Title: Car2Go Portland Home Area Expansion

Course Title: **Advanced Engineering Economics**

Course Number: **ETM 535**
Instructor: **Dr. William (Ike) Eisenhauer**
Term: **Spring**
Year: **2015**

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ETM OFFICE USE ONLY
Report No.:
Type: Student Project
Note:

Abstract

Car2Go has been in Portland since March 2012 and has yet to show they are a profitable in this city. This report is an economic analysis of expanding Car2Go services in Portland, Oregon. The annual worth method is used to evaluate the profitability of three expansion options: 1) expanding the home area, 2) increasing fleet size, and 3) expanding the home area and increasing fleet size. A market analysis was conducted to determine the serviceable obtainable market and likelihood of obtaining new members with home area expansion. Based on the economic and market analyses, it was determined that expanding the home area in the first two years and then increasing fleet size in year three would be their most profitable option. However, further market research needs to be conducted with a larger sample size for a more accurate analysis.

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1. Introduction

When determining how their going to get from point A to point B, people living in and around Portland have many options. Car2Go, a relatively new subsidiary of Daimler AG, is just one of those options. Looking around downtown Portland at noon on a weekday, it appears there is a Car2Go invasion. After taking some time to study the behaviors and usage of the 530-car Car2Go Portland fleet, it becomes apparent that changes could be made to increase the Car2Go revenue stream.

Often, Car2Go vehicles are sitting for hours at a time, waiting to be used. There is a potential opportunity to generate revenue. Finding ways to get more use out of the vehicles generates more revenue for Car2Go and meets the transportation needs of people living in and around Portland.

2. Background

Daimler's car sharing service, Car2Go, has been in Portland since March of 2012 [1]. The service allows customers to rent a car by the minute. They can pick it up anywhere they can find one parked and unreserved, and then they can park it in any legal street parking spot when they are done. The driver does not pay for parking even in metered spots.

2.1 How It Works

A customer can view a map of all available cars in the home area using a mobile app or via Car2Go.com. If they find a vehicle nearby, they can reserve it for up to 30 minutes without being charged. If this option was not in place, customers could not be guaranteed to find a car nearby when they need one. To use the vehicle, a member card is scanned against a card reader mounted on the windshield on the driver's side dashboard. Through a cellular connection the member account is authorized and the doors unlock. Upon entry, the customer is asked to rank the vehicle for cleanliness and damage. This provides a way for Car2Go to charge the previous customer for any unreported damage and also alerts the Car2Go staff of maintenance needs.

The car can be driven anywhere, but must be within the home area in order to checkout of the rental. If the car is parked outside of the home area, the cellular service will prohibit checkout and the customer will continue to be charged for driving time.

A large advantage of this service for the customer is that the cars do not have to be returned to where they were originally checked out and they can be parked for free in metered street parking spots.

2.2 Revenue

For this service to work well, it helps to have a large number of the company's vehicles densely located and evenly dispersed around town. If a customer repeatedly cannot find a car when they need one, then they will stop relying on the service and find some other means of transportation. Restricting the cars to a home area helps to ensure the cars are densely located.

In Portland, the home area currently is primarily downtown and Northeast Portland (see Figure A1) [2]. In order to keep the cars evenly distributed around the home area, a team of support personnel must monitor where the cars are parked and relocate them whenever they are stacking up in large numbers in one area. As customers have become more familiar with the service, large numbers of Car2Go vehicles have consistently been stacking up in the evenings at the edges of the home area. This behavior suggests that many of the Car2Go customers live outside the service's home area and therefore only use it during the day.

3. Methodology

The annual worth method was used for this project. A survey was conducted to determine the serviceable obtainable market in Portland, Beaverton, and Gresham. Finally, a spider plot was used to conduct sensitivity analysis on the impact of a few key variables.

The Car2Go map was monitored for a few days to determine any trends in usage. The cars are densely packed and evenly distributed downtown during business hours, but after rush hour there was not a car to be found downtown (see Figures A2 and A3). This behavior implies that the Car2Go service is being used, in a big way, for commuting to work.

Since the cars cannot leave the home area for commute trips home, this mass usage of Car2Go in the mornings and evenings is limited to shorter trips. Commuters that live outside of the home area are forced to leave the cars at the border and use mass transit, bike, walk, or hitch a ride to get the rest of the way home. The company stands to make more money the more the

cars are driven, so it is in their best interest to expand their home area strategically to maximize drive time.

