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Community impacts: Accessible electric vehicle carshare programs

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Summary

Having abundant and affordable access to transportation affects an individual's ability to live a healthy and fulfilling life. To date, a majority of carshare models have been implemented in urban, affluent areas, and have not focused on electric vehicles (EVs). Recently, Forth has developed and tested a variety of EV carshare programs, with the goal of identifying and understanding best practices and challenges associated with implementing these programs in underserved locations, specifically in low-income and rural areas. In this paper, we will share the design and results to date of several of these programs, as well as a framework for designing a carshare program.

Keywords: BEV (battery electric vehicle), car-sharing, consumers, emerging, passenger car

1 Introduction

The ability to access affordable transportation directly impacts an individual's access to education, professional development opportunities, child care, and healthy food choices. [1] Urban settings often feature a variety of transportation options that can complement or serve as an alternative for personal car ownership.Examples include public transportation, shared mobility services, and micromobility options such as bikes and scooters. Transportation options are often more limited in rural communities due to lower population density and greater travel distances between destinations. To date, much of the adoption of and investment in electric vehicles (EVs) and carsharing has occurred in urban or more affluent areas, resulting in rural and low-income communities experiencing lower awareness of EVs, their benefits, and the availability of EV charging infrastructure. [2] At Forth, we are committed to improving mobility options for all. Wemaintain that electrifying and broadening the transportation sector is a key strategy to improve mobility options in rural and low-income communities.

1.1 Carsharing Models

Carsharing is a model of car rental in which individuals have the benefit of using a car without the costs and responsibilities of car ownership. [3] There are a few key differences between carsharing and traditional car rental via companies like Hertz or Enterprise:

- Carshare tends to be short-term, lasting minutes to hours, whereas traditional car rental typically lasts one or more days;
- Carshare transactions are typically executed through a mobile app or web-based tool, whereas traditional car rental often requires a visit to a brick-and-mortar storefront
- Vehicles are typically decentralized, i.e. spread out across a metropolitan area, rather than concentrated at a single parking lot;
- Insurance, roadside assistance, and often fuel, is included in the rental.

In the world of carsharing, there are three business models available: Station-based, free-floating, and peer-to-peer (P2P). [3] The station-based model is a historically traditional model that's best for longer and planned trips. An individual reserves a particular car model from a station, drives the vehicle wherever they wish, and then returns the vehicle to the station to end the rental. [3] Users typically pay by the hour, mile, or both.[3] In the U.S., station-based car share companies include Zipcar, HOURCAR, Miocar, and Envoy. Station-based car share companies in Europe include Cambio CarSharing, GoCar, Greenwheels. Enterprise CarShare is present in both the U.S. and Europe.

Free-floating carshare provides flexibility in terms of pick-up and drop-off locations. An individual can rent the vehicle in one location and end it in a completely different place without the need to return the vehicle to a specific rental point. [3] In the U.S., BlueLA, AAAGig, Free2Move, and the recently removed Car2Go, are examples of free-floating carshare companies. Within Europe, Enjoy is Italy's free-floating carshare, while Flinkster and Stadtmobil are all present in Germany. ShareNow provides the service in multiple countries across the continent.

Sometimes called the "Airbnb for Cars," the third model of carshare is P2P, which allows car owners to share their vehicles with others for use for short periods of time. [4] Individuals often subsidize the cost of their own personal vehicle by renting it out through the P2P model. [4] Examples include Turo and Getaround, both U.S.-based companies. In Europe, Drivy, owned by Getaround, and Hiya provide P2P carshare services.

1.2 Carsharing Benefits

There are many individual, social, and community benefits of carsharing. [1] Economically, vehicle ownership is costly. In 2020, the U.S. Bureau of Labor Statistics estimated that the average American household annually spent over $9,000 on transportation expenses. [5] Meanwhile, privately owned vehicles spend 95 percent of their life in a parking spot, unused. [6] On average, a single carshare vehicle takes 15 privately-owned vehicles off the road, reduces congestion, and benefits the environment. [4]

Socially, carsharing's primary benefit is that it allows low-income people, students, and seniors to affordably and sustainably maintain their mobility and participate fully in society while reducing parking demand, the number of idling cars, air pollution, and greenhouse gas emissions. [4] This decreases parking demand and creates opportunities to reallocate land for parks, new housing, or other community needs. When carshare operators use EVs in their fleets, these benefits increase exponentially, and the advantages extend to both the user and the operator.

