mostly non-profit and service groups that focused on eldercare and services in the region. Although several of the more prominent groups were insightful and offered their support, their service areas were nearby but did not overlap with AMORE's, which meant that only a small percentage of their network would be able to use AMORE services. Included in these groups were the Pima Council on Aging, Neighbor's Care Alliance, Elder Alliance, and Eastside Neighbors Volunteer Program. These groups primarily offered additional area contacts and promised to keep AMORE information on hand for current or future clients who lived within the service area, with some posting information on AMORE through their social media channels.

Surprisingly little traction was gained with local churches, which were presumed to have older adult members in need of assistance within their

respective congregations. Despite phone calls and in-person visits to a half dozen churches, there was no real interest in the program. Toward the end of the program, as the service area expanded, outreach to Vail's retirement community, Rancho Del Lago, began. Project team members met with the Activities Director, who was enthusiastic about posting information around the community center, and the community was targeted in the final run of direct mailer fliers; however, ultimately, the program ended before being able to tap into this area of the community and find an audience of potential users.

Two key employer stakeholder groups were actively pursued, as well a few prominent employers. Tech Parks Arizona, the University of Arizona's research park and business incubator, came on board as an early, ardent supporter of the program. The AMORE team had multiple meetings with Tech Park leadership, during which program scope and support methods were thoroughly discussed. Tech Park became one of the program's most prominent supporters, sharing program information and encouraging participation through its newsletter, social media channels, and email blasts. It also introduced AMORE representatives to leadership at several employers housed on its campus. From there, the AMORE team was able to host three tabling events with those companies on the Tech Park campus as well as additional tabling events at large local employers such as Amazon; however, these events did not yield the expected interest and participation from staff. This had to do with the nature of the tabling event—many employees were hourly staff who did not have the time to mingle or discuss the program and many lived outside the service area.

The second primary employee stakeholder was the Vail Chamber of Commerce, which saw the potential for AMORE project early and broadcasted information on the pilot program to its members via social media posts and email blasts. Throughout the program, the Chamber continued to disseminate AMORE's messaging, including placing an ad for AMORE in the local newspaper, *The Vail Voice*, and inviting AMORE staff to present at Chamber functions.

To reach students in the community, the AMORE team reached out to leadership at the local campuses of Pima Community College (PCC) and Cienega High School. PCC was eager to help and allowed the setup of tables in its lobby on multiple occasions. The school newspaper also included a story about AMORE during its official launch. Like the tabling events at employer offices, these face-to-face events were generally slow and, despite being in areas with higher likelihood of foot-traffic, there simply was not a great deal of activity on campus, perhaps due to the summer semester or simply because it is a smaller campus. The tabling events did not generate new passengers in any significant numbers and were ultimately abandoned. The partnership with Cienega High School was far more difficult. Timing of the pilot program did not align with the school calendar, as students were off for the summer, so the pursuit of this use case was delayed until the official launch. When that time arrived, leadership

at the school was in flux, with an interim Principal filling in while serving in his typical role as well. This turnover was a setback for the AMORE program, which had previously received the school's support to move forward with promotions to the student body. The AMORE team again approached the school board, PTA, and other entities to gain their support, all of which created a loop of visiting one group and being directed to another, with no real end or action items in sight. Before moving forward with planned activities for Cienega, the AMORE program ended.

Driver Recruitment, Training, and Retention

Delivery Overview

RubyRide used its existing driver and service models in support of the AMORE program. RubyRide operates a "neighborhood" model, with service vehicles assigned to cover a local area, and that model was well-suited to the scale of the project. The model has some unique characteristics. First, drivers are required to live in the area where they operate, which has a significant impact on performance and employee satisfaction, although it makes the recruiting process more difficult and means that drivers are neighbors with passengers, impacting trust and customer appeal. Second, drivers are extensively trained compared to taxi and TNC drivers for customer service, driving quality, and knowledge of the service, which engages them and gets them more invested in making the service successful.

As with transit drivers, RubyRide drivers are hourly employees with scheduled work shifts. Two key distinctions between independent contractors and employee drivers are that employees are paid the same rate regardless of the number of trips driven and the value of those fares, and employees can be assigned trips directly, whereas independent contractors can select which trips to serve. For AMORE, drivers were offered a base wage of $12 per hour plus $5 per hour non-taxed reimbursable for drive time. Reimbursable was calculated as any time during an hour that a driver was "moving for work," including the inbound portion of a trip, the trip itself, and any reset time required. This is roughly equivalent to the federal deduction for mileage, given that the drivers spent no time on the highway. No other benefits were offered to drivers. During interviews, it was learned that all drivers already had healthcare benefits through other employment, Medicare, or military service. Because the drivers were employees, they were entitled to and received Worker's Comp insurance, something that most drivers, whether taxi or TNC, did not receive.

Trips are assigned to drivers by Metropia's dispatch software, and the driver's job is to serve those trips in a timely, safe, and friendly manner consistent with company policy. The local team hierarchy was flat, with one employee elevated to "lead driver" status, a position that calls for a more flexible schedule; along with a slightly-elevated pay comes additional responsibilities, such as managing

driver schedules, assigning shifts, overseeing customer service and staffing challenges, and reporting to the regional operations level.

Although RubyRide drivers are employees, they mainly operate their own vehicles, making it a hybrid of a TNC and traditional public transit. For this project, RubyRide also brought in a WAV to provide paratransit services in compliance with the Americans with Disabilities (ADA) law. This vehicle was always available for operations, and several drivers elected to use it instead of their own car. Combining driver-owned and company-owned vehicles in the fleet added significant complications, as discussed later in this document.

Figure 2-26 *2016 Ford Transit Connect WAV*

Shifts were developed around driver availabilities and expected demand. Most shifts were 2–4 hours per day. For this program, the software required a 20-minute overlap to ensure that all trips could be safely assigned to a driver within the shift period, so typically one driver worked per shift with a 20-minute overlap during shift changes. Drivers indicated when they would be available in advance, and routine schedules generally were able to be set. An "on-call" driver was scheduled at all times who could serve additional customers during unexpectedly busy times. Both the lead driver and the driver-on-duty could request support from the on-call driver, although this was required only a handful of times throughout the project.

Project Planning

RubyRide initially planned to hire 10 drivers, with the ability to hire more as demand increased. Because this was a customer-service business, several driver qualities were paramount:

- Reliability – The most critical standard in transportation
- Personability – A personal relationship with the driver is what customers most often described when talking about their experience
- Service – Helping others is a significant motivator for many, and building a service that allows employees to contribute attracts good people

Staffing levels were typically routine, and final staffing requirements were determined based on pre-scheduled demand the night before. Initial service hours were as follows:

- Monday–Friday, 6:00 AM–8:00 PM
- Saturday and Sunday, 8:00 AM–8:00 PM

With single coverage, the service hours totaled 94 hours per week, and at least double coverage was expected most of the time—10 drivers at 20 hours per week provided some flexibility. In addition, most drivers had preferred work times, either for lifestyle reasons or to coordinate with other obligations. It was essential to have some redundancy for turnover, days off, vacations, etc.

RubyRide also established a communications channel using a mobile app called Discord that allowed drivers to communicate with Metropia, RubyRide staff, and each other from home or out in the field. This worked well for several reasons—it allowed a shortened feedback loop with drivers, it helped the drivers feel less isolated, and it allowed reaching out to on-call and off-duty drivers for rapid increases in staff levels in case of unforeseen demand.

Recruiting

A reliable supply of labor is critical to any operation. In a new area where the program had no history, this started early with free ads on Indeed.com. With service initially expected to start June 1, 2018, recruiting began in early April 2018. The initial campaign was run without promotion and received five applicants in the first week, one of whom was ultimately hired. Over the remaining six weeks, there were 84 applicants, about 20 of whom lived inside the work zone. Offers were made to 10, with 9 accepting and 8 ultimately going through training.

The hiring process started with a short application, which asked if the candidate had a vehicle, understood the job, and agreed to undergo background screening and drug testing. Candidates then selected a time for a phone interview, which served three purposes—it tested the candidate's reliability (interviewee had to call in), it provided the opportunity to see how the candidate handled conversations and challenging situations, and it allowed the candidate to ask questions about the position. From there, a background screening was scheduled, which included the following:

- Comprehensive background check:
  - Identity verification (SSN trace, address history)
  - Sex Offender Registry check
  - Global Watchlist check
  - National Criminal Records check
  - Fair Credit Reporting Act (FCRA) disclosure tracking
- Premium identity check:
  - Current county criminal records check
  - Motor vehicle records check
- E-Verify where applicable
- Individuals providing transportation had to be at least age 21 and possess a valid local or state operator or Commercial Driver License.

Also verified was that each candidate carried at least the state minimum insurance coverage for their automobile.

Once candidates passed the background check, a 10-panel urine-based drug test was administered at LabCorp in Tucson. Upon passing that test, candidates were formally offered a job.

The only credentialing challenge faced in this program was attempting to obtain fingerprint background cards for drivers for serving children ages 10 and over. Local school bus drivers are required to undergo this more-rigorous form of background check, and although this was not a requirement of the program, in an effort to foster the trust of parents it was promoted that the program would match that level of clearance. Fingerprint cards are facilitated by local government and performed by the FBI, which collects the candidate's fingerprint via a contractor, then runs it through their database of offenders. As there is no national, state, or local requirements that drivers of private fleets who transport minors get screened in this manner, and the FBI only conducts these checks based on legal requirements, proceeding was not possible. Although two drivers had cards from other employment, other drivers could not be approved at the same standard. This did not have any practical ramifications on the service—insurance, training, and other credentialing were sufficient—but public communication related to drivers undergoing these background checks was amended. There were enough jobseekers in the area so other sources such as social media, advertising, or press releases were not used to find qualified employees. Overall, this made the recruiting process in the Rita Ranch area easier than in other locations where RubyRide operated.

Training

RubyRide's training process is significantly more thorough than most taxi and TNC companies. The project process covered the following:

- Classroom:
  - Cultural competency
  - ADA sensitivity training
  - Appropriate methods of interaction with members during transport
    - Greetings
    - Seatbelt reminders
    - Embarking and disembarking considerations
  - Use of technology
  - Hiring and discipline procedures
  - Communications processes
  - Basic operations
  - Review of policies
- Field Training:
  - Full vehicle equipment and operation training, including manual overrides on any equipment.
- Training on response for emergency situations, including but not limited to accidents or incidents in vehicle during transport

Field training included practice trips with staff to run through the entire trip process, including how to approach a curb, speaking with passengers and confirming trip details, making sure passengers were wearing a seatbelt, using the app to service trips appropriately (e.g., confirming passenger pick-up) and responsibly (e.g., not manually engaging the app while driving), and dropping off the passenger. Also demonstrated was how to attach the AMORE magnetic decals on their vehicle and performing an initial vehicle check—ensuring that the back and passenger seats were clean and presentable, checking lights, tire treads, wiper fluid and wipers, and basic vehicle presentation.