For this project, we evaluated the expansion of new Car2Go home areas in Beaverton, Gresham, or both to increase Daimler's revenue by increasing the drive time and use of its Car2Go vehicles. A market analysis was conducted to determine the serviceable obtainable markets in Portland, Beaverton, and Gresham. Based on survey and demographic data, the scope of the project was changed to focus on expanding Portland's home area versus establishing new home areas in Beaverton and Gresham. We compared the estimated annual worth of the Portland Car2Go service as it stands today to the estimated annual worth of 1) expanding the home area, 2) adding more cars to the fleet, and 3) expanding the home area and adding more cars to the fleet.

3.1 Assumptions

Due to lack of access to Daimler corporate data, we made the following assumptions to be used in our calculations.

MARR = 12 %

Avg cost of fuel = $3.018/gal [3]

Annual maintenance cost per car = $1,500 [4]

Annual Parking Fee = $674,810 [1]

Annual admin cost = $72,000

Annual marketing cost = $10,000-$15,000

Capital expense for new car = $18,000 [5]

Smart Car Avg MPG = 34 mpg [6]

Car2Go Portland Fleet size = 350 cars [1]

Mean travel time to work = 24.4 minutes [7]

Accessibility Rate = 0.15

MARR is assumed to be 12% based on similar industry trends. The annual administrative cost is assumed to be constant due to the increase in fleet size and home area not warranting significant additional staff time. The annual marketing costs were assumed using research

conducted in a prior course. Accessibility rate is assumed to be 15% of the serviceable available market.

4. Market Analysis

As a relatively new transportation option in Portland, Car2Go is faced with the challenge of obtaining more market share in Portland's transportation market. Portland is a city with a very active and organized transportation system with multiple options for affordable travel, such as Tri-Met, Drive Less Connect, and bikeways/walkways.

A market analysis was conducted to find the serviceable obtainable market and market position of Car2Go in Portland, Beaverton, and Gresham to help determine if establishing new home areas in Gresham or Beaverton would be a more profitable option than just expanding the boundaries of Portland's home area.

4.1 Market Segmentation

A top-down approach was used to narrow down the target market for Car2Go. First, the Total Available Market (TAM) consists of all those who potentially could have the two years of driving experience required of all Car2Go customers. Second, the Serviceable Available Market (SAM) includes individuals in the age range of 20-39 years based on survey data; the majority of the survey respondents who responded "likely" or "very likely" to adopt Car2Go if services were expanded to their neighborhoods were within that age range. Finally, the Serviceable Obtainable Market (SOM), which can be realistically captured by Car2Go, has been shown in Figure 4.1. Calculations can be found in Appendix C.

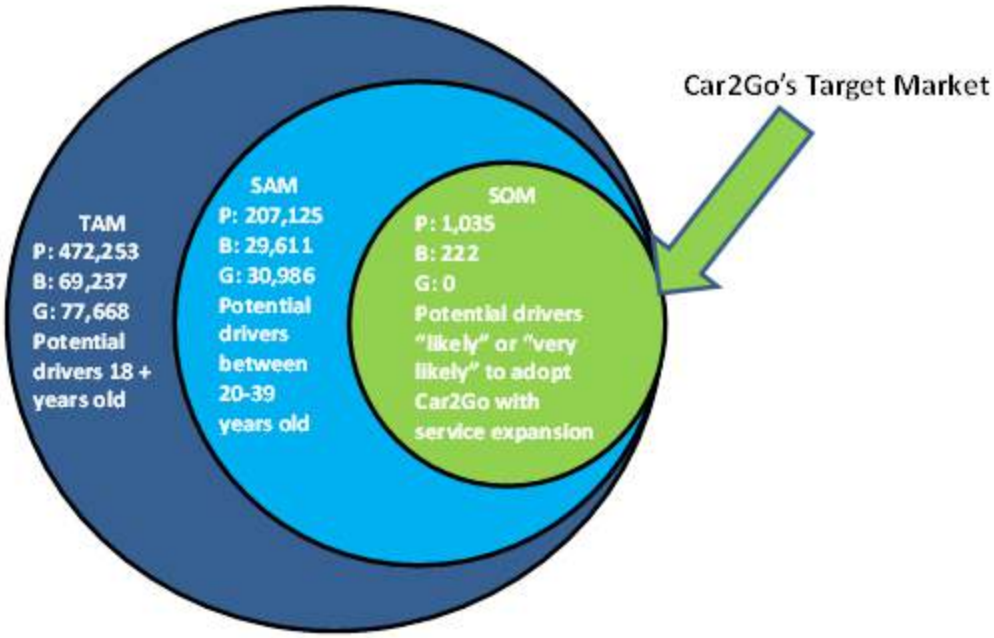

Figure 4.1: Market Segmentation for Car2Go [7]

4.2 Competitor Analysis & Positioning

The transportation options considered as Car2Go's competitors include public transportation, carpooling, owned or leased vehicles, bicycles, and finally our bodies. An analysis was conducted using "affordability" and "accessibility" as the x- and y-axis because these are attributes that are advertised as compelling reasons to buy on the homepage of their website [2]:

> *"…with over 500 vehicles, which are always ready to go, for as long and as often as you want."*
>
> *"Affordable drive through the city."*

Based on the competitor analysis (see Appendix D), Car2Go is not as affordable as Tri-Met or Carpooling, but it is more accessible. The only transportation options that are both more affordable and accessible are walking and biking. But those options are not as strong when

considering the benefits of storage space and protection from the environment that Car2Go would offer.

