

Measurement Framework Development

Smart Columbus Columbus Partnership

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Table of Contents

EXECUTIVE SUMMARY	3
1.0 INTRODUCTION	4
1.1 Key Findings and Document Guide	4
2.0 PARTNERSHIP OUTREACH	5
2.1 Geography Differences	6
3.0 COMMUTE STATISTICS.....	6
3.1 Influences on Effectiveness of SOV Program Impact.....	7
4.0 SOV MARKET RESEARCH	8
4.1 Best Practices for SOV Program Implementation	10
Incentives.....	10
Shifting Parking Costs	10
Software as a Service (SaaS)	11
5.0 DATA COLLECTION AND MEASUREMENT.....	13
5.1 Existing Measurement Methods.....	13
5.2 Existing Data Collection.....	13
5.3 Data Integration with Shared Mobility Applications.....	14
6.0 DEVELOPING A MEASUREMENT FRAMEWORK.....	14
7.0 SMART COLUMBUS OPERATING SYSTEM (SCOS) INTEGRATION.....	16
8.0 CONCLUSION AND FINAL RECOMMENDATIONS.....	17
9.0 NEXT STEPS	18
APPENDIX A: EMPLOYER OUTREACH PROTOCOL	19
APPENDIX B: CENSUS AND ODOT DATA COLLECTION.....	20
APPENDIX C: SHARED MOBILITY APPLICATIONS	21
APPENDIX D: SAMPLE SURVEY QUESTIONS FOR BASELINE.....	22
REFERENCES	23

List of Tables

Table 1. Employer Characteristics.....	5
Table 2. 2016 Franklin County, OH ACS Income and Mode of Transport Data ⁽¹⁾	7
Table 3. 2016 Franklin County, OH ACS Travel Time to Work and Mode of Transport ⁽¹⁾	8
Table 4. SOV Market Research Matrix.....	9
Table 5. Luum and RideAmigos Comparison	12
Table 6. Measurement Method Comparison.....	13
Table 7. Initial Measurement Framework	15

Executive Summary

The Columbus Partnership has taken on an ambitious goal with its Drive Less Campaign and Accelerator Partners of reducing single occupancy commutes at Partner companies by ten percent by 2020. Battelle conducted research and analysis into current commute options and usage, similar single occupancy vehicle (SOV) reduction programs around the country, and data collection and measurement techniques to develop recommendations about how this goal can be achieved and measured.

Why Reduce SOV?

Columbus is the fourteenth fastest growing city in the United States and is projected to add another one million residents by 2050 more than doubling the population. The current infrastructure and transportation system cannot support this growth without a significant change in how residents get to and from work. Building and maintaining parking costs employers significant resources that could be better deployed elsewhere, such as in innovation and growth. In addition, Transportation contributes approximately one third of greenhouse gases and we know that time in traffic negatively affects health. For all these reasons, it is an opportune time for Columbus employers to proactively work on shifting behavior change away from SOVs.

Research Conducted

Battelle spoke with nine Accelerator Partners, five transportation agencies, other program administrators around the country, new software solution providers, and conducted secondary and primary research on other SOV programs around the country. This work has brought several key learnings to the forefront, relevant in developing and implementing effective SOV reduction programs:

- Income and distance from workplace influence how people choose to commute
- Availability and cost of parking are strong influencers in how people choose transport mode
- Lack of viable and economic transport options can significantly increase employee turnover
- New software solutions provide significant benefits to users and employers in managing and tracking commute behavior across many transportation options
- Incentives for employees to take alternate commute modes are critical in driving behavior change
- Ongoing and frequent communication and education about SOV reduction programs is needed

Recommendations

Based on our findings and analyses, we have developed several recommendations for the Columbus Partnership to consider in supporting its Accelerator Partners' efforts in developing, implementing, and measuring SOV reduction programs. These include:

- Develop a Tool Kit with SOV reduction program options for all employers to include incentives, commute option, communications, measurement, and ongoing evaluation
- Work with a commute tracking Software Solutions provider such as Luum or RideAmigos to integrate the application into the employer program and to use for data tracking
- Survey employees to establish baseline and attitudes that inform program development
- Maintain ongoing, consistent, and multi-media communications

1.0 Introduction

The findings and recommendations in this report reflect an analysis of the Smart Columbus Drive Less campaign and how success of interventions and programs undertaken in the campaign can be measured. The Drive Less campaign seeks to reduce single occupancy vehicle (SOV) commuters at Accelerator Partners in Columbus, OH by ten percent by 2020, as part of the city-wide Smart Columbus Program. The Mid-Ohio Regional Planning Commission (MORPC) defines an SOV as a vehicle driven by a single occupant without any other passengers present.⁽¹⁾

This campaign's goal is ambitious, especially in an area where this number (SOV commuters) is currently at eighty-two percent and where there may not be as many challenges for SOV commuters as in other large metropolitan areas. With a population of 860,090 people living in Columbus, roughly 705,274 citizens commute to their occupation in SOVs.⁽²⁾

Parking and congestion do not present a significant challenge to many Columbus commuters, and the culture of the area is traditionally one of single occupancy driving, both to work and to post work activities. We explore both how to measure the impact of Drive Less campaign programs, as well as recommend methods to consider when developing such programs, and how employers may be able to affect the desired behavior change.