Because there was a WAV in the program, each driver was trained on its use; drivers took turns at training events held every two months preparing, loading, securing, and driving with a wheelchair passenger. As any driver might be called to use the WAV, it was important that all were trained. If there was a call for the WAV when it was not in operation, an on-call driver was tasked with coming on duty quickly to handle the trip.

Use of technology was an ongoing and collaborative process with Metropia's team, and many questions and issues were dealt with quickly through a dedicated channel on the Discord app. As new technology was introduced,

drivers tested it in the field, often working directly with technical staff to refine processes. Because this was a pilot and new software was being tested, it was useful to have a good working relationship and a direct line with the development team at Metropia. A number of processes were worked through during the pilot to shorten the training and upgrade times and to improve the reliability of use—in-person training, PowerPoint materials, videos on use, and one-on-one tutoring were extensively employed as different software challenges and solutions presented themselves. An ongoing challenge was working through technical issues created by integration of Zendrive's Software Development Kit (SDK) (discussed in more detail later), which often meant that updates worked on some devices but not others.

Corrective Training

The biggest challenge in driver behavior was making sure that drivers paid full attention to the driver app. This was an issue mainly when things were not busy; it proved very easy for drivers to get distracted and not see a trip request come in. Much time was spent working with different tools to make sure that this did not become a recurring issue; during the first month, there were cases of drivers not noticing alerts and failing to pick up a passenger on time, but safeguards such as driver follow-up from either RubyRide or Metropia staff were put in place if a driver did not promptly accept a trip. Metropia's developers added a process that delivered a message on each trip's status change through the Discord channel, which largely eliminated the issue.

The second operations challenge faced was making sure drivers were clocked in on time. The first shift of the day was the most prone to being overlooked, as there was no other driver to confirm the handing off of duties. Other shifts would begin/end with a digital handoff on the Discord channel, so if there was only one driver on duty, he/she would know when the replacement had clocked in. In one case, a driver failed to clock in on a weekend shift; staff met with the driver and reviewed the policy and potential consequences, and the incident did not occur again. No quality complaints or issues occurred with the drivers, so no corrective actions had to be taken.

Driver Experience

The work process for a driver was set up to maximize reliability and flexibility. Base driver shifts were established weekly based on driver availability and expected demand. Typical shifts were 2–4 hours in length, except on weekends, where there were two shifts across the day. As a precaution for reliability, drivers clocked in 15 minutes before their shift to allowed ensuring that the driver had time to get to their first pick-up if it started right at a shift change; the time buffer also provided time to reach out to the driver or mobilize another should the driver be delayed for some reason.

RubyRide used Humanity for timeclock management, and drivers used their app to review shifts and clock in and out. As drivers lived within the service area, they typically clocked in from home. Once they clocked in for payroll, they opened the AMORE Drive app and clicked “On Duty.” Once inside the app, they could see upcoming trips that had been assigned. They also were encouraged to announce that they had clocked in on the Discord Channel. During inactive periods, drivers were allowed to stay at home as long as they were able to mobilize quickly should they be assigned a trip.

When a passenger reserved a trip in the AMORE Ride app, the backend system analyzed available drivers, selected the optimal driver to service the trip, and assigned the trip accordingly. That driver received an alert through their app and accepted the trip. At the appropriate time, the app signaled the driver that they should head toward the passenger’s pick-up address, and service began. At this point, the driver tells the app that they are under way and starts the trip. The driver may use navigation, but since the driver is almost certainly well-acquainted with the area, it was not usually necessary. It was preferred that the driver did not interact with the mobile phone while moving; in fact, it was against policy to make a call or text while moving. Integrating the driver app with software from insurance provider Zendrive provided weekly dashboard summaries of individual driver behavior on the road, including hard stops, jackrabbit starts, speeding, using the phone while driving, and hard turns). Once the driver arrived at the destination, they navigated to a safe and appropriate place to drop off the passenger. The passenger leaves, and the driver clears the trip. This repeats until the end of the shift, at which point the driver clicks “Off Duty” and clocks out from Humanity.

Driver Retention

The AMORE program started with eight drivers, with more expected to be hired. Additional hires were not needed, and no drivers were replaced throughout the program. Of the eight original hires, seven continued throughout the pilot; one driver moved out of the area.

During exit interviews, drivers said they liked the job, wished it had continued, and enjoyed the opportunity. When asked what specifically they liked, responses were that they were able to stay close to home – no commute, and that they enjoyed being useful and helping their neighbors.

Insurance

Securing insurance proved to be one of the more challenging parts of the project. RubyRide had recently transitioned from a system in which drivers operated company-owned vehicles to a system in which they operated their own personal vehicles. Both are considered “surplus lines” insurance products,

and few companies sell this type of policy. Surplus lines insurance, as defined by the Wholesale & Specialty Insurance Association, is as follows:

> The surplus lines market plays an important role in providing insurance for hard-to-place, unique or high capacity (i.e., high limit) risks. Surplus lines insurers are able to cover unique and hard-to-place risks because, as non-admitted insurers, they can react to market changes and accommodate the unique needs of insureds who are unable to obtain coverage from admitted carriers. This results in cost-effective solutions for consumers that are not "one size fits all," but are skillfully tailored to meet specific needs for non-standard risks. Risks typically that are written in the surplus lines market fall into three basic categories:
>
> - Non-standard risks, which have unusual underwriting characteristics
> - Unique risks for which admitted carriers do not offer a filed policy form or rate
> - Capacity risks where an insured seeks a higher level of coverage than most insurers are willing to provide

This is not a reflection of RubyRide or its ability to be insured; instead, it is based on the size of the overall market and the fact that it is relatively new. As a rule, insurers do not like innovation; they rely on a long history of events to forecast and minimize risk and manage expenses. New business models without decades of existence are difficult to insure.

Realizing that procuring insurance could take a long time, the process commenced with the project kickoff around October 2017. The insurance broker worked closely with the project on requirements, then put together a package to take out to the markets. Initially, there was only one respondent—James River—who pioneered insurance for the TNC markets, working with Uber as they grew. They returned an informal quote of $100,000, which was unacceptably high for a small pilot in an area with a low accident rate, so program requirements were adjusted, resulting in a connection to Zendrive and its insurance partner Fair American Insurance in early 2018.

An interesting component of the policy was that AMORE drivers were required to be connected to the Zendrive platform for monitoring driver quality; the cost of the policy could be adjusted up or down over time based on the driving behaviors of the drivers. This was useful in two ways—first, it provided some control over the cost of insurance and rewarded the program for good driving; second, it allowed monitoring and correction of driver behavior. Although always rigorous about training and safety, the program never had direct feedback on driver safety performance on the road.

As part of the insurance package, Zendrive provided a software product that was integrated with the AMORE drive app to measure five key driving behaviors:

- Hard stops – coming to an abrupt or sudden stop ("slamming on the brakes")
- JackRabbit Starts – accelerating suddenly and quickly from a stop
- Speeding – driving faster than the posted speed limit
- Phone use – using a phone to call, text, or manually engage with apps while driving
- Hard turns – driving too fast to safely turn the vehicle

Zendrive's software was integrated into the app via an Application Programming Interface (API) and communicated directly with its servers. No passenger information was provided to Zendrive; it knew only if a passenger was in the vehicle or if the driver was en route to pick up a passenger—driver behavior was not monitored during periods when they were off duty. A sample driver scoreboard is illustrated in Figure 2-27, and a sample trip report is displayed in Figure 2-28. This information is not shared with outside parties by AMORE or Zendrive and is included only for reference. Note that there is no Personally Identifiable Information (PII) for passengers, nor are there corresponding addresses.

Clearly, this is a valuable resource. Knowing that a driver has not used a phone while operating the vehicle or that their driving style matches program standards is very important. Long term, it will be useful and appears to be the future of smart insurance.

For all the advantages, working with Zendrive presented some significant challenges, mostly stemming from the fact that Zendrive is a startup that is still actively developing and refining its systems and procedures. Their SDK contained bugs, was not easy to use, and took far longer to properly and completely integrate than expected. The primary issue caused several Android-based operating systems to crash, leaving some drivers unable to use the AMORE Drive app as planned. Resolving this serious issue required exhaustive diagnostics and testing from Metropia's development team, time that could have been spent otherwise improving existing features and introducing new ones. This process added cost to the software deployment that was directly attributable to insurance.