1.2.1 User Benefits

When an individual – or user/member – chooses carshare instead of vehicle ownership, they benefit financially. They are free of costs and other hassles, which can include car insurance premiums, monthly payments, maintenance, vehicle registration fees, repairs, parking, traffic violation tickets, and car shopping, among others. [4] Choosing carshare over ownership could save users thousands of dollars per individual annually. [7]

Additionally, former car owners shift their travel behavior significantly after joining a carshare, increasing their transit use, walking, and cycling, and reducing their total vehicle miles traveled by an average of 44 percent. [4]

Many underserved and vulnerable communities lack access to safe, reliable, economical, and clean transportation and are more likely to face health burdens, such as asthma from poor air quality, and longer commutes because of their limited access to transportation options. [8] For individuals in these communities, carshare can lead to new economic opportunities and bolster existing options. Because most carshare services offer on-demand rentals and keyless entry, users experience the freedom and flexibility that car owners do.

1.2.2 Operator Benefits

For carshare companies – or operators – using EV fleets has significant operational benefits. Financially, gasoline-powered cars are more expensive than employing EVs. A 2018 study from the University of Michigan found the average annual cost to own and drive an EV in the U.S. is $483. A gasoline-powered vehicle costs $1,117 per year. [9] While the purchase price of EVs is typically higher than that of gasoline-powered vehicles, the total cost of ownership (TCO) should be considered.

Generally, EVs are easier and cheaper to maintain than gasoline-powered vehicles because the EV has only one moving part: the motor. Operators can save significant costs by using EVs as they don't require regular oil changes or tune-ups. The battery also lasts nearly a decade. [10]

Switching an operator's fleet to EVs is also of great benefit to the environment. A Dec. 2021 study conducted by the Yale School of the Environment found that total indirect emissions from EVs are much lower than indirect emissions from fossil-fuel powered vehicles, demonstrating that EVs are safer for the environment than gas-powered cars. [33] Carsharing programs that use EVs can reduce greenhouse gas emissions from daily travel by up to 43 percent per user compared to gasoline-powered travel methods. [11] The adoption of EVs by carsharing fleets is already underway. In 2019, 66 percent of the world's carsharing companies used EVs for some or all of their fleets. [11]

2 Forth's Experience in Carsharing

Over the past half decade, Forth has developed a series of projects to understand the needs and challenges of the electric carsharing model in underserved communities. Through these projects, we have learned lessons and developed best practices for building a carshare program. Below are summaries of the four projects that Forth has managed toward its mission to advance electric transportation through innovation, industry development, advocacy, and consumer engagement.

2.1 The Community Electric Vehicle Project

Forth's project development began in 2017 with the launch of The Community Electric Vehicle Project. [12] Forth partnered with Hacienda Community Development Corporation (CDC) in Portland, Oregon to provide community members access to shared electric vehicles. Hacienda CDC provides affordable housing, economic development and educational opportunities, and community support to a predominantly Latino and immigrant community in the Portland neighborhood of Cully. [13]

One of the goals of this project was to introduce an additional, reasonably priced, and convenient mode of transportation in the neighborhood while also demonstrating the economic and environmental benefits of electric cars. Two EVs were made available for community members to rent through the digital P2P carsharing platform, Turo. Community members were able to access a low-cost, daily rental with car insurance and free onsite charging through the project site. [12] Forth intended this project to provide a model that would be both sustainable and replicable for future projects. Throughout the program, rental length for community members varied from daily rentals to multi-day rentals. [12] It lasted nine months and during that time, both Hacienda staff and the community used the EVs dozens of times, saving Hacienda CDC money and generating funds, which the organization could use at its discretion.