Transportation contributes to approximately one-third of greenhouse gases in the United States and the single occupancy vehicle is the largest contributor.⁽³⁾ Travel by vehicle accounts for eighty-four percent of all trips, with seventy-five percent of those being individuals driving alone.⁽⁴⁾ When the Mid-Ohio percentage of SOV commuters (eighty-two percent) is compared against the national average, it becomes clear why Smart Columbus is making it a priority to reduce the SOV percentage of riders.⁽⁵⁾ SOVs lead to increased traffic congestion, increased payload on supporting infrastructure, and negatively influence economical developers decisions to build more parking garages that overcompensate for the number of parking spaces actually required.

While SOV is an easy metric to point to and is collected by most large data collection organizations, including the U.S. Census Bureau and the American Community Survey (ACS), it is not the only metric to consider when understanding users' impact on the transportation system and environment. Battelle will discuss SOV and other metrics and how to work with local Columbus employers to affect and capture such measures. Battelle also includes recommendations about alternate methods of measuring impact on the end goal.

1.1 Key Findings and Document Guide

After data collection that included speaking with several Columbus based employers, primary and secondary research into current data collection and measurement organizations, and comparisons of similar programs around the country, we extracted a few key lessons to inform and guide the Drive Less Campaign:

- The goals and anticipated efforts in the Drive Less Campaign mirror those of many similar programs around the country
- Key incentives, consistent and frequent communication, and availability of convenient transportation options are the key drivers for affecting the desired changes
- Measurement and data collection are generally conducted through surveys, which can be significantly augmented using new mobility tracking and planning applications

This report summarizes our research and findings, best practices of existing programs, data collection options, and concludes with recommendations about how the Drive Less Campaign and Columbus employers

can go about implanting effective programs to shift behaviors away from single occupancy vehicle commutes as the only or predominant option in Columbus.

2.0 Partnership Outreach

Battelle has conducted interviews with nine of the Accelerator Partners to understand the motivations for their participation, the current state of their employees’ commutes, and begin to explore how the Columbus Partnership and Smart Columbus can help these employers shift behavior. Appendix A: Employer Outreach Protocol includes the interview protocol used to obtain detailed responses from Partners. Table 1 below includes various employer characteristics, and some high-level findings from our discussions. These are noted here:

1. Employer motivations for participating in the Drive Less campaign tend around the following:
 - Be strong partners to the Smart Columbus Program and active citizens in the community
 - Be on the edge of future technology and demography changes
 - Help reduce emissions and load on the transportation system
2. Of the nine companies Battelle spoke with, only one, CoverMyMeds, is currently collecting data about their employees’ commutes. Chase has implemented a pilot commuting program using Chariot’s services.
3. Based on general awareness and anecdotal information, most of the companies estimated that well over ninety percent of all employees were SOV commuters with a small percentage of employees riding their bikes or using public transportation.
4. Most employers either have bike racks and changing facilities for their employees or are nearby a bike sharing service location. The employers that have employees who bike to work estimate the percentage of bike riders to be negligible. Companies located in a suburban setting experience the least amount of bike rides commuting to work.

Table 1. Employer Characteristics

Employer	Surrounding Environment	Number of Employees	Parking		Commuter Data Collected
			Availability	Cost to Employee	
AEP	Downtown	~2,000-3,000 across 5 locations	Low	N/A	None
	Suburban		High	N/A	None
Alliance Data	Suburban	~4,300 across 4 locations	High	None	None
Cardinal Health	Downtown	N/A	High	None	None
Chase	Downtown	~10,400	High	None	None
CoverMyMeds	Downtown	~700	Low	None	Modes of transportation
Huntington Bank	Downtown	~5,300 across 3 locations	Low	Yes	None
	Suburban		High	None	None
IGS Energy	Suburban	~485	High	None	None

Employer	Surrounding Environment	Number of Employees	Parking		Commuter Data Collected
			Availability	Cost to Employee	
Ohio Health	Downtown	~28,000 across 400 locations	Low	None	None
	Suburban		High	None	None
Steiner	Suburban	~3500	High	None	None

All employers are currently making strides to reduce SOV commutes or are exploring different ridesharing and other programs to promote sustainable modes of transport. IGS Energy currently has a fleet vehicle program to transport employees traveling to meetings together in a compressed natural gas-powered shuttle. Steiner and Alliance Data are planning to install more electric vehicle charging stations for employees. AEP is looking into participating into the COTA CMAX program to improve reliable transportation options for call-center employees. CMAX is Central Ohio’s first bus rapid transit line that will service customers along Cleveland Avenue between downtown Columbus and Polaris Parkway.⁽⁶⁾ Chase has recently launched a private shuttle run by Chariot.

The consensus among the employers is that reducing the number of SOVs will be challenging. There is an abundance of parking at all suburban located companies, while parking is limited and expensive in the downtown region. Employers are confident that younger workers (Millennials) represent the group most open to alternate modes of transport.

2.1 Geography Differences

Accelerator Partners vary by type of location where their employees work – from clusters in downtown Columbus or at Easton Towne Center, or in stand-alone locations outside of the I-270 ‘Outerbelt’ and other suburbs. In less dense locations, there are little to no issues around parking, congestion, and there may not be opportunities to take transit or ride bikes to work. The locations present additional challenges when developing effective interventions for reducing SOV commutes.

Our conversations with partner companies revealed clear patterns around parking: if the business was in a downtown environment, parking was limited and seen as a burden for employees not having enough parking and employers having to pay for maintaining and operating the space. Conversely, if the business was in a more suburban environment, there was an overabundance of parking and it did not cost the employees to park; however, a substantial cost still existed for employers to operate and maintain these lots. Parking is discussed in further detail in *Shifting Parking Costs* below.