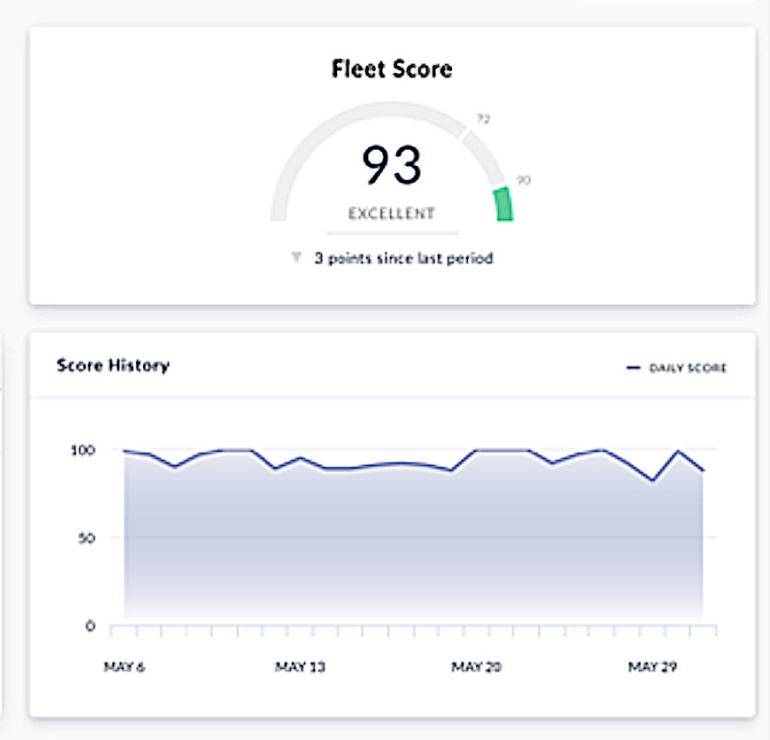


Figure 2-27 *Zendrive Sample Scoreboard*

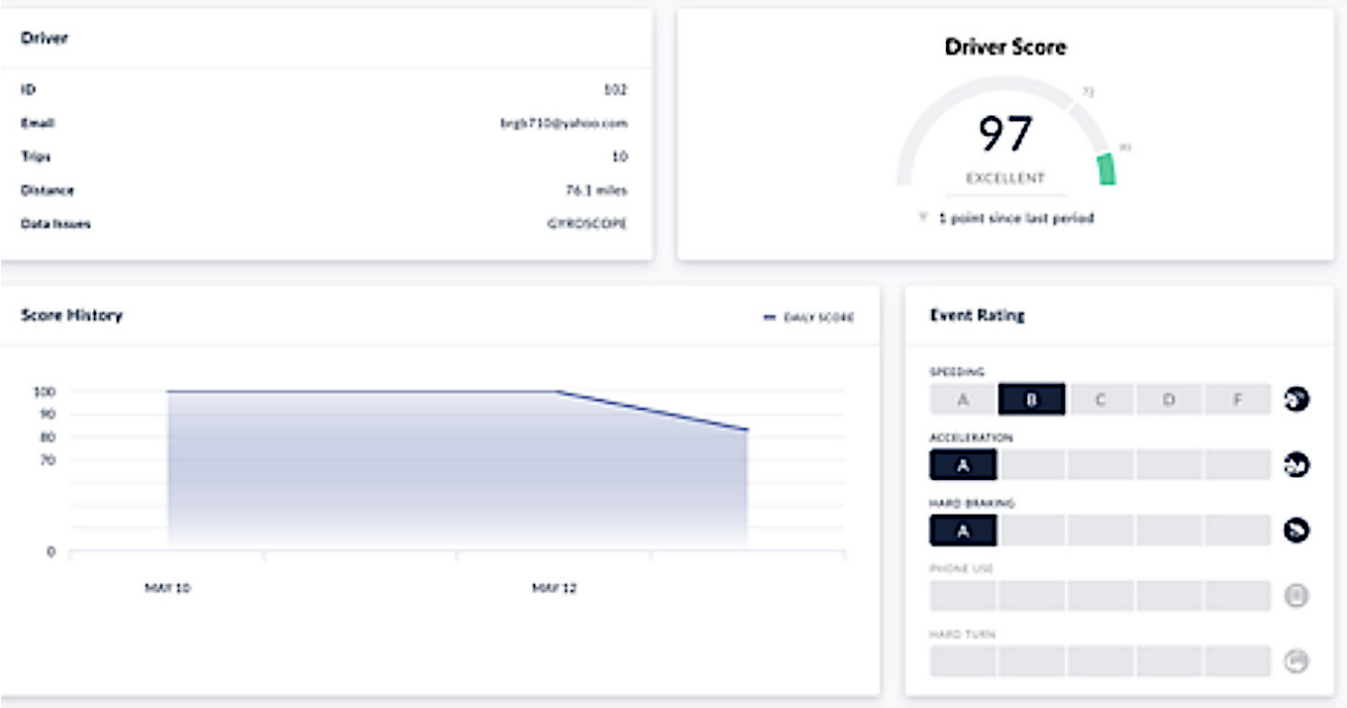


Figure 2-28 *Zendrive Sample Trip Report*

Technology Platform Readiness and Continual Enhancements

At a high level, the user-facing technology supporting the AMORE program can be broken down into three major subsystems—rider-facing interface (AMORE Ride app), driver-facing interface (AMORE Drive app), and backend administration and management tool (AMORE Fleet Management Dashboard). Due to the phased release of the AMORE Ride app to the public, the emergence of minor bugs, and the deployment of additional features and refinements, these three sub-components were routinely upgraded and updated by the Metropia development team. Though not exhaustive, a highlight of those software releases follows.

AMORE Ride

The AMORE Ride smartphone app, available for iPhone and Android devices, allows riders to request service and pay for trips provided by AMORE drivers. Passengers pre-schedule a reservation by entering their origin, destination, travel time, and number of passengers, and they indicate if a WAV is required through the Ride app. The backend system analyzes current supply and demand variables—i.e., nearby available driver capacity, estimated trip travel time and fare, wait time estimation, and potential carpool matches—and notifies passengers of either their successful match with a driver or the need to reschedule the trip at a different time.

For purposes of the pilot program, Metropia's developers deployed the app to program participants via Crashlytics, a third-party app distribution system popular with the testing and refinement of beta app versions. This selective deployment allowed for monitoring and improving the app in a controlled environment, as opposed to listing the app on stores where any member of the public could download and use it.

Updates to the beta version of the app were scheduled on two-week cycles to allow ample time for user testing and reporting as well as technical resolution of any issues reported, although some releases were quickly executed to resolve more substantial problems. In total, there were eight updated releases of the Ride app. Early updates to the beta version of the app primarily resolved bug issues and crashes reported by pilot program participants. iOS and Android Beta v0.2.0b displayed the program's service area and deactivated the "Leave Now" button. This significant change was to require that passengers schedule trips with a minimum one-hour lead time.

Versions v0.3.0b and v0.3.1b saw an increased performance in point-of-interest listings in addition to search results for businesses and location names returned by the mapping provider. Those results were blended with point-of-interest

from Google and Yelp for increased accuracy. The helpdesk module to a better User Interface (UI), and the status between passengers and drivers were calibrated to better sync, and critical bugs regarding a repeating rating message and an issue preventing the app from starting in certain scenarios were resolved as well.

The address search and map UI/User Experience (UX) continued to be improved to provide a smoother reservation flow in v0.4.0b and v0.5.0b. Furthermore, to address real-world time constraints and concerns, a novel time reservation system was implemented that allowed passengers to select either the time they wished to depart or the time they would like to arrive at their destination. The optimization engine was also upgraded to maximize fleet utilization with respect to passenger time-windows.

In v0.6.0b, a confirmation message triggered by conflicting reservations was added to avoid multiple bookings as well as duplicate trips. The team also fixed all remaining minor bugs and crashes in preparation for the official app store releases.

On Nov 25, 2018, official versions of the app were submitted and released on both iTunes (iOS) and Google Play (Android) stores, making the app available to the public for free download. In this version, in-app messaging was optimized for better communication with the users.

In v1.1.0, the team implemented and activated the payment collection flow reflecting the tiered trip fare structure as well as a two-week free trial setting for new users in support of marketing acquisition efforts. The upgrade also implemented a 10-minute buffer time between the time a trip was reserved and a potential “no driver available” message to give RubyRide drivers additional response time should they currently be serving a ride.

In v1.2.0, added were a welcome message to better introduce the program, a security check for payment fraud, and an upgraded UI design for many pages in the app (e.g., landing page, reservation screen, and navigation pages).

AMORE Drive

The AMORE Drive app, available on iPhone and Android devices, allows RubyRide drivers to accept and serve trips from AMORE passengers. The Drive app collects driver location via GPS and reports their position back to the system, allowing for the backend to determine availability and calculate service times. A full list of upcoming missions (trips) is presented in the app to allow drivers to plan their day and be aware of service levels. Incoming “same day” trips are also dynamically pushed to drivers through the Drive app, where they can accept the trip and see it added to their manifest. The app prompts drivers when it is time to head toward a pickup location, navigating them throughout

the service of the trip. Through the app, the driver can also communicate with the passenger and confirm passenger pick-up.

Given that only drivers employed by RubyRide were qualified to serve in the program, the Drive app was distributed via Crashlytics rather than a public release through official app stores. There were six updates of the Drive app throughout the program.

The initial beta version of the app, v0.1.0b, supported key operational functionalities. Drivers could access their manifests, receive tasks from the backend system, communicate with passengers, and complete the service.

In July and early August 2018, the team released v0.2.0b and v0.3.0b with fixes of bugs and [system/app] crashes reported by beta users. v0.4.0b featured a major system upgrade through which the optimization engine assigned drivers with schedules submitted ahead of operations and polished wording and UI design changes geared toward reducing driver confusion throughout the trip process.

Working toward insurance requirements from Zendrive, v0.5.0b marked the start of integrating its third-party SDK for evaluating driver behavior while driving. This update also further optimized the UI/UX design of general pages, e.g., helpdesk, legal, etc.

v0.6.0b and v0.7.0b were released to resolve stability issues reported by drivers as a result of the Zendrive SDK integration. The team then worked with Zendrive engineers and continued resolution efforts in v0.6.0b and v0.7.0b.

Based directly on driver feedback, two major features were released with v0.7.0b—the existing in-app messaging service that allowed drivers to communicate with passengers was replaced by Short Message Service (SMS) text messaging to increase utility and response rates, and a countdown timer to the start of the next mission was incorporated into Drive app so drivers would better know the amount of spare time they had before leaving to pick up a passenger, which is especially useful should one passenger's tardiness begin to encroach on the ability to serve an upcoming trip. Furthermore, this version of the app resolved an issue surrounding repeating reservations due to poor device connections.

The Drive app remained stable from v0.7.0b until May 2019, at which time the team released v0.8.0 and v0.9.0 to significantly improve the UI for all navigation flows as well as an enhanced registration page.

AMORE Fleet Management Dashboard

The AMORE Fleet Management Dashboard allowed the RubyRide and AMORE management teams to fully manage driver and trip activities through one

tool. Within the dashboard, drivers can be scheduled, and reservations can be monitored and observed (passenger details, date/time, route, fare, driver assignment, stats, and cancellations, should the need arise).

Fleet management dashboard v0.1.0b included passenger management, driver management, and reservation management, which allowed administrators and operators to track the status of each party.

Along with an upgrade of the optimization engine, v0.2.0b included enhanced support of driver schedules, which allowed operators to pre-enter a driver's future schedules. The update also further optimized trip assignments with driver's schedules, and a task management page was added for tracking driver assigned tasks.

In v0.3.0b, the team upgraded the design of the forms of each management page so that operators can review and track not only the status of ongoing rides/tasks but also both historical records.

Pilot Testing

As with any new technology or service, extensive user testing was required to debug and optimize software and improve driver performance on the road; pilot testing was launched in late June 2018.