2.2 Clean Rural Shared Electric Mobility (CRuSE) Project

In 2019, Forth began working on the Clean Rural Shared Electric Mobility (CRuSE) Project. CRuSE is a three-year, U.S. Department of Energy (DOE)-funded program that seeks to demonstrate that roundtrip, plug-in EV carsharing can serve rural communities in a financially sustainable way while benefiting low-income residents, government and local businesses, and the town as a whole. [14]

As of 2022, this project is still in progress. Currently, five EVs are stationed throughout Hood River, Oregon, a town of about 8,300 people, at affordable housing sites, the city center, and near public transit stations. [15] Envoy Technologies provides the carsharing platform, which includes a Spanish language version of its software app, alternate payment mechanisms for those without access to credit cards or bank accounts, and tiered pricing structures to make the cost more accessible for low-income members. Envoy manages the fleet operations and member services component of the service with its phone application, Envoy Mobility. Members can download the app, set up an individual account, and then make reservations to use the cars.

There are five cars total in the CRuSE fleet. Two are available at sites specified for residents of affordable housing, and the three others are centrally located in Hood River for public use. Forth is working with Columbia Willamette Cities Coalition, the Pacific Northwest National Laboratory, and a number of community-based and industry partners to implement this program, collect and analyze data, and disseminate results. Various local groups are continuously providing support for the program, particularly via area connections and outreach.

2.3 St. Louis Vehicle Electrification Rides for Seniors (SiLVERS) Project

In 2021, Forth established the St. Louis Vehicle Electrification Rides for Seniors (SiLVERS) project to increase electric vehicle adoption and reduce transportation-related operating expenses for social service agencies in low-income communities. SiLVERS aims to demonstrate the benefits of EV carsharing, including how EV fleets can save social service agencies money on transportation expenses and improve service; EV charging equipment for fleets can also serve employees and community members; and the use of EVs by service agencies can accelerate regional EV adoption and the use of tools and best practices, which can be replicated nationwide. For this project, Forth received funding from the U.S. DOE for Advanced Innovative Vehicle Technologies.[16]

SiLVERS was established as a partnership between Forth and several community-based organizations (CBOs). AmpUp provides an EV charger-sharing platform for the project while The City of St. Louis, the St. Louis Area on Aging, and other CBOs have introduced EVs, as well as community support and awareness of the program to the senior residents they serve. [16] Five EVs and 10 charging ports went live in November 2021, and the CBOs began utilizing the technology soon afterwards. These charging stations are also available to the public when not being used by the program vehicles.

While this project is ongoing, results have begun to come in. Between November 2021 and March 2022, the two CBOs provided 358 rides and delivered 3,629 meals via the vehicles. During the time, the vehicles recorded 186 charging sessions, refuelling 4,302 kWh of energy. It's estimated this has saved 6,884 pounds of carbon dioxide compared to a gas-powered vehicle. This data originates from AmpUp via a dashboard that is shared with Forth.

By the end of 2023, once the vehicles have operated for at least one year, Forth will calculate and report on expenses (including fuel, maintenance, operations, registration) of the program EVs, compared to ICE vehicles being used for the same purpose. While the SiLVERS vehicles are currently using a non-technical solution for

the sharing of the vehicles (e.g. no additional software, the keys must be physically given to the driver), adding carsharing software and increasing the use cases for these vehicles will be evaluated, and potentially implemented, in future scenarios.

2.4 Affordable Mobility Platform (AMP)

The Affordable Mobility Platform (AMP) began as a way to connect carshare technology and EVs, as well as to bring those EVs to low-income communities, which lack access to the technology. [18] Over time, AMP has evolved and grown as Forth has learned from the process of the project.

2.4.1 The Evolution of AMP

The impetus of the AMP project began quite focused, but increased scope and potential impact since its establishment. Geography and economic status are both the primary variables of bringing EVs and carshare technology to low-income communities. In rural areas of Oregon and Washington, the closest dealership carrying EVs is often well more than 100 miles away from potential drivers. Even if there are dealerships carrying such inventory, studies have shown that dealerships are far from adequate in meeting the needs of consumers looking to purchase an EV. [19]

One way to potentially combat this knowledge gap is through renting and test-driving. A recent study by Drive Electric Orlando showed that renting an EV can have a positive impact on a consumer's attitude toward and interest in the technology. Two-thirds of EV renters surveyed indicated that their experience with Drive Electric Orlando made them more likely to purchase an EV as their next vehicle. [20]

Through the AMP project and with financial support from the American Public Power Association (APPA), Bonneville Environmental Foundation (BEF), and local utilities, Forth has begun placing EVs in smaller communities across the Pacific Northwest with the purpose of providing a no-pressure environment for people to test-drive an EV on their own time. These test-drives are known internally at Forth as "self-service ride-and-drives." This was seen as the next evolution of traditional ride-and-drives, a service which Forth and other companies perform to offer vehicles for test-drive in a brand-agnostic setting while providing education and resources on EVs and charging.