Figure 4.2: Car2Go Market Positioning

5. Financial Analysis

Initially, the scope of the project was to do a comparative economic analysis to determine the profitability of expanding to new home areas. After analyzing survey results, it was determined that the market share in Beaverton and Gresham was too small to pursue at this time, and instead the scope of the project changed to focus on expanding the home area, increasing the fleet size, or expanding the home area an increase fleet size of Car2Go Portland.

To calculate the profitability and economic justification of the project, the minimum acceptable rate of return needs to be assumed. Here there is a justified assumption made that MARR will be 12% from the present economic analysis. Using this assumption, the annual worth was calculated using referenced expenses and revenues [8].

In the following table, you can see that expanding the home area is the most profitable option in the first two years, after which it will be more profitable to expand the home area and increase the fleet size. Calculations can be found in Appendix E.

Table 5.1 Annual Worth Calculations

	Portland	Expand Home Area	Increase Fleet Size	Expand Home Area & Increase Fleet Size
One year	$1,015,208.68	**$2,155,529.69**	$816,333.05	$2,002,725.76
Two Years	$1,371,712.07	**$2,547,683.43**	$1,299,628.90	$2,521,671.94
Three Years	$1,490,039.42	$2,677,843.51	$1,460,040.04	**$2,693,915.82**
Four Years	$1,548,825.19	$2,742,507.86	$1,539,733.29	**$2,779,487.65**
Five Years	$1,583,797.02	$2,780,976.87	$1,587,143.05	**$2,830,394.59**
Ten Years	$1,651,565.19	$2,855,521.86	$1,679,013.37	**$2,929,041.72**

The annual worth was calculated using estimated monthly revenues and expenses, and annual expenses including the annual parking fee and capital costs of adding cars to the fleet. To do this, the values required were gathered from different sources because the data needed was not available directly from Car2Go. Data from the survey was used to estimate revenue generated from increased usage and membership.

From the various attributes gathered, a model was built separating the expenses required and revenues generated. Then the annual worth for each alternative was calculated and compared. The results were calculated for one to five years, and 10 years. The results show that expanding the home area is the best option, whereas, if the calculations are projected further out, expanding the home area and increasing fleet size is shown as the best option.

A sensitivity analysis was also performed, using the variables that drive cost and revenue: cost of gas, average minutes driven per car per month, charge per minute, and annual parking fee. The figure below shows the results of the sensitivity analysis, calculation can be found in Appendix E.

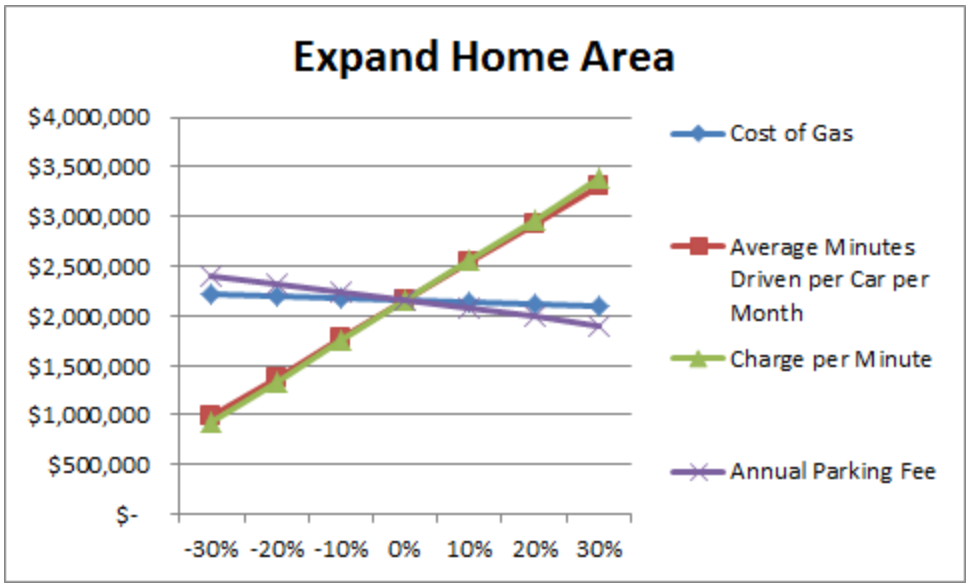

Figure 5.1: Sensitivity Analysis

Since the option to expand the home area in the first year was the most profitable option, it was chosen for this analysis. As you can see, the annual worth is most sensitive to the charge per minute and average minutes driven per car per month.