In some ways, AMORE's similarities to existing services and apps such as Uber and Lyft were a double-edged sword, in that participants came into the program with certain expectations that did not always align with the program's objectives and goals. For example, familiarity with other rideshare apps likely helped people reserve a trip more quickly, whereas the idea of reserving those trips the day before (or even an hour ahead of) service and taking trips only within a smaller service area contrasted with previous experiences. These challenges made it clear that the pilot program would be an opportunity to improve user communication to better inform passengers and the community about AMORE's differences and advantages over existing services.

From experience, the team knew that many iterations of app releases, service and operations rules, and more would be required before AMORE was ready for a full-scale launch, so an ongoing pilot program was designed to allow for two-week cycles of user testing, feedback, and refinements before a new app version was released. This cycle allowed both drivers and passengers to become familiar with the apps and service and provide meaningful feedback before the next cycle began.

The AMORE website served as the main pipeline for the pilot program and was crafted to provide essential information to would-be participants. A signup form allowed the public to register their interest in joining the program. To encourage

visits to the website, the AMORE team sent out press releases notifying the media of the pilot program, launched a social media outreach campaign, and worked with supporting partners and stakeholders. Due to timing constraints, bureaucratic obstacles, and, in some cases, waning interest, stakeholder engagement delivered far less activity than expected. Fortunately, media coverage and social media posts generated the desired traction. Also contacted were participants in the regional transportation survey whose responses indicated that they were ideal candidates for the program. The AMORE website had over 1,000 unique visitors during the initial pilot signup phase, with 125 individuals filling out the signup form to join the program.

From the onset, it was clear that a great deal of handholding was necessary to onboard pilot participants. Many people who signed up for the program did not read the details of the program, especially concerning the limited service area, which led to a large amount of time contacting and speaking with registrants only to learn that they could not use the services. Revisions to the signup form, including a requirement for signups to indicate the intersection closest to their home, helped whittle down the number of unqualified participants registering.

Another anomaly of the signups was the disparity between expressed interest in and need for the program and the rate of follow-through during the onboarding process. Although persons interested in signing up had taken the proactive steps of visiting the AMORE website and enrolling in the program, including providing a synopsis of their interest in participating, many did not respond to multiple emails and phone calls attempting to formally sign them up. Included in this group were many individuals who had indicated that they suffered from limited mobility options due to age, disability or medical condition, and lack of resources.

Participants who responded to the team's follow-ups participated in a 15–20-minute phone interview during which their needs, program goals and objectives, service overview, and pilot expectations were discussed. All 30 individuals who participated in these phone interviews opted to move forward and participate in the pilot program.

As neither the AMORE Ride app nor service and operations were ready for the general public, the app could not be made available for download on the Apple App Store and Google Play. Instead, the team used Crashlytics, a popular app delivery system for beta and restricted app downloads. The download process for Crashlytics, however, is far more cumbersome than a typical app download and registration process from an official app store. Extensive supporting documentation and phone support were necessary to assist pilot participants with the installation process, which proved to be a more substantial time commitment than expected for participants and program staff; at least

one individual bowed out of the program at this stage due to the technical requirements and installation issues encountered.

Once the app was fully installed on participant phones and the service was launched, there was, again, a great divide between pilot member expressed interest and actual activity and participation in the program. Despite rides being free for the duration of the pilot, few participants took advantage of the service, even those who had noted their great need for the service. The few participants who did begin taking trips were very active and provided a great deal of feedback. Bi-weekly surveys were sent to all participants covering topics ranging from timeliness and quality of service to functionality and user-friendliness of the app. Several key pilot participants provided the bulk of feedback, going far beyond filling out the surveys by providing detailed trip-by-trip reports and phone consultations, highlighting bugs they encountered and areas for improvement in the app. As expected, the interaction between two different Ride and Drive apps (iOS and Android) across numerous phone types, the dispatcher dashboard, and the backend system presented many opportunities for bugs and glitches of various sizes. After more than 300 actual pilot participant trips and countless testing simulations, the software team was able to swiftly communicate with drivers and pilot participants to identify those issues and often resolved them on the same day. The same was true for implementing user suggestions for feature improvements in future updates of the app. Many users of the Ride and Drive apps were excited to see their suggestions take form in later updates.

Just as passengers required a great deal of handholding early on, so did some AMORE drivers. Instances of drivers inadvertently canceling a trip or failing to notice a reservation assigned to them resulted in several no-shows for service early on. Some updates to the AMORE Drive app were made to prevent drivers from quickly double-tapping a button or mistakenly canceling a trip in haste. Backend adjustments to the system were also made to accommodate driver desires to be outside the service area during lulls in activity. These adjustments often came with unintended consequences, which required additional refinements or adjustments to the system's algorithms and operational processes, but by the end of the pilot program, the team had reached a stable balance between service requirements and driver requests.

Official Release

Initial discussions for the official launch scheduled for December 2018 included the possibility of a public event. Suitable venues in the area were not plentiful, with the best option being a public park. Concerns over budget and resources, along with potentially low turnout, led to consideration of a more media-driven, forum-based event at Pima Community College (PCC). Hosting the event there would provide a comfortable room for hosting a panel with media attendees,

onsite catering, and a student body and staff to serve as an added audience and potential customer base. As stakeholders, PCC was happy to provide the venue for the event, but as the team discussed the pros and cons of hosting such an event, it was clear that the best outcome from the event would be generated by earned media, something that likely could be obtained with a simple press release and outreach.

Ahead of the launch, the team completed several key tasks. First and foremost, the AMORE Ride app had to be available to the public for download on the Apple App Store and Google Play. The content was written and graphics were designed for placement on these stores; a custom video highlighting the app was created as well. Submissions to the app stores must pass a rigorous vetting process by Apple and Google, and many minor revisions had to be made to the listings to meet their stringent criteria before the listings were approved.

With the apps ready for download, the AMORE website was updated, with the focus shifting viewers from signing up for the pilot program to downloading the app. The signup form was removed, and download links to the app stores were prominently placed throughout the site. All content, including Q&A, was updated to reflect service to the general public, the new pricing structure, and more.

Just prior to the official public relations launch, the team executed a soft launch strategy of encouraging pilot participants to convert from the beta version of the app to the official download from the app stores. This was a necessary step, as the competing apps could not coexist, but it also provided an opportunity for final testing of the official app in the real world as well as a chance for early favorable reviews to be listed on the stores. In addition to pilot participants, previous parties who had expressed interest in the program, key stakeholders, and other supporters were invited to download the app and try it. As a lure to try out the services, it was decided that all new users would receive unlimited free service for their first two weeks after downloading the app, serving as a “hook” in the promotional materials and outreach.

Public relations activities ranged from online campaigns to in-person tabling events. The media coverage generated by the press release was not as broad as hoped, but it did garner a wave of additional app downloads. The small population of the service area made Facebook Click-To-Install ads challenging to execute and wholly ineffective. The AMORE team did, however, join many private community Facebook groups to execute a free, organic information-based campaign, sharing media coverage, program updates, and more. These postings and pursuant conversations helped drive some additional downloads. AMORE representatives, including drivers, set up a series of information booths at popular stores around the service area and at the well-attended Vail Pride

Parade, but the limited visits to the AMORE table and a lack of downloads in their wake led to pursuing other outreach efforts.

For the official launch, the stakeholder groups were tapped for additional support. The Vail Chamber and the University of Arizona Tech Park published social media posts and newsletter articles, although Tech Park's outreach came some weeks later due to internal delays.

As was done previously during pilot recruitment, the team developed direct mailer postcards that were delivered to nearly every home and business in the service area. These postcards showcased key audiences and touted the program's free two-week trial with a call to action to download the app. Additional non-mailer versions were printed with a focus on particular use cases for distribution to targeted audiences.

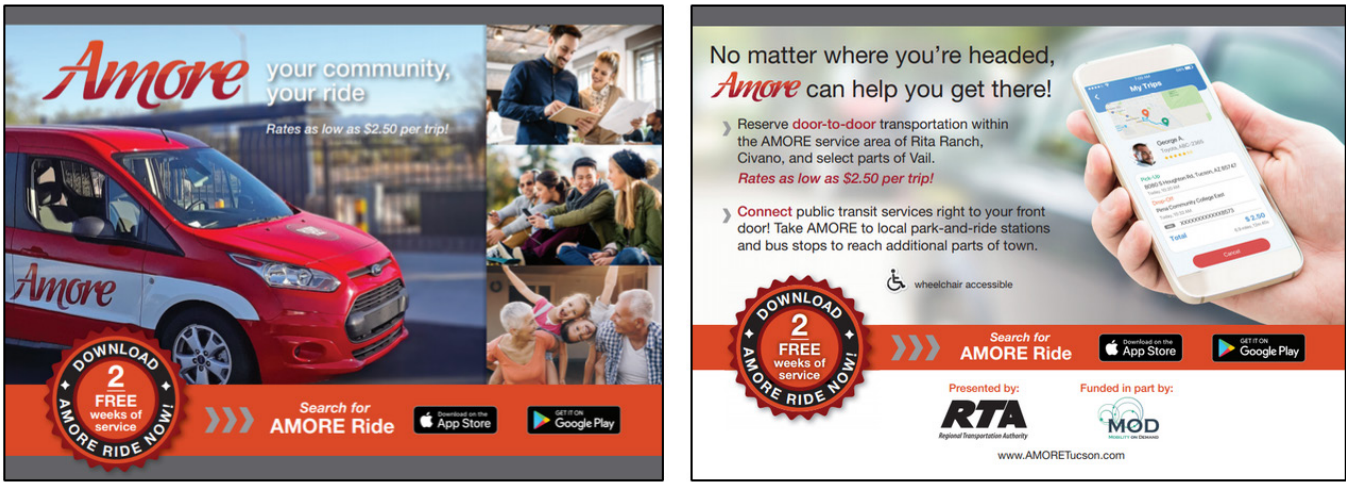


Figure 2-29 *AMORE Direct Mailer Postcard*

With the *Vail Voice* serving as the most significant news outlet specific to the service area, an article announcing the expansion of the service area throughout the greater part of Vail was submitted and published.

Pricing Model

For the initial pilot program that kicked off AMORE, it was decided that service would be entirely free to passengers. This approach was ideal for two key reasons—it was known that there would be wrinkles to iron out both in the apps and in the service itself, and making the service free would make those issues more forgivable, and requiring pilot participants to complete bi-weekly surveys and provide critical feedback on the program would prove more valuable at the initial stage than any fare. Participant feedback helped AMORE identify weaknesses and oversights in the program and improve those deficiencies prior to the full-scale launch.