One potential barrier to the success of traditional ride and drives is that the prime customers of these services are small, community-owned utilities (COUs). That means the overhead, coordination, and cost (between $5,000 and $15,000 for a single ride-and-drive event) may be a challenge.

At Forth, selecting a platform to deliver these services to a consumer proved to be an intensive process. A half-dozen platforms were reviewed, including WuntRent, GoodMoovs, Good Travel Software (GTS), EVE, ShareNow, and Envoy. While there are pros and cons of each platform, ultimately GTS, a Dublin-based carsharing software provider was selected. GTS, pairs with INVERS, which creates in-vehicle telematics devices, to bring the technology needed for carsharing.
While developing this project, Forth quickly realized that the location of these EVs would be critical. From there, the idea to place these vehicles at affordable housing developments was born. In these locations, the EVs have the potential of a core-user base while also fulfilling the wider goal of increasing test-driving of and exposure to them. This led to the GoForth Electric CarShare pilot project.

2.4.2 GoForth Electric CarShare

The GoForth Electric CarShare project is an electric carsharing service designed to provide greater access to clean, local transportation, and increase exposure of people to driving EVs. This is one of several public-facing brands of the AMP project. GoForth Electric CarShare has two goals:

1. Provide an affordable, on-demand transportation option to low-income housing residents, staff, and community members;
2. Create a program that allows customers to test-drive EVs for free.

Forth designed this model to be sponsored by local electrical utilities at an initial cost of $12,000 per year. Though, as referenced in findings, it will likely prove that actual expenses for this service will be higher. GoForth all-electric vehicles are placed at affordable housing sites, local electric utility headquarters, and high-density parking lots. Interested users can reserve and drive vehicles by downloading the Miocar Networks app and completing the account creation process. Miocar Networks may be familiar to some carshare users as it also hosts several other nonprofit carsharing networks across the U.S., including Miocar in the San Joaquin Valley of California and Floshare in Rochester New York.

GoForth began operating vehicles in March 2022, and currently has a fleet of seven cars (three Chevrolet Bolts and four Nissan Leafs). All vehicles in the program were purchased as used, ranging in years from 2018-2020. They are all located in the Oregon communities of The Dalles, Philomath, Eugene, Bend, and La Pine. Three more vehicles are expected to be online by May 2023. Forth has partnered with Mobility Development to co-lead vehicle procurement, carsharing insurance, fleet management, and member support. We also share a software platform (Miocar Networks, based-on GTS.) Local participating COUs and host sites provide charging infrastructure, which are be dedicated to the project. A single-charging port and parking space is required to be donated at no-cost for the duration of the program. GoForth Electric CarShare will run at least through the end of 2023.

2.4.3 AMP Goes National

Most recently, Forth was awarded $5 million from the U.S. DOE to develop and operate a carsharing program in several regions as part of AMP. [17] Eighty vehicles and charging stations will be installed at affordable housing sites in eight U.S. cities. The overarching goal of the program is to develop a sustainable model for affordable housing developers to offer EV charging infrastructure and shared vehicles in underserved communities as an amenity for tenants, as part of their wraparound services. Forth is working with more than 40 partners to bring the project to fruition, including Mobility Development, charging companies, local nonprofits, housing sites, electric utilities, and local governments. Current work is focused on identifying partners, performing site assessments, installing infrastructure, and procuring vehicles. A full project launch is expected in 2023.

2.4.4 A Shared Platform for Nonprofit Carsharing

As stated, a versatile software platform is needed to keep the GoForth project successful and accessible to users. Miocar Networks, an app running on Good Travel Software technology, hosts Forth and several other nonprofit carsharing networks across the U.S. Originally, Miocar Networks was exclusively hosting the Miocar carsharing network in California. But recently, Mobility Development signed a memorandum of understanding (MOU) with Forth and other organizations to turn the Miocar Networks app into an ecosystem for different nonprofit operators to launch and operate carsharing while reducing barriers.

