

Selecting the Best Carsharing Alternative for Tourists around the Portland Area

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Executive Summary

Carsharing as a membership system for the joint use of cars, is a growing industry. The system is proving popular because you can use a car anytime you need one. These automobile rental services are intended to substitute for private vehicle ownership, with vehicles located in neighborhoods, rented by the hour, and easy to check in and out. Carsharing services are increasingly common with tourists who want to get from one point to another without spending hours on public transport. These have the added benefit of convenience and comfort of a four wheeler without paying much extra as in the case of taxi or cabs.

This paper utilizes Hierarchical Decision Model (HDM) to evaluate and select the best carsharing alternative for tourists around Portland area by analysing different perspectives and criteria that can be used to predict which alternative is preferred, address which criteria are most important to the tourists, and provide recommendations to travellers and carsharing businesses.

Car2go, Zipcar, ReachNow, Turo, and Getaround are the five alternatives that were evaluated. The result showed that "ReachNow" is the best alternative for tourists around Portland area and indicated that the convenience perspective is the most important to achieve the object, and carsharing should put more focus in improving areas related to convenience.

1.0 Introduction

Carsharing services are changing how people travel these days. The current transportation market offers consumers many options for buying a vehicle, but fewer practical options for using a vehicle occasionally. Most rental cars services are priced per day or week, making them inappropriate for short trips. In its most basic form carsharing is rental car per hour. The expansion of carsharing is visibly changing the transportation landscape in urban areas by

- Providing a vehicle to people who need a vehicle occasionally a few times a week or month
- Low income household that cannot afford a vehicle
- Reducing traffic congestion from the roads
- Reducing high costs to maintain a vehicle that is needed occasionally
- Reducing impact on the environment

Armed with such benefits, carsharing is no doubt a growing industry and a number of players are trying to grasp their hold on the already competitive market. Portland and surrounding areas are a big travel location in the Northwest and attract thousands of tourists per year. Tourists especially these days prefer to have a four wheeler at their disposal due to comfort, safety and convenience. While exploring a city it is much more comfortable and easier to drive than use public transportation. Also, people often travel on a budget and carsharing provides them an option that is both economical and convenient.

On a close analysis we found out the list of five carsharing alternatives that are the biggest market players in Portland currently. This project analyses these five alternatives based on a set of factors that people generally look for when they rent a car for travel. These were then ranked based on criterias and given weightage, a HDM model was then developed and the best carsharing alternative was selected as a result of this analysis. We discuss these results based on perspectives and criteria and also an alternatives ranking by the companies. Based on these results we have given our recommendations for all applicable customers need and demands.

2.0 Literature Review

Carsharing Introduction

Carsharing is a business model of the rental car that allows consumers to benefit a private vehicle for short periods of time while relieving them of the costs of purchase and maintenance. This model attracts users who make occasional use of vehicle by accessing vehicles owned by char sharing companies as part of a shared fleet. Members stated the membership by paying an initial membership fee, then pay the usage fee of the shared car on an as-needed basis, often by hour or mile [1]. Membership fee ranges from \$20 to \$70, while usage cost ranges from \$4 to \$13 per hour and up to \$0.5 per mile. Also, some carsharing offers per day usages that varies in cost depending on the car model and ownership.

Evolving of the Carsharing Models

In Portland, carsharing business model started to shape in the early 2000s when Flexcar acquired Carsharing Portland in 2001, that followed by the merger of Zipcar and Flexcar in 2007. Then, recent acquisitions and emerging models continues the trend in North America when Enterprise Holding acquired PhillyCarShare in 2011 and Mint Cars On-Demand in 2012. Later, Zipcar has acquired by the Avis Budget Group in January 2013 and IGO CarSharing acquired by Enterprise Holding in May 2013 [2]. Carsharing has also spread to the developing world (Brazil, China, India, Mexico, and Turkey) because population density is often a critical determinant of success for carsharing, and developing nations often have dense urban populations [3].