For the official launch, the team opted for a tiered pricing model that would encourage and reward frequent, repeat ridership. Pricing was divided into three tiers based on the number of trips completed in a month, with the trip counts and rates starting over on the first of each month, with a lower rate for priority reservations over standard reservations:

- Trips 1–10 – $4.00
- Trips 11–20 – $3.00
- Trips 21+ – $2.50
- Standard Trips are an additional $0.50
- Cancellation fees:
  - $0 cancellation fee when trips canceled prior to 8:00 PM the night before service; otherwise, cancellation fee of $1.50
  - Once a driver is on the way (alert sent to passenger), passenger charged full fare even if they cancel or if they do not show up

It was hoped the pricing incentivization for greater numbers of trips would tip the scales in favor of a more devoted ridership as the cost of service declined at volume, but the model did not produce those results. Based on reactions to price testing, the team decided to adopt a more straightforward fixed rate of $2.50 per trip for priority reservations and $3.00 per trip for standard reservations. In both pricing models, the reduced rate for priority reservations was successful in increasing advance reservations in support of program goals.

Geographic Reach

The project team determined that the original project service area should encompass the three major neighborhoods in the area—Rita Ranch, Mesquite Ranch, and Civano—as well as all major employers, employment centers, and major destinations such as PCC.

Following the model already successfully employed by RubyRide, an initial design decision was to have a small service area, which can help minimize travel time and resources. Ideally, it was desired to keep trips short to maximize the availability of drivers. In scenarios with few drivers on duty, a potential conflict could arise in which multiple trips were scheduled close together but at opposite ends of a large service area. This is a common problem for demand-based point-to-point services.

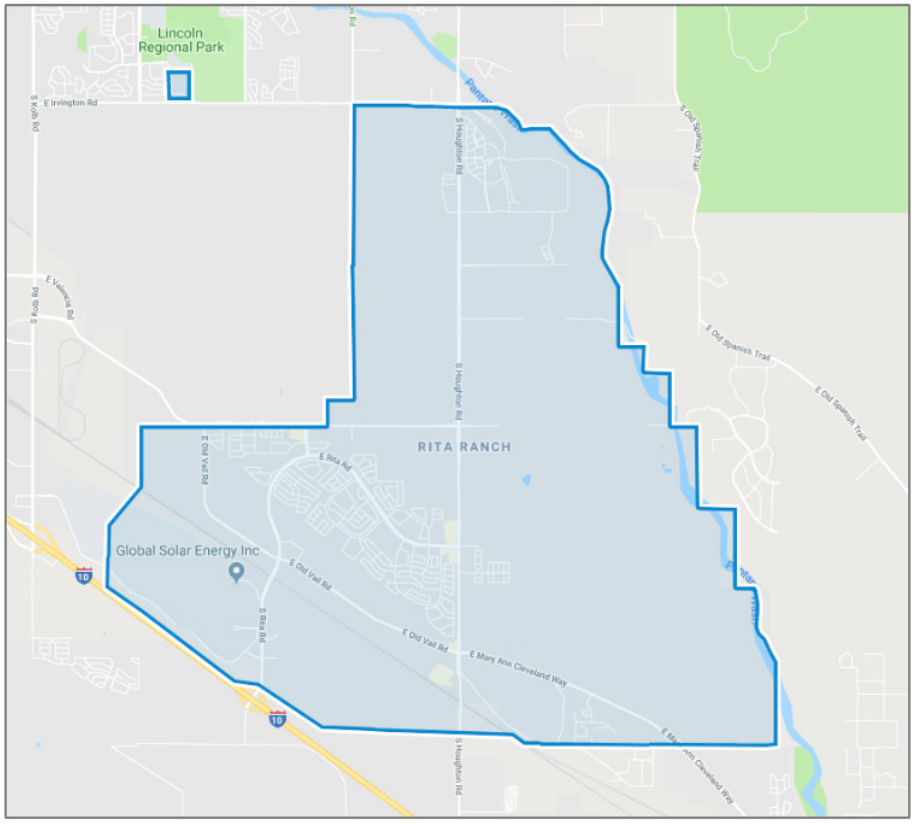


Figure 2-30 *Original AMORE Service Area*

As the project progressed, suggestions from area stakeholders and team members highlighted opportunity areas for expansion. Data from operations also indicated that the fleet RubyRide had assembled would be capable of handling increased demand from expanding the service area.

The first project expansion was modest in size; it extended service into the community of Vail, an area the team had long discussed engaging. As shown in Figure 2-30, the initial expansion included two large Vail School District schools (Cienega High School and Old Vail Middle School) and a large commercial area in Vail.

Figure 2-31 *First Project Service Area Expansion, Vail*

Additional small expansions of the area were made in response to customer requests to include an activity center north of PCC and at the suggestion of a driver who identified a housing development north of the main service area.

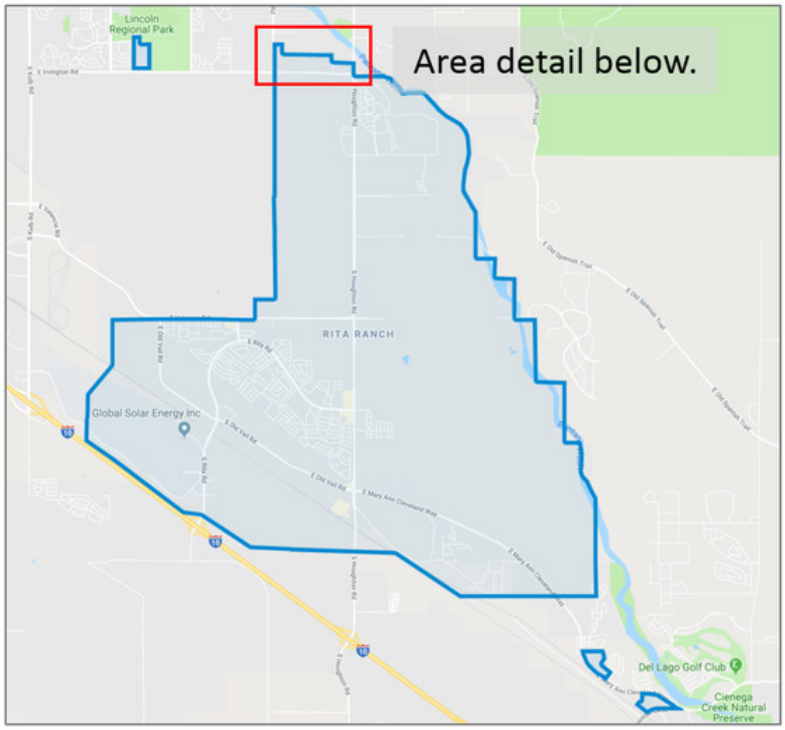


Figure 2-32 *Additional Northern Service Area Expansion, Vail*

The final and most extensive expansion was launched and coordinated with the second round of targeted direct mail flyers and extended the service to a series of housing developments along Mary Ann Cleveland Way and, more significantly, to the majority of the Vail community. Nearly every developed area served by paved roads in Vail was included in the expansion. The rationale for the final expansion was based on targeting the potential user groups identified early in the project as the most likely customers—older adults and older children. Vail has a higher proportion of both groups.

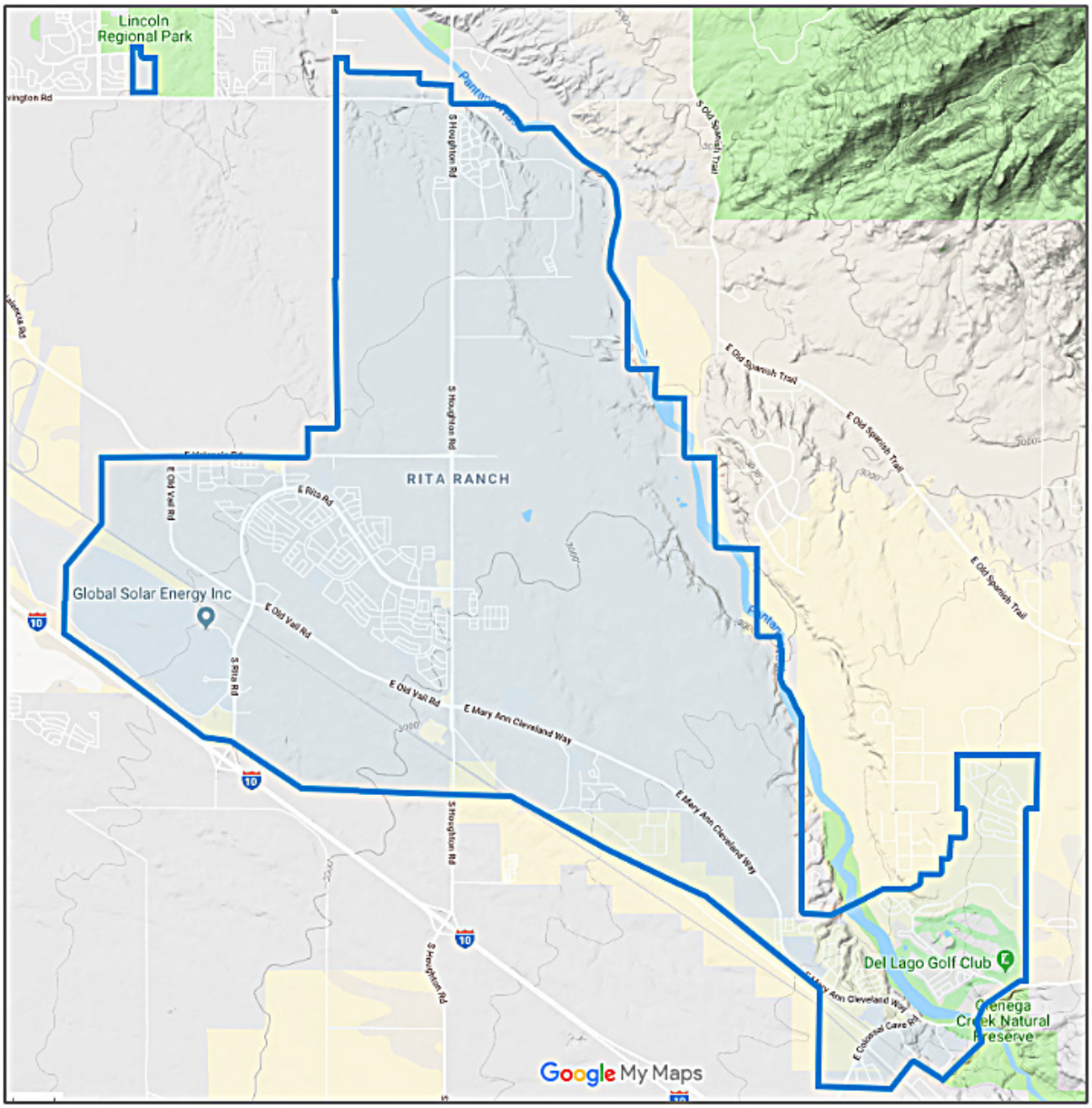


Figure 2-33 *Final Project Service Area Expansion, Vail*

Section 3

Conclusions, Lessons Learned, and Next Steps

Overview

The scope of the AMORE project required bringing together a diverse team with expertise in the key areas of software development, transportation logistics, fleet management, and operations. Models exist for MaaS-type services such as AMORE, but the project team's ambition was to build a unique iteration from the ground up. Although some of Metropia's existing platform was leveraged to build the eventual apps used to coordinate the service, most of the app platform and all driver operations were newly-assembled. Building an entirely new service provided freedom to innovate, but it also generated many challenges given the project's relatively modest lifespan and budget. The AMORE service worked as anticipated in the test environment from a purely technical viewpoint. Reservation, management, and delivery of trips were predictable and effective; however, as noted below, more testing, data collection, and a higher-demand operational environment would greatly benefit future iterations of the concept.