3.0 Commute Statistics

Most data that measure how people commute to work and what other modes they use for commuting and other travel are collected by MORPC, the United States Census Bureau through the ACS and the Ohio Department of Transportation (ODOT). The current statistics and what can be considered as a “baseline” for how people commute to work, are based on data and measures from these three organizations, compiled by MORPC into one annual report card. Relevant metrics in the report card that relate to commute patterns include:⁽⁷⁾

- Percentage of commuters driving alone

- Percentage of commuters riding transit, bicycling, or walking
- Vehicle miles traveled (VMT) per capita

A note about the VMT metric – while that has not been the focus of the Drive Less campaign to date, it is important to note that it is a robust measure of impact on the transportation system. If average VMT per person can be reduced, by definition, SOV commutes and other trips are can be reduced. However, it is a more difficult metric to capture, especially for smaller sample sizes. In the section below, we will discuss potential usage of VMT and existing metrics.

Additional data can provide a more nuanced understanding of commute types. A list of applicable data collected both by the ACS and ODOT is included in Appendix B: Census and ODOT Data Collection.

3.1 Influences on Effectiveness of SOV Program Impact

The potential effectiveness of an SOV reduction program varies based on numerous employee characteristics, including occupation, education, income, commuting distance, and demographics.

- **Income:** Data from the 2016 ACS in Franklin County, OH (summarized in Table 2) indicates a relationship between worker income and their mode of transport; while not a directly inverse relationship, it is representative of a trend. Workers with lower income show a greater tendency to carpool or take public transit.

Table 2. 2016 Franklin County, OH ACS Income and Mode of Transport Data ⁽⁸⁾

Subject	Franklin County, OH				
	Total		Car, Truck, or Van – Drove Alone		Car, Truck, or Van -- Carpooled
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
EARNINGS IN THE PAST 12 MONTHS (IN 2016 INFLATION-ADJUSTED DOLLARS FOR WORKERS)					
Workers 16 years and over with earnings	752,772	+/-10,225	622,298	+/-11,051	57,419
\$1 to \$9,999 or loss	11.3%	+/-0.6	8.4%	+/-0.6	21.3%
\$10,000 to \$14,999	5.8%	+/-0.6	5.5%	+/-0.5	7.7%
\$15,000 to \$24,999	12.9%	+/-0.5	12.2%	+/-0.8	19.0%
\$25,000 to \$34,999	14.4%	+/-0.8	14.7%	+/-0.9	13.8%
\$35,000 to \$49,999	17.5%	+/-0.8	18.3%	+/-0.8	15.2%
\$50,000 to \$64,999	12.9%	+/-0.6	14.1%	+/-0.7	7.6%
\$65,000 to \$74,999	6.5%	+/-0.4	7.0%	+/-0.5	4.5%
\$75,000 or more	18.8%	+/-0.6	19.9%	+/-0.6	11.0%

- **Length of Commute:** Data indicates that the highest percentage of SOV commuters and commuters who carpool do so the most when the travel time to work is between ten and twenty-four minutes. Table 3 summarizes:

Table 3. 2016 Franklin County, OH ACS Travel Time to Work and Mode of Transport ⁽⁹⁾

Subject	Franklin County, OH				
	Total		Car, Truck, or Van – Drove Alone		Car, Truck, or Van -- Carpooled
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
TRAVEL TIME TO WORK					
Workers 16 years and over who did not work at home	722,518	+/-10,635	622,298	+/-11,051	57,419
Less than 10 minutes	9.5%	+/-0.6	8.9%	+/-0.7	9.1%
10 to 14 minutes	12.0%	+/-0.6	11.9%	+/-0.7	12.6%
15 to 19 minutes	16.3%	+/-0.8	16.0%	+/-0.8	19.2%
20 to 24 minutes	18.6%	+/-0.8	19.2%	+/-0.9	17.9%
25 to 29 minutes	9.5%	+/-0.7	9.9%	+/-0.7	8.1%
30 to 34 minutes	15.1%	+/-0.7	15.5%	+/-0.8	13.1%
35 to 44 minutes	6.6%	+/-0.4	7.0%	+/-0.5	4.4%
45 to 59 minutes	6.7%	+/-0.5	6.5%	+/-0.5	8.3%
60 or more minutes	5.7%	+/-0.4	5.1%	+/-0.4	7.3%
Mean travel time to work (minutes)	25.1	+/-0.3	24.9	+/-0.4	25.7

These two indicators, income and length of commute, provide insight into how employers’ programs may be best targeted to particular segments of their workforce.

4.0 SOV Market Research

Battelle conducted research into other comparable campaigns and programs around the country, to understand best practices of effective interventions and measurement approaches. Research revealed that many programs or campaigns collected little or no data. The few programs that did collect data achieved this through surveys or a manual participant tracking tool. Table 4 discusses each SOV program in detail.