Carsharing Business Model Types

The carsharing business model can be classified into two ways, the type of trip and the fleet ownership. The type of trip is a service model that include roundtrips and one-way carsharing. In roundtrip carsharing, the shared vehicle must be returned to the original location, while in one-way carsharing the car typically can be parked anywhere within the designated service area [1]. The fleet ownership classification includes company owned-fleet and peer-to-peer. In company owned-fleet model, which is the original business model where a company owns the fleet and provides the carsharing service to the end-users. Whereas, the peer-to-peer model is a car rental marketplace where travelers can rent any car they want from a vibrant community of local car owners.

Carsharing Benefits

The carsharing can provide many transportation, land use, environmental and social benefits [4]. It is often promoted as an alternative to owning a car where public transit, walking, and cycling can be used most of the time and a car is only necessary for out-of-town trips, moving large items, or special occasions [4]. Therefore, it offers many benefits to consumer over the traditional rental cars. It is not limited by office hours and all services are self-service. Users are members and have been pre-approved to drive at any time they needed the service. Vehicle locations are distributed throughout the service area and often located for access by public transport. Insurance and gas cost and usually included in the rates [4].

Carsharing in Portland

Mainly, there are five carsharing options available in Portland area which are Car2Go, Getaround, ReachNow, Turo, and Zipcar. These options have different business models and offerings to the consumer. Turo and Getaround are peer-to-peer carsharing services where the member can choose from assorted vehicles offered by their owners who set the hourly or daily rates. In this model, members start the trip from the owner location and end the trip at the same location. Car2Go and Reachnow are company owned-fleet carsharing services where members have few vehicle models scattered in a designated service area around Portland. Trip started from the car location and ends by parking the car on street anywhere in the service area. In this model, hourly and daily rates are fixed by the company. Zipcar is a company owned-fleet carsharing service with assorted vehicles parked in more than 60 assigned locations around Portland. Trips start from these assigned locations and ends at the starting point. Zipcar hourly and daily rates varies by car model, size, and time.

Portland Tourism

In 2016, the Portland metro area welcomed 8.99 million overnight person-trips [5] and visitors to the Portland metro area generated \$5.1 billion in direct spending [5]. Focus on tourist attractions out of the trail area, like Mount Hood, Multnomah Falls, Oregon City, Woodburn county etc.

3.0 Project Objective

To use the HDM to evaluate and select the best carsharing alternative for tourists around Portland area by analyzing different perspectives and criteria, that can be used to

- Predict which alternative is preferred
- Address which criteria are most important to the tourists
- Provide recommendations to travelers and carsharing businesses

4.0 Methodology

A hierarchical decision model (HDM) is used to evaluate and assign weightage to the options mentioned. This model helps the decision maker by breaking down the decision problem into criteria and sub-criteria. Thereby, bringing clarity in the various options available, and displaying lucidly the importance and utility of each option. HDM basically consists of stages that display the breakup of the decision problem [6]. For instance, a typical hierarchical decision model (HDM) are constructed as Fig. 1, which used to start from the establishment of the mission or objective, perspectives that are evaluated for their importance to the objective. Each perspectives can break into different criterions. The alternatives that are evaluated for how preferred they are with respect to each criterion [7]. The objective, perspectives, criterions, and alternatives are all elements in the decision model. The level of the decision tree depends on the complexity of the problem and it can be added between objective and perspective. The connected line from the objective to each perspective means that the perspective must be compared pairwise for their importance with respect to the objective. Likewise, the lines connecting each perspective to criterions express that criterions are compared pairwise as to which is more preferred for that perspective.



4.1 HDM Model Development

The model for deciding on a carsharing service was developed with a tourist in mind. What important criteria people look for while renting a car? What kind of requirements do people generally have while deciding on renting a car?

The alternatives were five highly used carsharing services in Portland that have already been discussed in the section above .We then started with a list of perspectives that people base their decisions on, like economic, convenience etc.. After that we looked at the criteria of choosing a service based on these perspectives example factors like

mileage limit and Car model etc. were considered. The perspectives and criteria are discussed in detail below. We then had experts evaluate these criteria and perspectives and additionally all the carsharing alternatives were ranked with respect to these criteria.