6. Conclusion & Recommendation

It was evident from our market research and literature review, that Car2Go is currently not making enough profits from the business and it needs to take a few actions to improve its revenue. The alternatives considered were to expand Car2Go Portland's home area; increase the fleet size of Car2Go Portland, or both. From the market analysis, it was found that there is minimal serviceable obtainable market in Beaverton and Gresham, 222 and 0 respectively. From the 2010 U.S. Census, it shows that Portland has a higher percentage of households without vehicles (7.1% vs. 4.5% in both Beaverton and Gresham) and a higher percentage of public transportation users (11.6% vs. 7.8 for Beaverton and 7.7% for Gresham) [7].

From the financial analysis, it shows that expanding the home area is the most profitable option in years one and two, and in year three on forward increasing the fleet size in addition to expanding the home area is the most profitable option. The analysis also shows that the average drive time per car per month and cost per minute are the more influential driving factors impacting annual worth. Based on this analysis, it is not recommended that Car2Go

expand into Beaverton and Gresham. Instead, it is recommended that Car2Go expand the Portland home area in the next two fiscal years to increase drive time per vehicle, and in the third year increase the fleet size.

7. Limitations & Future Research

One of the biggest limitations for this project is the availability of financial data on Car2Go. While many of the assumptions were backed up, they were not actuals (e.g., MARR). Another limitation is the number of respondents to the survey: there were 30 from Portland, 4 from Beaverton, and 1 from Gresham. Further research should include a larger sample size in all three cities for a more accurate calculation of serviceable obtainable market.

8. References

[1] OregonLive.com,. 'Joseph Rose: Feeling 'Car2cursed' With Car2Go In Portland'. N.p., 2015. Web. 1 June 2015.

[2] Car2Go.com,. 'Hello Portland'. N.p., 2015. Web. 1 June 2015.

[3] “Portland Gas Prices - Find Cheap Gas Prices in Oregon.” [Online]. Available: http://www.portlandgasprices.com/. [Accessed: 11-Jun-2015].

[4] Edmunds,. '2012 Smart Fortwo 1.0L 3-Cyl. 5-Speed Automated Manual True Cost To Own'. N.p., 2015. Web. 1 June 2015.

[5] Truecar.com,. 'New 2015 Smart Prices W/ MSRP & Invoice'. N.p., 2015. Web. 1 June 2015.

[6] Fueleconomy.gov,. 'Gas Mileage Of 2014 Vehicles By Smart'. N.p., 2015. Web. 1 June 2015.

[7] “American FactFinder.” [Online]. Available: http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml###. [Accessed: 03-Jun-2015].

[8] Costs, 2012. '2012 Smart Fortwo Pure Hatchback Costs, Depreciation, Ownership - Motor Trend'. *Motor Trend Magazine*. N.p., 2015. Web. 11 June 2015.

[9] “Car2Go - Wikipedia, the free encyclopedia.” [Online]. Available: http://en.wikipedia.org/wiki/Car2Go. [Accessed: 11-Jun-2015].

[10]“Portland is the car2go capital of North America - BikePortland.org.” [Online]. Available: http://bikeportland.org/2014/12/02/portland-car2go-capital-north-america-114155. [Accessed: 11-Jun-2015].

[11]“Portland growth slows, but still among U.S. leaders | Metro.” [Online]. Available: http://www.oregonmetro.gov/news/portland-growth-census-032714. [Accessed: 11-Jun-2015].