Traditionally, when an entity starts carsharing operations, it needs to buy or lease the license of a software platform. These costs can be prohibitive, especially for a nonprofit carshare network. However, with the Miocar Networks app, each company can take advantage of economies of scale while reducing redundancy in many facets of operations, such as app start-up expenses, operational procedures and policies, and a shared call center for user support.

3 Building an Electric Carsharing Program

Since its origin, Forth has always sought to use its learnings and experience establishing EV carshare programs to help other entities replicate these projects using best practices and recommendations. Below is an abridged guide to launching an electric carshare program, as well as the challenges and subsequent recommendations Forth has identified as a result of our work.

3.1 Abridged Guide to Launching an Electric Carshare Program

1. **Choose the carsharing structure.**
    a. The first decision to make is whether the structure is free-floating or station-based.
    b. If station-based is chosen, decide whether the program is fleet-based or P2P.
2. **Set up a legal entity.**

    The next choice to make is identifying the legal entity. Will it be for-profit, nonprofit, a mixed partnership, or a co-op model? The co-op model is exemplified by Canada's Modo. [22] This choice can affect the types of funding the entity can apply for. For example, in April 2022, the state of Washington released a request for proposal (RFP) that only allowed nonprofits and government agencies to apply for funding to support carshare activities. [21] Forth is designated as a 501 C (6) nonprofit organization in the U.S., but it also has a closely affiliated 501 C (3).

3. **Establish the business model and revenue plan.**
    a. Operating strictly on earned revenue can be extremely difficult for a carshare program, especially one that hopes to serve low-income drivers. This is why large carshare companies only operate in dense, prosperous cities and neighborhoods that they expect to be particularly lucrative. In trying to establish carsharing in more marginal locations, a mix of funding sources will likely be needed. Additionally, the funding plan for the initial launch, and a few years beyond, will likely differ from the long-term funding plan.
    b. A few examples of revenue types include:
        i. Earned revenue from sign-up, usage, and excess mileage fees;
        ii. Private grants, such as those from foundations;
        iii. Public grants from municipalities, states, provinces, or federal jurisdictions;
        iv. Sponsorship from electric utilities or other businesses.
4. **Create partnerships.**

    These partnerships can be financial, in-kind, media, or on-the-ground support. Examples include municipalities, electric utilities, business leaders, housing organizations, and local community-based organizations (CBOs).

5. **Select a technology platform.**

    Providers can range from the bare bones of just providing a software backend to a turn-key solution that includes everything from software and hardware integration to vehicle procurement, insurance, operations and fleet management. This choice will dictate the rest of the steps in this guide. A platform will also establish how earned revenues are managed and

distributed. Table 1 is a list of questions, developed by Forth, to ask and consider when selecting a technology provider:

Primary Questions

- Is round-trip, station-based carsharing supported?
- Are aggregated sub-branches on a single platform? (e.g. Zipcar) Does it allow "area managers" to view and manage only their own data, vehicles, etc.?
- Is remote locking/unlocking supported?
- Is remote ignition disablement supported?
- Does it allow for promo codes for free and/or discounted trips?
- Does it allow for reservations 14+ days in advance?
- Does it allow area managers to limit "available" vehicles to specific users?
- Does it support geofencing of vehicles to minimize the likelihood of running out of battery power?
- Are multiple languages, especially English and Spanish, supported?
- Is there the ability to limit vehicle use to certain times of day (e.g. 5 a.m. until 12 a.m.)?