4.2 Pairwise Comparison

The pairwise comparison method will be used to determine relative importance of each alternative. Relative scores will help us determine the weights of each criterion. These criteria when compared to each other in pairs, and the relative comparison will show us the successful order of the options. Pair-wise comparison combined with the HDM will guide us through choosing the absolute relevant option while keeping in mind the selected criteria

4.3 Objective (O)

The main objective of the project is to select the best carsharing options available around Portland area for tourists.

4.4 Perspectives (P)

Decision making is a complex task that involves various socio-economic and physical factors into account before evaluating options or making decisions. For this model we have divided our approach into the following perspectives

- 1. Convenience: how comfortably the options are in terms of saving time, simplifying your work and making the task overall easy and requiring less difficulty.
- 2. Economic: Relates to all types of costs and any other factor that can be valued in terms of monetary value.
- 3. Features: Features provided in the vehicle and specialties that are customer preferences based on their area of travel, number and kind of people on board etc.. Includes type of car model and accessories etc.
- 4. Safety: Matters that include but are not limited to general safety policies of the rental company, car owner. Policies followed for assistance in case of any mishap or broken vehicle, quality check of vehicles etc.

4.5 Criteria (C)

Decision-making involves the analysis of a finite set of alternatives described as evaluative criteria. The decision Makers might rank the alternatives in terms of how attractive they are when all the criteria are considered simultaneously. For our model the Criteria are as follows based on the perspectives described above.

Convenience

- 1. Drop-Off Options: These relate to where you can drop off the rented car and ranges from same pickup location to anywhere near your destination. It varies with company policies.
- 2. Duration Options: The length of time for which you can keep the shared vehicle with you. It can range from few minutes to hours to daily rentals.

- 3. Ease of Access: How easily can the car be accessed, includes but is not limited to proximity to car pick up locations and rental process and faster reservations etc.
- 4. Fleet Size: determines how readily the vehicles will be available for rental and larger car selection options.
- 5. Mileage Limit: To avoid excessive wear and tear, carsharing companies keep a mileage limit. If you go over this Limit there is an extra fees that you have to pay.
- 6. Parking Availability: How easily can one get a parking space for the shared vehicle.

Economic

- 1. Gas Cost: If cost of fuel, petrol, diesel, or gas is included or not in the rental
- 2. Parking Cost: Cost of parking the vehicle at designated parking places
- 3. Miscellaneous Cost: This includes but is not limited to extra mile cost ,penalty fees ,cancellation cost, insurance upgrade cost
- 4. Rental Cost: The hourly or daily Cost of renting the shared vehicle. It depends on the duration of your renting
- 5. Subscription Cost: The cost to be eligible for renting cars from a particular carsharing company and can be one time, monthly or annual.

Features

- 1. Car model: Model of the car being offered for rentals, can range from luxury to basic depending on the customer's needs.
- 2. Car size: Size of the car being offered for rentals, focused on the number of the seats.
- 3. Interior Features: we only considered if GPS was included or not.

Safety

- 1. Insurance coverage: Kind of insurance covers offered by the carsharing company and the deductible amount in case of accident.
- 2. Reliability: How reliable is the company and its service and the quality of roadside assistance provided.

4.6 Alternatives

We decided to choose alternatives that are the most common car-sharing service in Portland, which lead us to evaluate the following five options

 Zipcar: Zipcar, launched in 2000, is a subsidiary of Avis Budget Group that provides carsharing service in more than 170 cities in 44 states, the District of Columbia, Canada and Europe and at more than 300 U.S. colleges and universities [8]. With same day reservations, good customer service reviews, insurance coverage and fuel cost included, Zipcar makes not owning a vehicle a lot easier when you do need one. The downside of this service is the minimum rental time is one hour, so if you only need a quick 30 minute trip to the store and back, you're locked in for the hourly rate.