Key lessons from the AMORE project include the following:

- Point-to-point TNC-like operations, not unlike traditional transit, are driven by the latent consumer demand of the operating environment. Even the best designed, lowest-cost service will not be valued over SOVs without a pain point compelling customers to switch modes. Take time to understand the demand in a given market before launching the service.
- Marketing a new service concept takes time, especially in today's saturated media environment. Engaging local stakeholders is valuable, but it cannot replace traditional marketing strategies. Customer behavior is often slow to change, and even potential customers interested in using an alternative service may take time to fully shift their patterns.
- Tight integration between software platform developers and system operators is critical for a MaaS-type service. The positive feedback-loop between Metropia's developers and RubyRide's operators allowed for quick, flexible, and effective operational iteration of the platform software; however, the necessary but challenging software integration with a third-party insurance company demonstrated the risks of working with a remote and unintegrated participant.

Technology

During development of any new software, issues certainly will arise, but developing multiple integrated platforms that must cohesively work together

presents additional layers of challenge. Add to that the human element and the need to design for instinctual utility, and a project such as AMORE is a massive undertaking. Careful resource planning should allocate significant time for bug and crash resolution as well as improvements made via user-testing. Metropia's experience in this arena proved valuable, and AMORE's pilot program was extremely fruitful in generating critical feedback, which helped the team produce improved products for the official launch.

For the pilot program beta testing, the team reviewed various software development kits on the market for private app distribution before deciding on Fabric/Crashlytics. In addition to being compatible with both iOS and Android platforms, it also features crash reporting, application logging, statistical analysis, and issue tracking. However, there were some trade-offs with choosing Crashlytics. To distribute the private app to the beta tester's device, a user must first download a separate app, "Beta," sent via email from Crashlytics. The installation of that app requires many additional steps and setting adjustments within the user's phone, particularly for iPhone users. To overcome this obstacle, Metropia's team created an installation guide to walk users through the process, but despite those efforts, issues ranging from users missing the email invitation to problems with the installation still were encountered. There is great utility in a distribution service such as Fabric/Crashlytics, but project teams must plan ahead for additional support to help testers get off the ground.

For drivers, there was a learning curve associated with the Drive app as well. Many drivers were not particularly tech-savvy, so the entire process was new to them. It was imperative that drivers correctly use the app to conduct and complete their trip assignments; to increase driver comfort with the system and reduce costly errors, the Metropia team produced detailed documents and training materials to outline key features and walk drivers through the processes of accepting and serving trips within the Drive app. This effort paid off in a notable reduction in dispatcher and driver errors and an increase in service quality on the road.

Due to the nature of this project, Metropia's developers leaned toward a variable design module as opposed to a more rigid system, which allowed the team to quickly and easily adjust program specifications on the back end without the need for additional app releases. For a new program such as AMORE, developing a platform with changes and updates in mind is critical. The program shifted many facets of operations, such as service times, fare costs, and service area, and as a result of flexible design work, those adjustments were made without significant developmental burden.

Off-the-shelf, third-party products were a significant aid in allowing introduction of enhanced functionalities to the product without significant development work. At the beginning of the program, a basic "Customer

Feedback" section of the app with a simple open field was developed where users could send a message. In the implementation stage, customer support software services were surveyed, and Zendesk's platform was selected as a Q&A and customer support system. Its SDK was incorporated to automate the process of developing and organizing content, live editing, email notifications, and support analytics. However, relying on third-party products can introduce risk. As noted earlier, the integration of the AMORE app with the SDK of Zendrive, RubyRide's insurance provider, led to serious crashes, which took significant resources to resolve. Incompatibility between Zendrive's SDK and the new Android operating system rendered the Drive app unusable on some driver phones, and the team had to roll back to the previous app version while working with Zendrive engineers to fix the problem. The issue was eventually resolved, but understanding the stability and track record of third-party tools is vital.

A development project as complex as AMORE requires the right tools to log, track, and resolve known issues, bugs, and improvements. Throughout the project, feedback was received from internal team members, pilot passengers, drivers, and third-party providers. Reliable communication between project functional teams was mainly driven through Basecamp, an online project management and real-time communication tool. Furthermore, the development team ran an agile development process and maintained a product feature backlog with prioritized tasks on Jira, a tool developed by Atlassian used for bug tracking, issue tracking, and project management that also allowed connection to software versioning tools such as Bitbucket so the development procedure was cohesive with issue tracking. The team also updated continuously rankings with the feature's importance and workload required by the task. With such an automated and transparent procedure, the development team was able to work efficiently and completed many system upgrades and improvements.

Operations

The biggest challenge for operations was a general lack of trip volume, which complicated reaching target efficiency. The hope was that as volume grew, driver-hour utilization would increase enough to hit close to break-even on costs. Low trip volume resulted in variable driver shift demand, often requiring fewer hours per driver than ideal. A fuller workload would have increased efficiency, boosted morale, and lead to higher-quality operations. Unfortunately, that opportunity did not present itself. With just one driver on duty most days, the service rarely operated at better than ~25% utilization, which was not enough to justify the expense. Two drivers would increase that to about 38%, three to 45%, and so on.

This challenge also made the development cycle longer for the software, mainly because less frequent or less common use cases did not get exposed as quickly, and the ability to test the solutions in real situations was not always available.

On the positive side, useful experience was gained in building a driver ecosystem and operating a modified TNC model—employed drivers providing their own cars. Among the lessons learned are the following:

> "I like working at RubyRide because you get to meet new and interesting people that live in the Rita Ranch area. You help them get to where they are going, whether it be to the store or a doctor's appointment or home. The 'thank you' you get at the end of the ride makes you feel that you have helped someone and have done a good job". – M. K.

> "I'd like to say that I'm quite pleased to be part of a surprisingly remarkable group. I truly believe that we are offering a viable and needed service to the community. Seems like everyone is willing to contribute to the cause. Thanks". – J. L.

- Many potential drivers for this model do not want to work as independent contractors—the service was not competing with Uber and Lyft for talent. Those who were attracted to an AMORE position were interested primarily in a simple way to make extra money without the overhead and the risk of acting as an independent contractor. The teams believes there is a large pool of these workers in the US.
- Being useful in their community was an essential motivator for most drivers, which helped in selecting the most competent, customer-service oriented staff.
- Activating drivers for sales is a useful exercise, with qualifications. Some drivers are not comfortable in that role, but those who are can be quite effective.
- Several tabling events were held, and at one of them outside a local large grocery store on a Saturday morning, AMORE staff engaged with 20 residents over a 90-minute period; of the 20, only 1 had previously heard of AMORE. This reinforces how difficult it is to get people's attention today; most had likely received more than one mailer and still were unaware of the project. This highlighted that even with extensive marketing efforts, some people were still unaware of our service.
- Drivers are willing and able to work more dynamic shifts. Some had second or third jobs or attend school and have fixed schedules, and others were working for extra cash and keeping themselves engaged. Members of this second group often were willing to come on duty at short notice when things got busy, one of the benefits of robust communications tools and making sure that drivers work in the area they serve.

A significant challenge of the pilot was incorporating a WAV. Procurement challenges and difficulty finding insurance made for difficulty early in the project. Despite best efforts, the WAV was used only once to deliver a customer using a wheelchair, and that was a trip primarily created to test the feature.

To ensure WAV service was offered in the project, a WAV vehicle was proposed as part of the pilot. At the beginning of the project, however, there was some confusion about whether the vehicle could be purchased with grant funding without being part of competitive procurement and whether the grant could support a vehicle with such a short service life. Ultimately, it was determined that grant funding could not be used to reimburse for the cost of WAV. RubyRide found another way to finance a WAV and was able to sell it to a local Non-Emergency Medical Transportation provider who leased it back to the program fully-insured. This cost significantly more than the original plan in addition to the hours invested in resolving the issue.

A project goals was to show that while universal parity of service is challenging for many reasons, it is worth moving in that direction. A significant barrier is hardware; there are few WAV vehicles on the market today able to operate in a short-trip environment. There are two challenges—a WAV must be able to navigate neighborhoods and easy for customers using wheelchairs as well as convenient as a regular, commonly-deployed vehicle, and branding and appearance of the WAV must be attractive to the general public; a specialized vehicle may not be accepted by the public at large, especially if branded as a quick, fun, and easy way to get around.

This poses a dilemma for providers and agencies—the best way to provide affordable, high-quality universal mobility for any is to make it work for all. However, regulatory controls such as mandated signage on and inside the WAV, vehicles designed for even the largest wheelchairs, and brand messaging that designates the vehicle as “specialized” can confuse the general public. Customer welcome universal mobility and a vehicle that can move wheelchairs, but people with options may not choose a service that appears designated for specific clientele only. Positive feedback was received that the WAV used for AMORE was attractive and appealing to all customers who used it; many did not know it accommodated wheelchairs until they got inside. The WAV vehicle was an operational compromise; it could hold only three passengers plus the driver and a wheelchair, and there was no option for a motorized lift, but experience showed that vehicles such as the WAV used for AMORE have the potential to play a role as a universal vehicle.