Table 4. SOV Market Research Matrix

Program	Summary	Objective	Location	Funding	Data Collected
Way to Go ⁽¹⁰⁾	Partnership between Denver Regional Council of Governments and a group of Transportation Management Associations to promote better commuting options for employers and individuals. Through this program, employers provide: <ul style="list-style-type: none"> • Free carpooling services • Vanpooling services • Information on transit and biking options • Guaranteed Ride Home service 	Reduce traffic congestion, improve air quality, and make life better for the region's residents	Denver, CO	Federal Congestion Mitigation and Air Quality Improvement Grant	Number of trips, mode of transport, vehicle miles traveled
Drive Less Live More ⁽¹¹⁾	MVRPC raises awareness about alternative transportation options to help reduce SOVs. They do this by holding public events throughout the year and partnering with employers to offer discounted parking and tickets to local events if citizens use a sustainable mode of transport. They also offer a free ridesharing service in the surrounding counties.	Offer healthier, cleaner, and more affordable transportation options	Miami Valley, OH	Miami Valley Regional Planning Commission (MVRPC)	Number of event participants
Commute Trip Reduction ⁽¹²⁾	The Commute Trip Reduction law states all companies with more than 100 employees must develop and implement a trip reduction program. The government has a partnership with large employers to connect them to tools and resources to help meet the goal.	Reduce traffic congestion, energy consumption, air pollutants	Seattle, WA	State Government	Unknown
Department of Environmental Quality Employee Commute Options (DEQ ECO) ⁽¹³⁾	All companies in the Portland area with more than 100 employees at a worksite must provide incentives for employee use of commute options. Employers are required to implement a trip reduction plan that offers incentives to employees and collects and tracks data to measure progress.	Reduce smog and traffic congestion	Portland, OR	Businesses	Unknown
Parking Cash Out Law ⁽¹⁴⁾	The State of California passed a bill that requires businesses with fifty or more employees in areas with poor air quality and that lease parking spaces for their employees, to offer employees who do commute to work alone, the cash value of the subsidized parking instead of using the parking space. Businesses must submit an annual Emission Reduction Plan to comply.	Reduce commutes, vehicle-miles traveled and emissions	Santa Monica, CA	Businesses	Number of commutes, vehicle miles traveled, CO2 emissions reduced

Program	Summary	Objective	Location	Funding	Data Collected
20% Reduction in City Employees Commute Trips during Peak Hours ⁽¹⁵⁾	After a Traffic Congestion Action Plan was announced, the City Manager required his employees to reduce their commutes during peak hours and pointed them to the resources to shift their habits and educate them on potential benefits.	Reduce single occupancy trips during peak hours by 20%	Austin, TX	City of Austin	Peak hour commute trips
Travel Reduction Program ⁽¹⁶⁾	Employers with a minimum of fifty employees and schools were asked to reduce SOV trips and miles. Valley Metro Commute Solutions works with employers to implement and promote trip reduction programs through education on different alternative commuting options and services.	Reduce air pollution and traffic congestion	Maricopa County, Arizona	Arizona Department of Environmental Quality, Maricopa Association of Governments, Maricopa County Air Quality Department, and employers.	Number of SOV trips and miles

4.1 Best Practices for SOV Program Implementation

Our research indicated that several key characteristics of SOV reduction programs tend to produce more effective outcomes.

Incentives

Incentives and disincentives are likely the main motivators of shifting behavior away from SOV commutes, assuming viable options for alternative modes exist and are convenient for users. They can be offered by several entities, but regardless of the source, they are critical to changing behavior.

Incentives and disincentives implemented by the DEQ ECO Program and Bill and Melinda Gates Foundation, as best practice examples include:^(17, 18)

- Financial incentives such as cash for using non SOV modes
 - Transit and vanpool subsidies
 - Ability to purchase transit passes with pre-tax dollars
- Free bus or other transit pass for commute trips
- Compressed work weeks (reduces number of days)
- Free carpool or vanpool matching service
- Telecommuting / work from home opportunities
- Emergency ride home program
- Prioritized parking spaces for van or car pool
- Subsidized SaaS solutions

Shifting Parking Costs

As shown in Table 1, parking availability and the Partners’ surrounding environment differ greatly. The employers with office buildings located in suburban environments do not face parking constraints, while businesses located downtown have limited parking and must subsidize the cost of parking for employees and pay for parking maintenance, or the employees must pay for parking.

During many conversations, businesses expressed frustration with employee parking and its costs. Parking facilities present several constraints to employers, including:

- High costs to build and maintain: Alliance Data stated they can pay upwards of \$100,000 annually just to operate and maintain their parking lots. Ohio Health mentioned it conservatively costs around \$15,000-\$20,000 per parking space to build a new parking garage.
- Constraint on employee growth – several employers downtown expressed concern with limited growth opportunities because of the need to provide parking. Rather than use the same space for parking, if they had less SOV commuters, they could shift that space to office space, representing growth opportunities for the company.
- Employee turnover – this is an issue not just for parking, but for transport options in general. When employees have limited transport options or have high costs and restriction on parking, they tend to leave their positions more frequently.

[Bill and Melinda Gates Foundation Use Case Summary](#)

In 2008, the Bill & Melinda Gates Foundation applied for permits to build its new headquarters in Seattle, WA that would be home to 1,200 new full-time employees. The Gates Foundation would no longer be able to offer free parking due to economical constraints so the number of employees who drove alone to work had to be reduced. At the time, ninety percent of employees drove alone to work. To drive the new change in behavior, the Gates Foundation offered free transit passes, locker rooms, bike-storage areas and a \$3 per day incentive for choosing an alternative mode of transportation. A year after opening the new headquarters the 90 percent SOV commute rate was reduced to 42 percent and down to 34 percent the following year. Offering extra incentives to employees did not cost the foundation or its employees any additional money. The Gates Foundation also implemented a \$12 per day cost for parking, capped at \$120 per month. The thought behind this method is that a daily rate has a bigger impact on your budget than a monthly cost.