9. Appendices

Appendix A: Screenshots of Car2Go Home Area

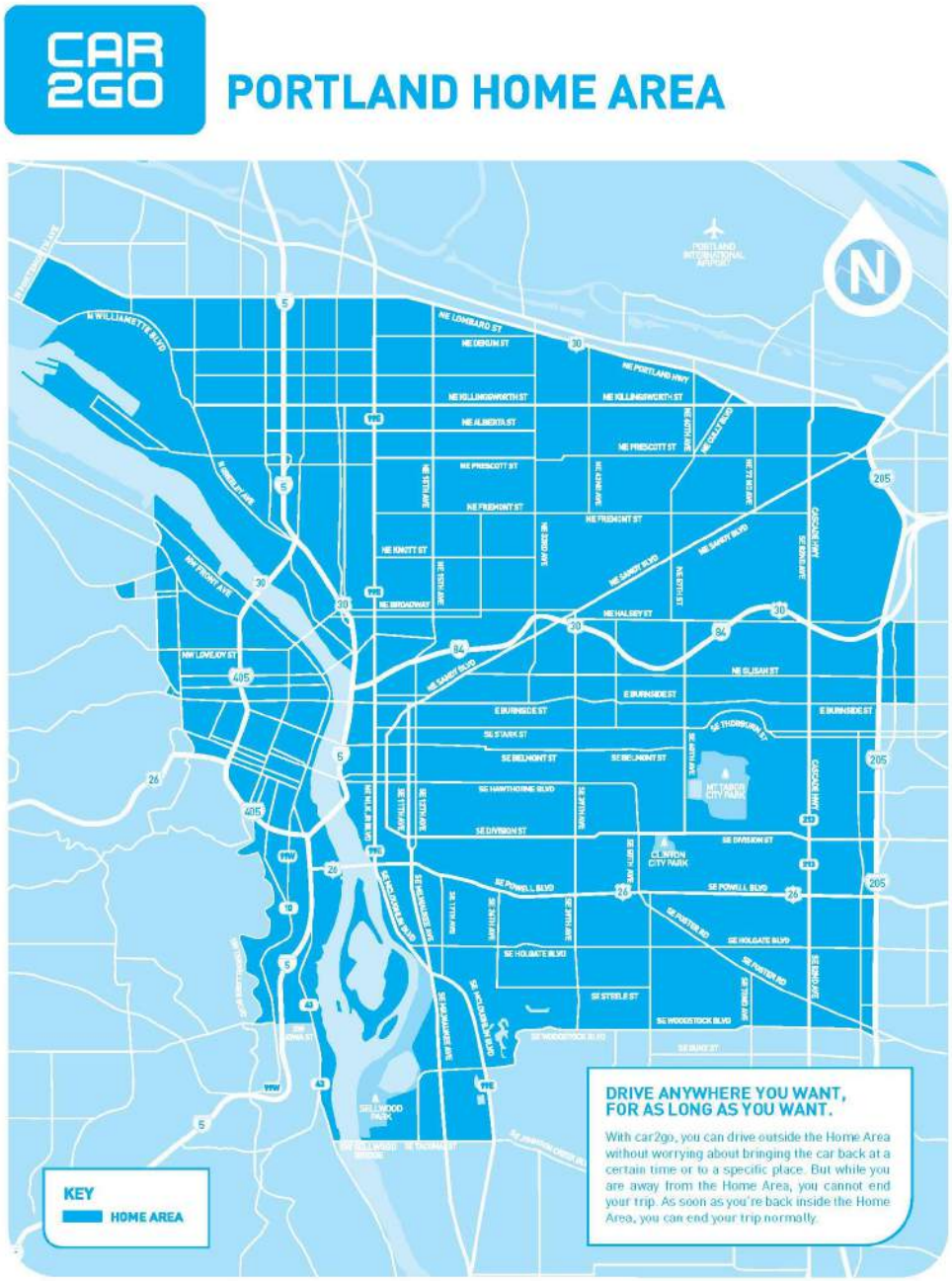

Figure A1: Car2Go Portland Home Area [2]