Going Forward

From an operations perspective, several changes are recommended for future projects:

- Get drivers out into the community promoting and advocating the program sooner. It is a great way to measure the effectiveness of marketing efforts. Drivers are the best advocates for our service, it is good for morale, and it personalizes the service for potential clients.

> "I think what I like the most is that this is a low-key operation while not short-cutting safety or customer service. We have a real stand-up crew. I'm excited to be part of something new and growing." – P. C.

- Plan for more training time. More time was spent doing technology training than expected. In hindsight, this is a natural result of the development process. Future projects should expect training and feedback time to be 5% of total hours.
- The WAV was a challenge to include in the pilot project. The administrative difficulties of acquiring a specialized vehicle for the short term were not expected initially, and there was initial confusion in the project team regarding how the vehicle should be procured and whether grant funds should pay for the capital costs. Ultimately, WAVs need to be a part of any fleet operating the type of service AMORE offered, but it is recommended to make expectations and procurement requirements more explicit in grant guidance documents.
- Acquiring insurance was a significant process. While it is unlikely that a different approach could have been taken, it should be recognized that insurance can pose an impediment to innovation in public-sector mobility. The amount of time invested and policy expense cost the project significantly more than expected and recovered.
- Projections included best, expected, and worst-case scenarios from a revenue standpoint, but the worst-case scenario was too optimistic, which was counted on to make the project viable.

Marketing/User Outreach

There were many marketing and outreach challenges throughout the program, some of which could be quickly learned from and adjusted and others that could not be overcome before the program came to an end.

It is crucial to identify and gather communications teams from the partner groups early in a project lifecycle. Although the AMORE team selected members from Metropia to develop all content and collateral for the program, it failed

to bring corresponding representatives from RTA on board early enough to outline its policies pertaining to word choice and the editorial process. Those representatives were highly-skilled and contributed to the program, but the oversight in securing their feedback early on led to delays and some rewriting of content. Establishing who will oversee authoring various communications and who will sign off on them and laying out essential style guides or prohibitions can save a program much work.

One issue hampering solicitation of target audiences and the pursuit of specific use cases was timing. To reach certain audiences, the program relied on stakeholder groups to share the message with their clientele; however, in several instances, delays in sharing that information, either due to scheduling requirements or stakeholder prioritization, led to the AMORE team either postponing those efforts or canceling them altogether. A key example came in outreach to high school students in the service area. Initially, this group was a primary use case for the program; however, the school was on summer break when the program first launched, which meant postponing that outreach. Later, when ready to engage them, personnel turnover at the school led to confusion among various entities and organizations to secure the necessary permission and support to work through school channels. These roadblocks nullified marketing efforts to this audience.

As noted earlier, the controlled pilot program took considerable resources to meet with potential participants and onboard those who chose to join the program. Although these measures were deliberate and necessary to pre-qualify participants and cover all bases, opportunities to remove roadblocks and reduce friction in the signup process can conserve resources and increase participation. Critical to that is tightening up communication. Adding required fields to the AMORE signup form eventually reduced some workload for the team, allowing securement of pre-qualifying information from signups who had not read the program specifics in detail. Additionally, a lesson learned quickly, but not quickly enough, was to cut losses in engaging pilot signups who expressed interest yet never followed through. Desires to secure broader pilot participation led to unnecessary follow-up efforts that took resources away from more valuable efforts. If a person is genuinely interested in participating, they will respond accordingly.

This program not only was trying to introduce a new service but to change the behavior of local commuters. For most, transportation is a daily affair and a firm routine. Overcoming that routine and getting the public to consider a new mode of transportation takes time and, for a program such as AMORE, time was a limited commodity. Marketing efforts often require repeated exposure to the same audience before eliciting a response and building brand awareness, and introducing a new service takes time.

Late in the program, an extension of the service area opened additional potential customers and additional exposure to the senior and high school use cases. However, time constraints prevented fully tapping in to those markets before the program's end. From the first day of the pilot to the last day of service, the number of app downloads greatly exceeded the number of passengers who had taken a trip. Anecdotal feedback and surveys both suggested that many were interested in the service but did not feel a pressing need to use it at that time; over time, consideration for alternative modes may increase, particularly as a person's circumstances change. In one instance, a local resident's car needed to be replaced; rather than purchase a new vehicle, she opted to become a routine AMORE passenger. Instances such as this take time to reveal themselves and for the program to take root in the community.

The ability to pivot marketing channels and outreach efforts is critical. The AMORE team did an excellent job of adjusting when specific campaigns and opportunities did not pan out. Early on, the project had much support from various stakeholder groups; in many instances, their willingness to deliver on that support or the overall impact of their support did not meet expectations, which put more emphasis on other marketing endeavors. Considering the support of outside parties as a bonus to, rather than a pillar of, marketing efforts will ensure that the program is not reliant on promises of support that may not materialize.

Use Cases

Many of AMORE's passengers came from lower economic brackets (unemployed, underemployed, on public assistance) and lacked the funds to purchase a car and found TNCs such as Uber and Lyft outside their means. Ultimately, many pilot participants within this demographic dropped out of the program once it began charging a fare, although the lower price rate later deployed may have been more in line with their budget. There are likely groups just above this economic bracket for whom the service was within their price range.

Passengers who indicated that they were facing economic hardships overwhelmingly used AMORE for necessary and essential quality-of-life trips such as doctor appointments, emergency room visits, and trips to the grocery store. Without the program, these necessary, routine trips would have been a much more significant burden, both in terms of cost and time.

Several participants were routine public transit users. For them, AMORE services bridged the first/last mile gap between their homes and the two main park-and-ride stations in the service area at the University of Arizona Tech Park and PCC campuses. Limited service times and days of service for the circulator route left transit riders without a means of connecting to those transit hubs for one

or both legs of their trips depending on their schedule. At those times, AMORE saved them a significant walk or bike ride.

Throughout the program, signups and downloads far exceeded actual ridership. In surveys and interviews, over one-third of interested potential users indicated that AMORE's service area limited their participation in the program. That feedback also suggests that a significant percentage of potential users simply did not need our service. One-third of user survey respondents indicated that they did not have anywhere they needed the service to take them, and nearly another one-third already owned and regularly drove a vehicle. A transportation service such as AMORE is one primarily centered around utility, and for populations who have alternative means of transportation that fit their lifestyle, there is no need to pursue other alternatives.

User Profiles

AMORE's passengers came from many different socioeconomic and demographic backgrounds, but they largely showed a common denominator—need. Whether their transportation challenges were rooted in economic hardship, medical conditions, or lack of a functioning vehicle, high-volume riders either lacked suitable transportation options or were unhappy with those at their disposal. Following are snapshot profiles of some frequent riders:

- Juan is reliant on public transit to reach his job in central Tucson, but the limited service hours and days for Rita Ranch's shuttle means riding a bike for several miles of his trip on evenings and weekends. AMORE allowed him to connect directly with a bus at the PCC park-and-ride and significantly shorten his commute time.
- Lynn is 18, and both parents work. Her high school offers no bus service from her home and, as their household only has two cars, one parent must drive her to school five days a week and friends drive her home after class. AMORE gave her flexibility to travel without relying on other people and freed her family from the obligation of chauffeuring her to school on their busy mornings.
- Jenna is pregnant and does not own a car. Although she relies on public transit when possible, first and last miles are getting increasingly taxing, especially when grocery shopping or traveling with her young child. AMORE enabled her to run daily errands and make her routine doctor's appointments without additional stress.
- Sally was a routine, daily driver who lived and worked in the AMORE service area. She was very satisfied with her chosen mode of transportation until her car engine died and the cost of repairs was prohibitive. While shopping for a new vehicle, she heard about AMORE through a flier in the mail and downloaded the app. After trying the service free for two weeks, she

realized that reliable and affordable service would allow her to go without purchasing a vehicle, and she quickly became a daily passenger. Upon conclusion of the program, she indicated that she would once again begin shopping for a vehicle, as no other services in the area truly matched her needs.

- Phil is carless, unemployed, and struggles to travel to the store with his aging mother. With a very tight budget, his travel options are limited mainly to walking, which can be difficult for the pair, especially when returning home with groceries. AMORE gave him the ability to make that frequent trip to the grocery store in comfort, and he and his mother both became frequent riders, at times as a pair and at others alone.
- Michele works outside the AMORE service area and catches the bus from UA Tech Park's park-and-ride location. Her house is about a seven-minute walk to the park-and-ride, and although she has a vehicle, she more often relies on her husband to drop her off and pick her up, although walking is an option. Although not a necessity, AMORE gave her another option to make her public transit connection in comfort rather than cope with the weather elements or coordinate and compromise travel times with her husband.

Surveys and Stats

The AMORE team relied heavily on user feedback to help identify and target use cases and audiences, campaign channels, marketing, and communications efforts, and more. Bi-weekly user surveys were conducted throughout the pilot program, with post-trip surveys taking place toward the end of the program. These surveys, along with surveys of potential passengers who downloaded the app but never took a trip and many interviews with users across the participation spectrum, helped the program better understand motivations for using (or not using) AMORE services.

Figures 3-1, 3-2, and 3-3 show responses to survey questions that helped identify specific needs and use cases among user groups.