- 2. Car2go: This company started in 2008 in Ulm Germany, it is now available in 15 North American cities and 14 in Europe. People can rent car2go by minute, and there is no minimum limit, so people do not necessarily have to reserve a vehicle. Car2go only offer compact and hybrid cars which is more eco-friendly. There is also no membership fee which makes it an affordable option for many people. The downside is car2go does not include airport locations, it might be not so convenient for people who have this kind of needs [8].
- 3. Getaround: Getaround is a peer-to-peer carsharing service that provide on demand reservation services. It allows the renters to rent a car from local owners. It currently operate in only six cities in which Portland is one of them [8]. Getaround allows affordable car rental options for consumers and allow car owners to profit from renting their own cars. Getaround provides wide variety of car selections at hourly or daily duration options [11].
- 4. Turo: Turo is a car rental company that operates as a peer-to-peer carsharing service. People rent cars owned by other people via an online and mobile interface. The company is based in San Francisco. It offers more than 800 makes and models of vehicles and delivery can be done in more than 2,500 cities and 300 airports across the U.S. and Canada [12].
- 5. ReachNow: This is a premium carsharing service, owned by the BMW Group. ReachNow is designed to provide a user experience that's as convenient as owning a car: Drive on your own terms without the hassle and expense of traditional car rental programs [13].

4.7 Expert Panel

After developing the HDM model, an expert panel is formed. The expert panel of this project consists of five persons to determine the relative relationship among the decision elements at various levels of the model. There are two steps: data collection and development of the ranking table. We came out with the four important perspectives for tourism to determine the car-sharing service from our literature review, which are shown in the second level of our HDM model: economic, convenience, safety, and feature. Each of perspective will be evaluated by different criterions. For example, the economic perspective is evaluated by five criterions, which are the subscription cost, the rental cost, the parking cost, and the miscellaneous cost. In the data collection stage, we collected the information of each criterion based carsharing companies' websites. In the development of ranking table, we ranked numbers of each criterion from one to five for experts to measure the relative importance of each alternative as shown in Table 1. See details in Appendix 1.

Ranking (1-5) 1 -	poor 5 - excellent	Zip Car	Car to go	Get around	Turo	ReachNow				
	Subscription Cost	1	5	5	5	3				
	Rental Cost	3	2	5	3	1				
Economic	Gas Cost	5	5	1	1	5				
	Parking Cost	4	5	2	2	5				
	miscellaneous Cost	3	5	2	1	4				
	Ease of Access	5	4	3	3	4				
	Mileage limit	3	2	4	4	5				
Convenience	Parking Availability	4	5	2	2	5				
Convenience	Duration Options	4	5	4	1	5				
	Fleet Size	5	2	4	4	3				
	Drop-Off Options	2	5	3	3	5				
Coloty.	Reliability	5	3	4	4	4				
Safety	Insurance coverage	3	3	2	4	4				
	Car Model	5	3	5	5	3				
Feature	Car Size	5	3	5	5	4				
	Interior Design	3	3	3	3	4				

Table 1. Alternatives ranking table

5.0 Result Analysis and Discussion

The HDM is used to structure the decision into objective, perspective, and criteria to better understand the important factors to consumers when selecting the best carsharing alternative and identify the best among five alternatives. The following sections shows the result analysis and discussion

5.1 Perspectives Ranking

The perspectives used in this model are Economic, Convenience, Safety, and Features. They were ranked using Pairwise Comparison Method (PCM) software provided by Portland State University in order to determine the relative importance of each perspective to the overall objective of the project. The following Table 2 shows experts weighting for perspectives regarding the objective. The mean for each perspectives' weightings for the experts were calculated:

Perspectives Level	Convenience	Economic	Features	Safety	Inconsistency
Expert 1	0.23	0.49	0.15	0.13	0.02
Expert 2	0.24	0.39	0.08	0.29	0.01
Expert 3	0.27	0.34	0.14	0.24	0
Expert 4	0.48	0.08	0.09	0.37	0.01
Expert 5	0.31	0.14	0.21	0.32	0.02
Mean	0.306	0.288	0.134	0.27	
Disagreement					0.033