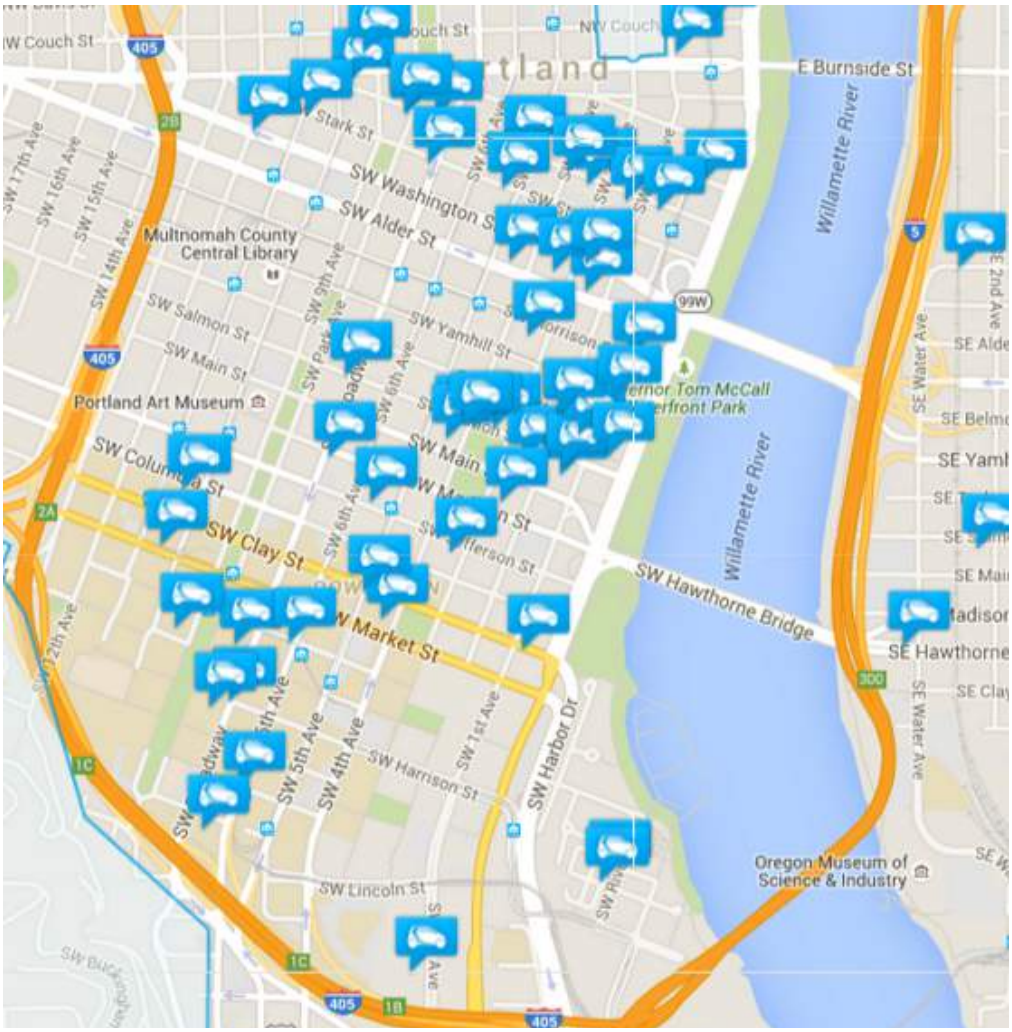

Figure A2: Downtown Portland during business hours

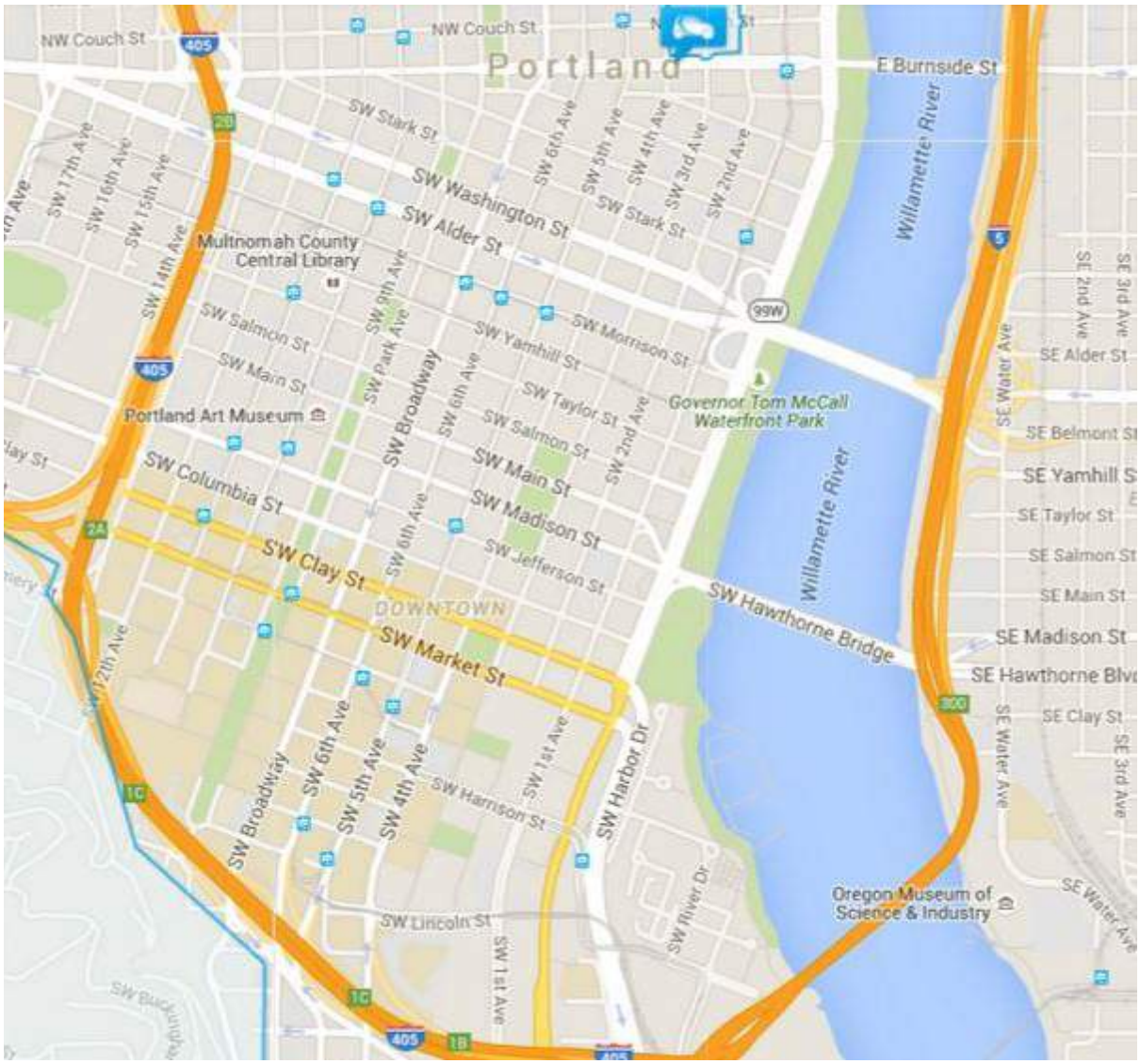

Figure A3: Downtown Portland in the evening

Appendix B: Online Survey

Car2Go Service Expansion Survey

Dear Participant,

Thank you for agreeing to participate in this survey. We are graduate students in the Engineering and Technology Management (ETM) department at Portland State University. This survey is part of an Engineering Economics class project. The results of this survey will be kept anonymous and will be shared in a final project report and presentation.
This survey consists of 11 questions, and should take no more than 10 minutes to complete. Thank you for your time.

1. What is your gender?
    a. Male
    b. Female
    c. Other
    d. Prefer not to answer
2. What is your age?
    a. Below 20 years
    b. 20-24
    c. 25-29
    d. 30-34
    e. 35-39
    f. 40-44
    g. 45-49
    h. 50-54
    i. 55-59
    j. 60 years or more
3. What city do you live in?
    a. Portland
    b. Beaverton
    c. Fairview
    d. Gresham
    e. Hillsboro

f. Lake Oswego
g. Milwaukie
h. Oregon City
i. Tigard
j. Troutdale
k. Tualatin
l. West Linn
m. Wood Village
n. SW Washington (e.g., Vancouver, Camas, Washougal)

4. Please rank the following modes of transportation in order of most frequently used, with the first selection as your primary mode of transportation.
    a. Car (own or lease)
    b. Carpool
    c. Car Rental or Car Share (e.g., Zipcar, Car2Go)
    d. Public transportation
    e. Biking
    f. Walking/Running
5. Do you currently use Car2Go?
    a. Yes
    b. No
6. How likely would you use Car2Go if services were expanded into your neighborhood?
    a. Very Unlikely
    b. Unlikely
    c. Undecided
    d. Likely
    e. Very Likely
    f. Services already in my neighborhood
7. What is the average monthly mileage you would expect to drive if Car2Go services were expanded into your neighborhood?
    a. Text box answer, whole numbers only >=0

If you currently use Car2Go, please answer the following questions to the best of your ability.