The majority of Accelerator Partners subsidize parking costs for their employees. Shifting parking costs from the employers to employees has proven to be an effective strategy in reducing SOV commuters and parking demand. The Delta Dental and Luum Case Study described in the *Software as a Service (SaaS)* section below, and the Gates Foundation Use Case Summary present great evidence on the impact this can have on reducing SOV commuters.

Software as a Service (SaaS)

Recent technology breakthroughs have seen Software-as-a-Service (SaaS) providers release products that enable commuters to readily track and enter their commuting habits. SaaS is software that is owned, delivered, and managed remotely by one or more providers. The provider delivers software based on one set of common code that can be consumed by a number of contract customers anytime. This option provides both a best practice example of part of an SOV reduction campaign and presents a new alternative for data collection and measurement to track effectiveness.

RideAmigos and Luum are both commuter planning and tracking SaaS providers that offer customized software solutions aimed at solving an organization's transportation challenges by collecting commuter data and sharing this data with the organization. These solutions offer a mobile application as a one-stop-shop resource for commuting employee interaction and for integration with a variety entity-owned or non-entity owned data sources. Table 5 includes a list of similarities and differences between the two services.

Table 5. Luum and RideAmigos Comparison

Luum and RideAmigos Similarities	Luum and RideAmigos Differences
<ul style="list-style-type: none"> • Data collected – mode of transport, number of trips, miles traveled, CO₂ savings, dollar savings, calories • Data collection method – mobile application logs commuting details • Access to Data – users must have a service agreement • Additional data sources – both companies have customizable platforms where additional data sources can be added such as parking garages, transit pass data, and other commuting applications • Incentives and rewards features • Anonymized data • Customizable platform 	<ul style="list-style-type: none"> • RideAmigos is also a multi-modal trip planner, Luum is not • Luum offers employee engagement and facilitation • RideAmigos has many more documented use-case scenarios on their website • RideAmigos has a more widespread customer base including cities, businesses, universities, and government agencies • Luum offers their own shuttle service and partners with Chariot

Both applications have been used by programs similar to the Drive Less Campaign, and two of those case studies are presented here as examples of implementation.

Massachusetts Institute of Technology (MIT) and RideAmigos Case Study

MIT partnered with RideAmigos to achieve the following goals at their Cambridge, MA campus.

- Reduction in parking demand in MIT-owned garages by ten to fifteen percent
- Reduce congestion in Kendall Square
- Increase campus sustainability
- Reduce SOV trips to campus

As a baseline measure, MIT collected over a million trip logs to assess their commuter’s habits before and develop a transportation demand management plan. MIT implemented a multi-pronged approach to this challenge including the following:

1. Shifted parking pricing from annual to daily
 2. Introduced universal transit
 3. Commuter dashboard access
 - a. Single sign-on recording system for commuters
 - b. RideAmigos platform integrated into existing portal
 4. Automatic trip log generation and logic
 - a. Importing data from as many sources as possible
 5. Financial incentives
-

Delta Dental and Luum Case Study

Delta Dental of Washington (DDWA) moved its headquarters from a suburban environment with an ample amount of parking space to downtown Seattle with only enough parking spaces for forty percent of employees. This move created parking challenges and a need to shift employee commuting culture.

Luum partnered with DDWA to implement a commuting program. DDWA achieved a sixty percent reduction in SOV.

DDWA implemented the following solutions offered by Luum:

1. My Commute Hub – a single tool with multiple resources to educate employees and facilitate use of multiple modes.
 2. Daily Parking – employees maintain the option to drive; they are charged daily.
 3. Daily Bonus – employees receive a financial bonus for each day not traveled by a SOV
 4. Reduced Rideshare Parking – parking is free for vanpooling vehicles and split between carpooling vehicles
 5. Full Subsidized ORCA cards – DDWA provided passes to pay for transit and vanpooling fees
-

5.0 Data Collection and Measurement

5.1 Existing Measurement Methods

Traditional data collection has been performed through surveys; however, advancement in technology has introduced a new alternative, as discussed above. Table 6 discusses the advantages and disadvantages of survey and SaaS measurement methods.

Table 6. Measurement Method Comparison

Measurement Method	Advantages	Disadvantages
SaaS	<ul style="list-style-type: none"> • Specific employee data/information can be collected • Minimal burden on employees, automatic logging • Data can be stored in digital format • Data can be accessed real-time, visual dashboard • Data can be easily shared with employees or other entities • High data accuracy • Comes with data analysis tools and figures • Changes to program can be made instantly • Multiple data sources can be monitored from a single platform • Platform allows for connection between the employer's login • High specificity of employee data/information can be collected • Survey can be filled out on a variety of mediums 	<ul style="list-style-type: none"> • Up-front cost to implement • All employees may not have a smartphone
Survey	<ul style="list-style-type: none"> • High specificity of employee data/information can be collected • Survey can be filled out on a variety of mediums 	<ul style="list-style-type: none"> • Potential for low participation • Survey fatigue • Potential for inaccurate data • Data quickly becomes stale • Cumbersome for employees • Data is not easily accessed or analyzed • All data must be converted from a visual to digital format

5.2 Existing Data Collection

As explained above, research has shown the primary methods for collecting specific data about SOV commutes are through surveys and SaaS solutions. A number of other data sources currently exist that represent generalized data that is anonymized and cannot be tracked back to a certain individual. While these sources cannot indicate exact impact of SOV reduction programs per individual, they can be used to augment the more specific data that would be collected from SaaS solutions. These sources include:

- MORPC collects Census data from the American Household Survey (AHS) for the counties surrounding Central Ohio.
- Ohio Department of Transportation (ODOT) currently conducts a Household Travel Survey which lasts for seven days and asks all participants in a household to log their commuter information via RSG's proprietary smartphone application called rMove.⁽¹⁹⁾
- Special Improvement District (SID) Services collects survey data from their client's residents about living and commuting habits.
- Central Ohio Transit Authority (COTA) has access to all bus pass membership data, usage information, and on-board survey data from citizens taking public transportation.