Secondary Questions

- Does it support alternative unlocking and payment methods (e.g. prepaid and RFID cards)?
- Is there dynamic pricing for different user groups? E.g., low-income qualified drivers can be charged lower rates than the general public.
- Are there branch-level reporting features?
- Are there roaming options (e.g. users of a subset of vehicles could be granted access to a larger network of vehicles)?
- Is there an ability to limit access to administrative dashboards to managers of specific stations/branches?
- Is it possible to send messaging that explains the vehicles need to be plugged back in to end rental?
- Is it possible to see the vehicle's state-of-charge from the administrative dashboard?
- Is the vehicle state-of-charge visible from the rental app?
- Is it possible to add a time buffer between vehicle rentals to facilitate recharging?
- Do admins have the ability to take a vehicle offline in advance?
- Can users schedule a recurring rental?
- Is it possible to show vehicles that are currently checked out or reserved by other users?
- Is it possible to provide referral credits to users who refer new customers?
- Can users receive ride credits or payment from a third-party service?

Tertiary Questions

- Does it support qualifying or sub-user agreements for different stations or vehicles?
- Does it support a free-floating carshare model?
- Can the local fleet manager and/or site host receive notifications when vehicle is reserved?
- Can the platform provide offers or help find insurance for vehicles?
- Is there multi-modal support (scooters, bikes, etc.)?
- Does it have the ability to send pre- and post-surveys to members?
- Is it operational in the U.S. market?

Table 1: Forth's Criteria Questions for Choosing Technology Platform Provider

6. Identify the refueling plan.

For this area of the program, there are several big questions to ask:

i. Who will own, operate, and maintain the home-station charging stations?
ii. How will the electricity at the home station be priced and billed?
iii. How does a user initiate a charging session?
iv. Who pays for fueling away from the home charger, the operator or the user?

7. Procure vehicles.

There are a number of questions entities should consider when building a fleet of vehicles for the carshare program:

i. Do the vehicles need to be new or could they be used?
ii. What kind of range does the vehicle need? Generally, we have found 150-250 miles is a good range. This answer also depends on geographic location and the driving needs of members.
iii. What size are the vehicles? In many cases, compact vehicles like a Nissan Leaf are a perfect option. In some circumstances, bigger vehicles will be needed for transporting more people, items, or making the vehicles wheelchair-accessible.

8. Secure carsharing insurance.

Insurance can be difficult to secure, especially for a company with no proven track record in carsharing. The smaller the fleet, the more difficult this becomes as insurers prefer to spread their risk across more units. Begin this work with an insurance broker early to get bids. Note that if you manage to get insured, there is a good chance rates will be high and budgeting may be difficult.

Some carshare companies, like Envoy, provide insurance for carshare host sites. While providing insurance increases total monthly costs of a carshare program, this method can be more cost-effective for a small fleet.

In addition to securing insurance for carshare vehicles, it may be worthwhile to budget for an incidental accident support fund for low income carshare members. If a member gets in an accident in a carshare vehicle, the member is usually responsible for paying a deductible before the insurance provider will cover remaining costs. Paying the deductible in the event of an accident could be a heavy burden to a low income carshare member. Budgeting to financially assist low income members with paying deductible costs may offset some of the financial risk of participating in a carshare program.

9. Make an operations and staffing plan.

A few common roles which will need to be staffed include:

i. Budgeting and securing financial support;
ii. Managing the technology (software and hardware) integration for your vehicles;
iii. Member services: How are you recruiting and onboarding new members? Who is there for customer support during business hours? What about customer service outside of business hours?;
iv. Fleet Management: While EVs need less maintenance, cars generally require continued support. What happens if a car doesn't get plugged in? How about a flat tire? What if there is a wreck and a vehicle needs to be towed? Hiring a position to manage this or contracting with a third-party fleet management company are options.

10. Decide if it's a public or private network.

Using private networks essentially means only those who are invited to a network (or have a community code) will be able to see and access vehicles on the platform. An open, or public, network means that anyone who downloads the app, passes the driver-screening process, and sets up an account will be able to see and use any of the vehicles available.

11. Locate host sites.

Depending on the goals of the program, there are several criteria that can be weighed on what makes a good host site. Here are a few questions to answer when considering a host site:

i. Is there charging infrastructure? What is the cost to "rent" this infrastructure and parking space(s) for the carshare vehicle(s)?
ii. Site population density: Is there an "anchor tenant," such as an apartment complex?
iii. Are there complementary transportation services? Contrary to some assumptions, a good carsharing location is not a transportation desert. Carsharing works best when it complements other established forms of transportation, such as biking or transit.
iv. Does the site have access restrictions, or will the site be available and safe at all hours?
v. Do people living at or near the site have interest in using carshare? It may be worthwhile to survey local residents to better understand their interest in carshare.
vi. Proximity to other carshare vehicles: If vehicles are located close to each other, this creates redundancy if one vehicle is occupied or needs to be taken out of service. Additionally, when vehicles are located near each other, this makes fleet maintenance and service work easier and cheaper.
vii. Is the host site willing to be a proactive partner for the program? Will it provide in-kind match funding (e.g. waived parking fees)? Will it promote the vehicle and its

usage? Perhaps it would also be willing to provide vehicle support?