If you do not use Car2Go, you are finished with this survey and can move on to the next screen.

1. On average, how many Car2Go trips do you take on a monthly basis?

    a. Text box answer, whole numbers only >=0
2. On average, how many minutes do you log on each Car2Go trip?
    a. Text box answer, whole numbers only >=0
3. In what city are the majority of your minutes driven?
    a. Portland
    b. Beaverton
    c. Fairview
    d. Gresham
    e. Hillsboro
    f. Lake Oswego
    g. Milwaukie
    h. Oregon City
    i. Tigard
    j. Troutdale
    k. Tualatin
    l. West Linn
    m. Wood Village
    n. SW Washington (e.g., Vancouver, Camas, Washougal)
4. Would expanding service into your neighborhood:
    a. Increase your usage
    b. Decrease your usage
    c. Remain the same
    d. Do not know
5. If expanding Car2Go service into your neighborhood increases your usage, how many additional Car2Go trips would you expect to take per month?
    a. Text box answer, whole numbers only >=0
6. If expanding Car2Go service into your neighborhood increases your usage, how many additional minutes would you expect to log on each Car2Go trip?
    a. Text box answer, whole numbers only >=0

Thank you for taking the time to take this survey. Click on the double arrows to the right to complete this survey.

Appendix C: Target Market Calculations

The target market was established using the survey results. In the survey questionnaire, respondents were asked the following question:

"How likely would you use Car2Go if services were expanded into your neighborhood?"

To identify the target market, we focused on those who selected "likely" or "very likely".

Survey results showed the following:

Table C1: Probability Factor Calculation

	Portland	Beaverton	Gresham
Very Likely	0%	0%	0%
Likely	16.7%	25%	0%
Total Respondents	30	4	1
Probability factor, P [0.4*(% of very likely) + 0.2* (% of likely)]	0.0333	0.05	0

The calculation for Car2Go's target market is shown below using data gathered from the 2010 U.S. Census [3].