5.3 Data Integration with Shared Mobility Applications

Commuters need convenient options and easy to use technology to help them shift away from SOVs. Shared mobility applications are specific to a particular non-SOV service, such as ride or van share, carpool, biking, on-demand services like Lyft or Uber, walking, business transit, etc. While convenient, they are generally only usable for the one service they facilitate.

Commute tracking applications such as RideAmigos and Luum allow for simplistic integration of the various transport options and the data that is automatically collected and tracked through the service-specific applications. Appendix C includes a list of many shared mobility applications that can be integrated into Luum or RideAmigos for comprehensive data collection. These applications may vary by geographical region, but this list is representative of additional data sources an employer may want as a part of their SaaS customized solution.⁽²⁰⁾

6.0 Developing a Measurement Framework

The goal of developing a measurement approach for the Drive Less campaign is to track changes in SOV commute, and the programs aimed at reducing it. The Drive Less Campaign is focused on employers in the Columbus metro area as catalysts to promote a shift in behavior away from SOV usage and towards alternate modes of transport to reduce the load on the transportation system. Through a robust measurement approach, we can accurately capture the baseline before implementation of employer initiatives and subsequent changes in behavior.

Battelle has developed an initial Measurement Framework that includes types of data that should be collected, and the how and when to collect them. It will capture changes in commute patterns in an easy and consistent way to measure true progress of Drive Less campaign interventions over time. Ideally, employers will be open to capturing the commute patterns of their employees before beginning any interventions to capture a baseline, and then regularly at defined intervals after a program or intervention has been launched. The frequency of data collection should be no less than annually, though potentially more often for the first five years of the Campaign.

It is critical to strike the right balance between collecting relevant and measurable data and not overly burdening employers and employees. Our recommendations include multiple paths that can be pursued in collecting the data. Data collection and measurement methods include employee surveys, secondary data points, such as bus ridership at certain hours of the day in specific locations, leveraging existing data collection sources (MORPC, ODOT, etc.), and most importantly data collected through SaaS solutions like Luum and RideAmigos.

The Framework will also include targets for each data point collected, and roles and responsibilities for collecting, storage and analysis of the data. The goal will be to ensure integration of the data collected for the Drive Less campaign to be integrated into the Smart Columbus Operation System (SCOS). We have developed an initial framework to illustrate the types of data to collect and how to capture, represent and track these data over time, and it is included here in Table 7.

Table 7. Initial Measurement Framework

Indicators	Baseline	Number of Participants	Target Reduction	Data Source, Collection Method	Frequency of Measurement
Number of commuter trips			Year1: 5% Year2: 12% Year3: 20%	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually
Number and Percentage of SOV trips			Year1: TBD Year2: TBD Year3: TBD	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually
Number and Percentage of Carpool trips			Year1: TBD Year2: TBD Year3: TBD	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually
Number and Percentage of Public Transportation trips			Year1: TBD Year2: TBD Year3: TBD	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually
Number and Percentage of Mobility-on-Demand trips			Year1: TBD Year2: TBD Year3: TBD	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually
Number and Percentage of Bicycling trips			Year1: TBD Year2: TBD Year3: TBD	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually
Number and Percentage of Walking trips			Year1: TBD Year2: TBD Year3: TBD	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually
Vehicle Miles Traveled			Year1: TBD Year2: TBD Year3: TBD	1) Surveys / Existing data 2) SaaS (Luum, RideAmigos) 3) COTA bus pass usage 4) Parking lot usage/counts	Semi Annually

The goal in implementing this or similar Measurement Frameworks is to work with employers to decide on data collection methods and techniques, frequency of measurement, and targets for each indicator. Then a comprehensive program within the company should be rolled out and the Framework can be used as needed during the measurement period. We will discuss this more at length in our Recommendations Section below.

7.0 Smart Columbus Operating System (SCOS) Integration

The data collected by the SaaS provider for the Drive Less campaign is an ideal candidate for integration with the SCOS. This integration will require collaboration between the SaaS provider and/or employer and the data curator working on the SCOS to get the data in an acceptable format. Below is a use case template for what will be required for successful integration. The answers to the questions and data fields in the template will need to be decided on by the Accelerator Partners in conjunction with the Columbus Partnership.