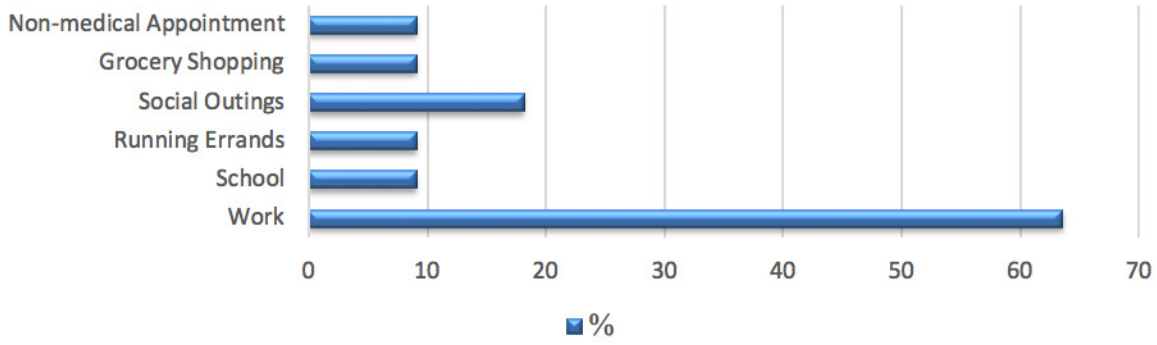
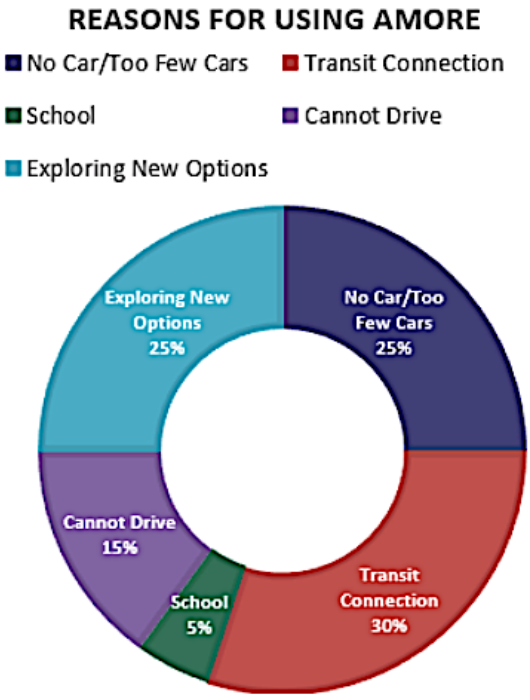


Figure 3-1 *Primary Trip Purposes for AMORE Users*



- 50% have no/limited mobility options
- Transit connection challenge identified as expected
- 25% of choice riders are exploring non-driving options

Figure 3-2 *Reasons for Using AMORE*

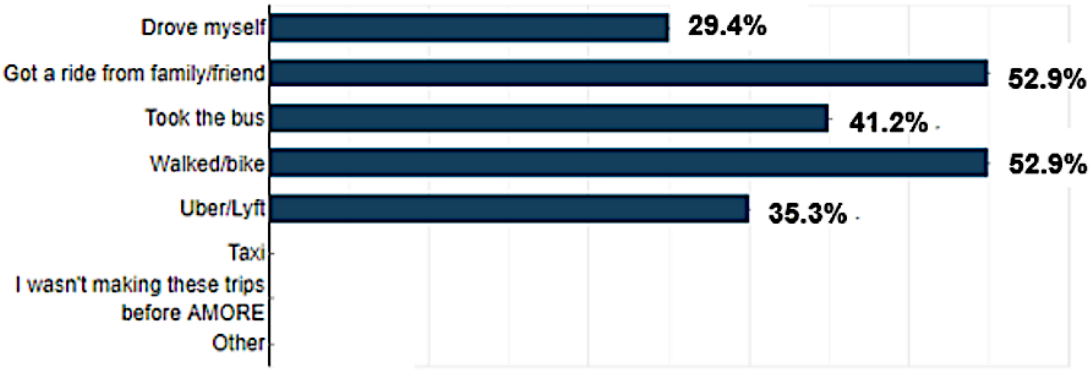


Figure 3-3 *What Form of Used Transportation Prior to Joining AMORE?*

Behavior Change Barriers and Opportunities

From this project, it can be concluded that the key to success for a service such as AMORE is to gauge potential demand before launching the service to the market. Transportation is needed for residents to fulfill various daily obligations; before any new service is introduced, community residents have already determined their transportation solution regardless of whether the solution is highly desirable or comes with a high pain point. A survey of a

prospective community of customers that measured their pain associated with the mode they currently used would have a distribution shown in Figure 4 4, which shows the varying degree of pain points for the current choice and where AMORE's falls on the spectrum.

AMORE's newly-introduced service with its perceived operating characteristics (travel time, cost, comfort, safety, etc.) is represented by the blue line in the chart. People whose pain points associated with their current transportation mode are higher than the new service are potential target users; those with a lower pain point associated with their current mode are less likely to adopt the new service.

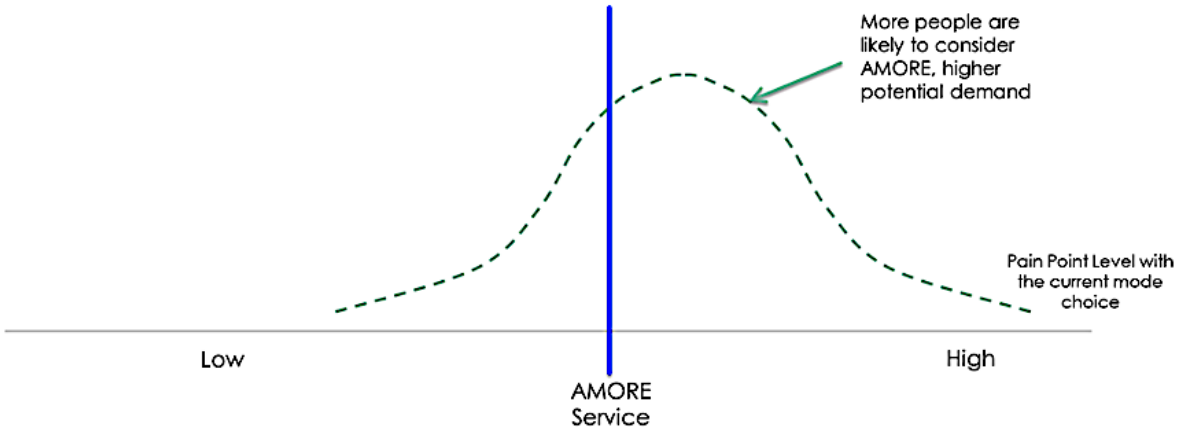


Figure 3-4 *Pain Point Distribution and Relation to AMORE Service Leading to Potential Demand*

As an example two communities, A and B, are likely to exhibit distinct pain point distributions for their current transportation mode choices. From Figure 3 5, it is clear that Community A has more residents whose pain point is higher than the AMORE service than Community B, thus making Community A more viable community in which to launch the service. Drilling further down to the trip purposes associated with the pain point reveals a clearer picture, regardless of the use case, of which trip purposes incur the highest pain and could be improved by a service such as AMORE.

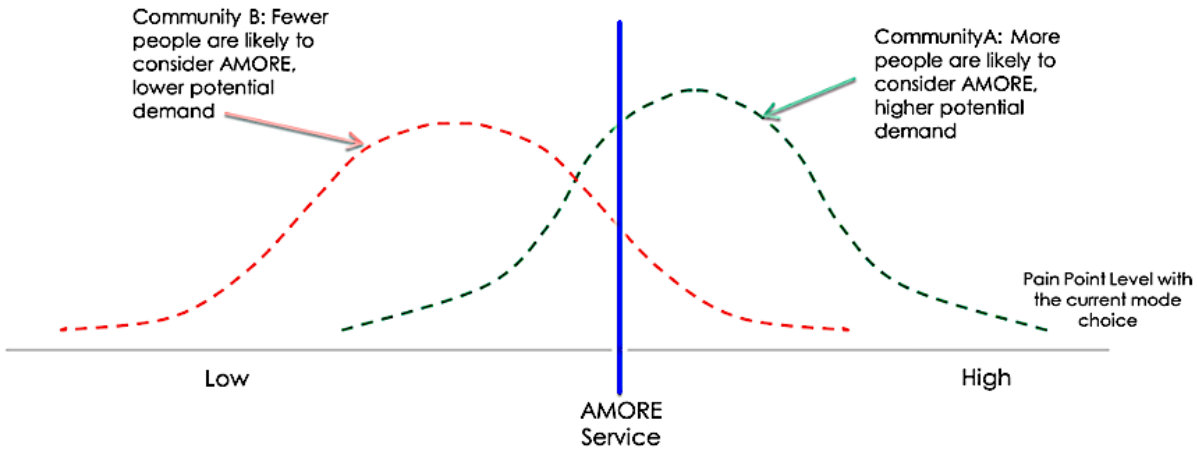


Figure 3-5 *Pain Point Distributions for Two Different Communities*

Next Steps

Community Qualification Methodology

Future research could develop a defined community qualification methodology that uses the pain point distribution concept to gain a better understanding of the state of current choices. Mainly what factors influence these choices and where the new service stands in comparison to current choices. This high-level assessment would be beneficial for an agency such as RTA to select one or several promising communities for deployment during the planning stage and would help increase the chance of success and reach a sound investment decision among multiple service options.

Broader Positive Impacts

For the short term, redeployment of the technology and experience developed during the AMORE project has already begun. One of RTA's largest public transportation services, Sun Shuttle ADA Dial-a-Ride (SSDAR), provides complementary and premium optional ADA services throughout the greater Tucson urbanized area. Its daily operations are managed through a contract with Totalride, Inc., which began in July 2017.

One of RTA's greatest challenges is providing accessible and reliable transit to the region's less urbanized areas in an economically-sustainable way. Outcomes from the AMORE project shed some light on the ways in which RTA can improve transit options for communities such as Rita Ranch. Although the success of RubyRide's on-demand service was minimal in this instance, this report provides a valuable list of reasons why this system was unable to effectively sustain itself and ways that future MOD services in the region could potentially succeed.

Currently, several low-performing regional fixed shuttle routes are being assessed further to help improve ridership and service quality. AMORE project data and MOD suggestions are being taken into consideration when establishing the best strategy to improve these fixed routes. A comparative analysis between the existing fixed routes offered in the region and a possible Mobility on Demand (MOD) system as a replacement are being conducted. The RTA is taking key findings from the AMORE project into account to create a more favorable service outcome.

The RTA is rethinking how its existing transit systems operate and perform as the region's transportation systems begin to recover from the impacts from COVID-19. This report's findings will contribute to the collection of resources needed to successfully determine if an AMORE-inspired service is a viable replacement for the underperforming fixed shuttle routes.

Acronyms & Abbreviations

AMORE	Adaptive Mobility for Reliability and Efficiency
API	Application Programming Interface
APTA	American Public Transportation Association
DRTS	Demand Responsive Transit Systems
FBI	Federal Bureau of Investigation
MaaS	Mobility as a Service
MOD	Mobility on Demand
NPS	Net Promoter Scores
PCC	Pima Community College
PII	Personal Identifiable Information
RTA	Regional Transportation Authority
SDK	Software Development Kit
SMS	Short Message Service
SOV	Single Occupancy Vehicle
TH	Transit-Hailing
TSP	Transportation Service Provider
UI	User Interface
UX	User Experience
WAV	Wheelchair Accessible Vehicle

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