12. Create marketing and promotional activities.

There are several means to grow your user base via marketing activities:

i. Word-of-mouth: In our experience, word-of-mouth messaging is the best promotion device. The program should offer free driving credits and/or promo codes to members who recruit their friends and colleagues.
ii. On-vehicle branding and parking signage: Quality designs should quickly tell the user that the program is carshare, as well as how and why users should sign up.
iii. Utilizing an anchor tenant: If the vehicle has an anchor tenant, such as a school, apartment complex, or business, using established media channels, like newsletters and posted flyers, can increase attention and interest.
iv. In-person events: Many people have reservations about new technologies, so demonstrating carshare and EVs with friendly, in-person support can overcome this.
v. How-to guides and video demonstrations: These resources can supplement carshare member support that takes place at in-person events or over the phone. Members can refer to guides and videos to learn more about the carshare program on their own time.
vi. Digital and print media: While these typically do not provide the best return on investment, they can be useful.

13. Measure success.

Carshare programs will need to establish goals and metrics and a timeline to have a certain number of members or vehicles on the platform. Several ways to measure whether strategies are working include gathering qualitative data via surveys and measuring reduced emissions compared to gasoline-powered vehicles. If external funding is provided, stakeholders will want to see the program meeting its goals.

3.2 Challenges and Recommendations

While the successes of carshare programs are well-documented, building one is not without its hurdles. Forth itself has experienced many of the challenges outlined above and, as a result, has recommendations for other organizations looking to create their own programs.

3.2.1 Car Insurance Costs

Finding car insurance to cover the vehicles in the carshare fleet can be time-consuming and difficult. When Forth was building The Community Electric Vehicle Project with Hacienda CDC, we eventually utilized three different types of insurance. Initially, we were quoted costs of more than $12,000. First, Hacienda CDC employees were covered by Forth's liability insurance, which added about $1,000 to the insurance costs for the project. Second, the primary insurance for when a renter was driving one of the cars was provided by Turo; the cost of that insurance is automatically included in the total rental cost. Lastly, Forth insured the vehicles themselves to account for the time when they were not covered by Turo. This insurance cost approximately $2,040 per car for the duration of 2017. Forth recommends that organizations begin searching for car insurance options early as it will likely take longer and cost more than expected.

3.2.2 Vehicle Procurement

Another challenge can be procuring the kind of vehicles that meet the needs of the drivers the carshare program serves and for the right price. Most EVs today are still classified as compact or crossover vehicles. For some individuals, these vehicles could pose space challenges. These smaller vehicles also do not meet the

accessibility needs of people with disabilities. There are few larger EVs available today, and the conversion of larger vehicles into EVs can be costly.

Meanwhile, the prices of new and used EVs are skyrocketing, with costs up 25 percent year-over-year. [23] Since gas prices began to rise, an increase of nearly 70 percent in shopper interest for EVs has been noted. And the prices are likely to stay high for the foreseeable future. [23]

3.2.3 User Pricing

Pricing the carshare service depends on many variables, including geography (i.e. cost of living for that area), the specific socioeconomic demographics being targeted, and the availability to subsidize program services through external resources outside of earned revenue. It is common for services to have a standard rate and a discounted rate. The discounted rate can be for members in a co-op model, or the program could use promo codes or other platform features to create different tier pricing for users. For example, there could be one standard pricing model, then a discounted rate for income-qualifying users. Organizations can conduct a transportation assessment to understand what local residents may be able to pay, and how this compares to other local transportation options. It should be noted that it is not recommended to price carshare services as free, even if there are enough external funds to support such a model. This can lead to individuals essentially reserving a vehicle indefinitely, limiting its use to other members. Table 2 shows the pricing models of several existing carsharing services:

Carshare Service	Locations	Pricing
Free2Move	U.S., Europe	Pricing varies by location. In Washington, D.C., $.47/minute, $13/hour, $95/day. [24]
Getaround	U.S.	Costs fall between $5-8/hour for trips under 200 miles. There is a booking fee of 3% per trip. For every mile over 200, cost is $0.50. [25]
GoForth CarShare	Oregon	For first 150 miles of reservation, $4 per hour, additional $0.35 per mile after 150 miles. [26]
Hourcar	Minnesota	Monthly plans that vary from $0-$30 that charge $6-$10/hour or $45-$75/day for rentals with excess mileage fees of $0.36-$0.60/mile. [27]
ShareNow	Europe	Pricing is dependent on the size of vehicle used. Per minute, the cost is 0,09€-0,19€; the cost per day is 49,99€-79,99€. [29]
Turo	U.S., Canada, UK	Begins at $25/day in the U.S. [30]
Zipcar	U.S.	Memberships start at $9/month and $90/year. Per hour, prices are $10-$18 and prices per day range between $83-$133, depending on vehicle. Traveling over 200 miles, costs are $0.58/mile. [31]

Table 2: Pricing Models of Existing Carsharing Services

3.2.4 Technology Barriers

Forth has found that some participants in its carshare programs experience technology barriers. EVs and EV chargers are new technologies to many program participants. Individuals who have not used an EV before may experience range anxiety, the fear that the energy storage of an EV will be insufficient to cover the distance needed to reach the intended destination–thus leaving the driver and any passengers stranded. [32]

Carshare members may also experience barriers associated with mobile apps used for carshare. An app may not be available in the language that a member speaks or reads. Some members may lack the technological literacy

to effectively use a carshare app. Some may be unable to access a carshare app because they do not have a smartphone.

Strategies to address technology barriers include:

1. Select a carshare app or platform that is user friendly. To the extent possible, the platform should meet the specific needs of the carshare program's target audience. For example, if some individuals in the target audience do not have smartphones, the platform should be accessible on a laptop or desktop computer.
2. Host hands-on learning sessions to help carshare members understand the EVs, mobile apps, and any other technologies used in the carshare program.

3.2.5 Payments and Privacy

Some potential carshare users may lack access to traditional banking and so may not be able to use a debit or credit card as a payment method. Additionally, some individuals may be uncomfortable sharing personal information via an app. Forth recommends that, when possible, alternative payment methods like pre-paid debit cards should be used. Additionally, organizations should consider working with local banks and credit unions within the community to develop other solutions. If possible, provide alternative payment methods such as cash and explore new innovative financial solutions that help individuals build credit, like Lemando.

3.2.6 Fleet Management

Even though EVs require much less maintenance and service than gasoline-powered vehicles, they will still need periodic management. The geographic locations of the vehicles should be considered. The closer the vehicles are located, the less a single person or company needs to travel to manage the vehicles. This cuts down on costs. If a vehicle gets taken out of service and there are other vehicles nearby, this doesn't completely eliminate the ability for members to use the program in that area.

3.2.7 Host Sites

Getting to an executed contract with a host site can be cumbersome. Liability and the amount of work (i.e. host site staff time and responsibilities) is often a prime topic of discussion. Additionally, host sites need to agree to the language of the carshare contract, host sites that "buy in" and have staff or volunteers willing to step in will increase the success of the program.

3.2.8 Timelines

An important reminder when setting up a carshare is that everything within the process takes longer than expected. This is especially true when it comes to contracting and installing charging stations. Ensuring that the organization has plenty of time to problem-solve for both planned challenges and unforeseen roadblocks will be key to the program's success.

3.2.9 Utilization

One of the most important goals to have when launching and managing a carshare program is to increase utilization. There are a number of ways to do this, including some of the recommendations listed above, including holding in-person events to familiarize users with EVs, focusing on marketing campaigns that reach target audiences, and partnering with organizations that can promote the program within the communities it serves. Additionally, partnering with organizations who are dedicated to the program and can use the cars for business purposes, such as local nonprofits, can increase utilization of the program.

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