SCOS Integration Criteria

1. Use Case Name – name the use case based on key words
2. Use Case Description – provide a brief description of the use case
3. Stakeholders – list all stakeholders involved in this use case
4. End User(s) – list the end user(s) that are using or being benefitted from this use case
5. Purpose of End User – state the purpose of the use case in detail
6. Source Data
 - a. Data Required – list the data items required to satisfy the use case
 - b. Data Owner – identify the source of the required data and its owner
 - c. Inbound Data Format – identify the format of inbound data or source data
 - d. Inbound Interference – what is the existing interface of the inbound data?
 - e. Inbound Metadata Format – detail about the format of the available inbound metadata
7. Outbound Data
 - a. Data Granularity – At what level of granularity does the end user want to see the outbound data? Or what level of data granularity is required to satisfy the end user needs? This requirement also defines additional requirements like merging other datasets to achieve the required granularity.
 - b. Data Ambiguity – check if multiple data points in a data element are having similar representation.
 - c. Outbound Interface – what is the expected interface of the outbound data?
 - d. Outbound Data Format – identify the end user requirement of the outbound data format
 - e. Outbound Metadata Format – detail about the format of intended outbound metadata.
8. Data Latency - how late can the data be sent to end user after the data has been created?
9. Data Frequency - how often should the data be updated?
10. Data Processing/Storage - this step should detail the way data is processed and stored. Based on the format of the inbound data, formatting and/ or processing might be required to ensure machine readability, completeness and accuracy of data.
11. Prerequisite Conditions and Assumptions - what conditions need to be met before the use case is sent into development stage?
12. High-Level Test Cases – break down each use case into high-level test cases. In this way, each test case is developed and tested, before the broader “Use Case” is tested
13. Post Completion Conditions – what conditions should the developed use case satisfy to meet the purpose of the end user?
14. Success Condition – if the developed use case meets all the defined end user(s) needs, then it is a success condition.
15. Failure Condition – if the developed use case does not meet the defined end user(s) needs, this is a failure condition.
16. Context/Solution Diagram - illustrate the inflow and outflow of the data.

8.0 Conclusion and Final Recommendations

SOV commuters enjoy reduced travel times, the flexibility to travel whenever they want, and the security of being in their own vehicle. Columbus, OH is the fourteenth fastest growing city in the United States with an expected population surge of one million people by 2050, which would more than double the city's current population. With such growth on the horizon, seeking to proactively change behavior around commute methods will go a long way in getting the area ready for this tremendous growth.

Based on Battelle's research and analysis, there are several recommendations to help the Columbus Partnership work with Accelerator Partners to plan and integrate SOV reduction programs. The key recommendation is that a systematic program or set of programs should be developed for easy implementation by employers. The program(s) should include:

- Initiatives to ensure that alternate modes of transport are available
- Incentives and rewards to help drive desired behavior change
- Targets of desired reduction in SOV and increases in other modes
- Communication plan for how the employer will roll out and continue to promote the program
- Measurement framework and method of data collection
- Cost and resource analysis for employers
- Employer education on current transportation services available as program options

Battelle recommends that employers use one of the existing SaaS solutions, such as Luum or RideAmigos to help employees manage alternate commute options, and to measure impact and changes over time. With automated data collection and the analysis tools in these solutions, we eliminate the burden of converting survey data into a format that can be easily analyzed. These solutions will also eliminate survey fatigue and thus probable lower response rates. In addition, accessibility to real-time data is embedded in these solutions, allowing for a proactive approach towards managing data.

While surveys can be cumbersome, we also recommended that employers distribute short pre-baseline surveys at the beginning of the programs to gain better understanding of employees' current commuting habits and what types services they would be willing to consider as alternatives to SOV commutes. Appendix D provides a sample list of questions to use for this baseline survey. Results from these surveys should serve as the baseline for designing and implementing a trip reduction program. While working with a SaaS provider, employers can also explore whether their data collection will address all needed areas of measurement, and if not, can develop and implement short surveys to augment automated data collection.

We believe that the goal of reducing SOV commuters by ten percent in Columbus, OH is aggressive, but achievable. Motivated senior leadership and mobility ambassadors will be key in helping meet this goal. With these individuals designing the program, they are laying the groundwork for changing employees commuting habits.

With the goal of each company deploying its new mobility benefits by the end of the 2019 calendar year, there are a few dependencies that should be considered. All Accelerator Partners must have a plan designed and implemented by this time. To support Partners working towards this goal, we recommend that the Partnership take on a leadership role by developing and supplying a Tool Kit that can include all options for employers to consider in terms of types of incentives and commute options to offer, costs associated with each, measurement framework and data collection plan, use of Mobility Ambassadors, and any survey questions or initial data collection required. The Tool Kit should also include communication recommendations that employers can implement throughout the program duration.

9.0 Next Steps

We have developed a draft list of next steps for the Columbus Partnership to consider in planning for area-wide adoption of something like the Tool Kit we recommend. It serves all interested parties to consider consolidating all elements of needed programs, to reduce the burden on individual Partners, and to ensure consistency and coordinated learning and measurement across all participating companies. The steps below are a starting point for a discussion about how to support Accelerator Partners in their efforts to roll out SOV reduction programs.

1. Developing and implementing a complete program and plan
 - a. Employee options
 - i. Employee needs (pre-baseline needs and habits survey)
 - ii. Employer location(s) and options
 - iii. Employer needs analysis
 - b. Incentives and Disincentives
 - i. Resource availability for employers
 - ii. Dedicated roles for starting and maintaining the program
 - iii. Cost-benefit analysis
 - iv. Cultural openness to incentives and changing commute methods
 - c. Data collection and measurement method
 - i. Survey vs. SaaS (comparative analyses)
 - ii. How is the data stored?
 - iii. Who manages the data?
 - iv. Who analyzes the data?
 - v. How is the data being integrated into the SCOS?
 - d. Education and communication plan
 - i. Outreach to employees (what, when, how)
 - e. Explore services available
 - i. Luum, RideAmigos, Chariot, Car2Go, etc. (comparative analyses)
 - f. Coordination with Leadership and Human Resources

Appendix A: Employer Outreach Protocol

The list of questions below were used as part of the interview protocol during discussion with employers. These questions are referenced in the

The list of questions below were used as part of the interview protocol during discussion with employers. These questions are referenced in the Introduction.