Table C2: Target Market Calculations

	Portland	Beaverton	Gresham

Total Population	583,776	89,803	105,594
Total Population 18 years & over (TAM)	472,253	69,237	105,594
Total Population 20-39 years (SAM), N	207,125	29,611	30,986
Accessibility, A (assumed)	0.15	0.15	0.15
Probability , P (from Table C1)	0.0333	0.05	0
Car2Go's Target Market (SOM), Q = N * A * P	1035	222	0

Appendix D: Competitor Analysis

Table D1: Competitors' Strengths and Weaknesses

Competitors	Strengths	Weaknesses
Car (own or lease)	· Available whenever you need it	· Value always depreciating · Expensive if you have a car payment or high insurance rate · Pay for parking · Owner responsible for maintenance, fueling, liability
Carpool, e.g. Drive Less Connect	· Free	· Rely on other drivers · Only available to/from work
Public Transportation, e.g., Tri-Met	· Affordable · Frequent, reliable schedule · Sometimes subsidized by employer	· Not available 24 hours · Availability diminishes the further from Portland City Center
Biking	· Low maintenance costs · Promotes healthy lifestyle · Available 24 hours	· Cannot transport large/heavy items unless you own a trailer
Walking/ Running	· Free · Promotes healthy lifestyle · Available 24 hours	· Cannot transport large/heavy items easily

Appendix E: Financial Calculations

Table E1: Annual Worth Calculations

Green Text = calculations based on survey data/assumptions				
Red Text = assumptions				
Blue Text = sourced data				
	Portland	Expand Home Area	Increase Fleet Size	Expand Home Area & Increase Fleet Size
Variables/Constants				
MARR %	12%	12%	12%	12%
Home Area # of cars [9]	530	530	550	550
Home Area (Sq mi) [10]	52	57.2	52	57.2
Cars per Square Mile [10]	10.2	9.3	10.6	9.6
Number of Customers [10]	28000	29035	28000	29035
Customers per Car	52.83	54.78	50.91	52.79
Portland Annual Growth Rate [11]	1.1%	1.1%	1.1%	1.1%
Cost of fuel [3]	$3.018	$3.018	$3.018	$3.018
Annual maintenance cost per car [4]	$1,500.00	$1,500.00	$1,500.00	$1,500.00
MPG per car [6]	34	34	34	34

Mean travel time to work (minutes) [7]	24.4	35.7	24.4	35.7
Average minutes driven per car per month [survey]	1,074	1,569	1,074	1,569
charge per car per minute [2]	$ 0.41	$ 0.41	$ 0.41	$ 0.41
charge per car per hour [2]	$ 14.99	$ 14.99	$ 14.99	$ 14.99
Expenses				
Capital investment [5]	$0	$0	$240,000	$240,000
Annual parking fee [1]	$674,810.00	$742,291.00	$674,810.00	$742,291.00
Annual maintenance cost of the fleet	$795,000.00	$795,000.00	$825,000.00	$825,000.00
Annual cost of gas	$151,523.48	$221,385.75	$157,241.35	$229,739.92
Annual admin cost	$72,000.00	$72,000.00	$72,000.00	$72,000.00
Annual marketing costs	$10,000.00	$ 15,000.00	$ 10,000.00	$ 15,000.00
Revenue				
Annual Revenue of fleet	$2,799,519.36	$4,090,281.36	$2,905,161.60	$4,244,631.60
Annual worth	$1,015,208.68	$2,155,529.69	$816,333.05	$2,002,725.76

One year	$1,015,208.68	**$2,155,529.69**	$816,333.05	$2,002,725.76
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Ten Years	$1,651,565.19	$2,855,521.86	$1,679,013.37	**$2,929,041.72**
Nper	1			

Table E2: Spider Plot Calculations

Expand Home Area							
	-30%	-20%	-10%	0%	10%	20%	30%
Cost of Gas	$ 2,221,945	$ 2,199,807	$ 2,177,668	$ 2,155,530	$ 2,133,391	$ 2,111,253	$ 2,089,114
Average Minutes Driven per Car per Month	$ 994,861	$ 1,381,751	$ 1,768,640	$ 2,155,530	$ 2,542,419	$ 2,929,309	$ 3,316,198
Charge per	$ 928,445	$ 1,337,473	$ 1,746,502	$ 2,155,530	$ 2,564,558	$ 2,973,586	$ 3,382,614

Minute							
Annual Parking Fee	$ 2,404,939	$ 2,321,803	$ 2,238,666	$ 2,155,530	$ 2,072,393	$ 1,989,257	$ 1,906,120