- Why are you participating in the Drive Less Campaign?
- Does your company currently collect data on how many employees commute via different methods?
 - If so, what are those data and how do you collect them?
- Are there current efforts underway to help reduce the number of employees who commute in single occupancy vehicles?
 - If so, what are they?
 - How many employees have signed up or expressed interest thus far?
 - How are you communicating about these efforts?
 - What are the incentives?
 - Are there any current measurement activities to track participation and impact?
 - If not, are you planning on launching any? And what are the ideas being considered?
 - More detail about what the current state of alternative transport options available (mass transit, ridesharing, cycling, etc.)?
- What do you think would be helpful in reducing single occupancy commuters?
- What seems to be the general cultural acceptance in the company around carpooling, biking, using mass transit, or other non-single occupancy commute options?
- Do you have telework or flex time opportunities for your employees?
- Are you (is the company) open to additional data collection efforts (as low impact as possible and as integrated into current efforts as possible) to help measure future changes in these numbers?
- Do you have recommendations of other contacts we should connect with about this work? At your company or at other companies in the area?
- Would you be open to follow up communications from us?
- Is there someone with whom we can connect to collect company stats (size, numbers of employees, etc.)

Appendix B: Census and ODOT Data Collection

The ACS provides detailed population and housing information to provide insight about the changes taking place in communities.⁽²¹⁾ Data deemed as beneficial towards developing a measurement framework for SOV commuters is listed below:

- Age
- Race
- Housing arrangement
- Number of occupants housed
- Internet access
- Number of household vehicles
- Languages spoken by citizen
- Marital status
- Citizen disabilities
- Employment status
- Mode of transport to work
- Length of commute (minutes)
- Time of day commute begins
- Number of people in transporting vehicle
- Number of weeks worked per year
- Type of work performed
- Government assistance
- Employment salary
- Employment industry

The information listed above collected by the ACS, provides valuable insight into the framework being developed. The type of data collected, how it is measured, and how the framework is implemented are all impacted by these influences. For example, an older man or woman may be less likely to ride a bike to their occupation than a Millennial. Data collection from these two modes of transportation are different; however, the measurement framework must be a diverse and scalable solution.

In addition to the data collected by the Census Bureau, ODOT also collects Household Travel Survey (HTS) data for the State of Ohio. FHWA recommends these surveys to be conducted every ten years. ODOT divides the state into ten geographical regions and collects HTS data from a different region each year. Within each region, they attempt to collect data from about 2,300 households for seven days each from September through April. This timeframe represents the time of year when traveling is deemed as 'typical'. A few examples of data collected from this survey are listed below:

- Number of commuting trips per person
- Commuting origin and destinations per person
- Vehicle occupancy
- Number of miles traveled per person
- Type of residence
- Household income
- Household memberships to bikeshare, carshare, or carpooling programs

Appendix C: Shared Mobility Applications

Shared Mobility Applications

Mobility Aggregators: Moovit, Moovel, Urban Engines

Private Sector Transit: Bridj, Chariot, Go Carma, Via

Rideshare within 10 minutes: Lyft Carpool, UberPool, Ford Dynamic Social Shuttle

Rideshare within 24 hours: Carma, HOVee, Carzac

Taxi-like services: Lyft, Uber, Juno, Sidecar

Carshare: Car2Go, Zipcar, Enterprise Car Share

P2P Carshare: Getaround, RelayRides, Ford Car Swap

Bikeshare: CoGo, Motivate, DecoBike, Bcycle, NextBike

Personal Electric Transport: Enzo foldable ebike, GenZe electric bikes, Scoot

Vanpooling: Enterprise, Vride

Commute Mode Detection: Strava, MapMyRide, Moves

Smartphone Transit Payment: Passport, GlobeSherpa, Masabi

Smartphone Parking: ParkWhiz, ParkMe, Parkmobile, Pay-by-Phone

Miscellaneous Apps.: City Mapper, Transitscreen, Modeify – TDM Trip Planner

Commuter Benefits: Commuter Check Direct, Commuter Benefits, Wageworks, Commuter Check, Transit Check, Tranben, Ltd

Personal Rapid Transit: 2getthere, Ultra Global

Niche Ride Match: Zimride, Otto

SOV Apps.: WAZE social traffic, Twist for Rendezvous

Niche Transport: Boost by Benz, Shuddle, Hop/Skip/Drive

Appendix D: Sample Survey Questions for Baseline

- In your daily commute, do you (check all that apply):
 - Drive yourself
 - Take the bus
 - Car or van pool (If this one is checked, then ask:)
 - How many other people do you ride with?
 - How do you find your car/van pool partners?
 - Ride your bike
 - Walk
 - Take other mode of transportation (fill in blank)
- Why do you not take the following modes: (for each choice provide options: not available, not close to home, not close to work, too expensive, too long, I don't enjoy it, other)
- How many days a week on average do you use each of the types of transportation above? (provide drop downs for the ones they choose)
- What would motivate you to use alternate modes of transport if you don't already
 - More bus times/stops
 - Easier way to find car or van pool partners
 - Financial incentives (reduced fare, bonuses, other rewards, etc.)
 - Premium parking (for example, for car or van pool)
 - Better understanding of other options
 - Other (open answer space)

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