Table 2. Perspective ranking



The following fig. 2 provide better representation of the weighting of each perspective

Fig. 2. Importance of the perspectives to the objective

According to the above, the impact of perspective to overall objective, the weight of convenience, economic, features and safety are 0.31, 0.28, 0.27 and 0.13, respectively. Convenience is the most important perspective for tourist when renting a car, it is surprise that Economic is the second important perspective, and Safety is just 0.01 lower than Economic. People now are really looking for the ease of use, in addition, life is getting better, people are not only focus on the cost but also the quality of the trip, many people would like to pay a little bit more to get a more convenience, more comfortable car in the trip.

5.2 Inconsistency and Disagreement

This model shows that level of inconsistency for all the expert's is below 0.10 which is in the acceptable range. Also, the disagreement level is 0.033 which is still less than 0.10 and within the acceptable range. The inconsistency level above 0.10 occurs when the choices of the preferences are not aligned. The experts answer to each pairwise comparison should be consistent and has overall level of 0.10 and less for each expert. Inconsistency is considered as a measurement of validation for the results

5.3 Criteria Ranking

For this model, 16 criteria were selected to evaluate the alternatives based on. The experts ranked each criterion with respect to its corresponding perspective. The higher value that a criterion has, the higher its impact on its perspective. In order to identify the weighting for each criterion, a pairwise comparison was conducted. The following fig. 3 shows the weighting for each criterion to its perspective





Fig. 3. Criteria weighting

The figures show each criterion relative importance to their perspective. In the perspective of convenience, drop-off options has a score of 0.07 which is the most important criterion, followed by duration options and parking availability. The least important criteria is fleet size. In the perspective of economic, the most important criteria is rental cost and the least important criteria is subscription cost, rental cost always is the big part when considering carsharing, and depending on the carsharing company, some cost such as parking and gas are covered and the subscription cost is really low. In the perspective of safety, insurance coverage is the most important criteria, insurance may cost a lot when tourists have accident, so it is understandable that people gave a higher rank on this. In the perspective of feature, tourists care more about the car size, and the least important for them if all the luggage can be put in one car, and nowadays many people use mobile device as GPS, so whether the car has a GPS or not is not that important for them comparing to car size. The detail ranking by each experts are shown in Appendix 3 and 5.

5.4 Alternative Ranking

The experts weighted each technological alternative with respect to the relative importance to each criterion that contributes to its perspective. Each alternative is assigned a value ranging from one to five with five being excellent and one being poor with respect to each criterion based on the literature review. These values then multiplied by the relative importance of each criterion to the consumers. The higher the value, the more important that alternative to the overall objective. The following table 2 and fig. 4 shows the ranking values of each Perspective for each alternative.

	Convenience	ience Economic Featur		Safety	Alternative Value
Zip Car	1.12	0.96	0.59	1.05	3.72
Car2go	1.27	1.13	0.39	0.81	3.6
Getaround	1.01	0.85	0.59	0.78	3.23
Turo	0.83	0.62	0.59	1.08	3.12
ReachNow	1.45	0.93	0.48	1.08	3.94

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Fig. 4. Perspective ranking

According to the result of impact of alternative to overall objective, the alternative values for Zipcar, Car2go, Getaround, Turo and ReachNow are 3.72, 3.6, 3.23, 3.12 and 3.94, respectively. ReachNow is the best alternative of carsharing for a tourists traveling in Portland. It has the highest value which means it is the best alternative that achieve the overall objective. The result was different than our expectation, ReachNow has a high score on the perspective of convenience which is the most important perspective comparing to other perspectives, car2go is the most economic.

It is also obvious that the business to consumer carsharing model wins the top three alternatives places which shown to be better in meeting the overall objective and the carsharing consumers' preferences. The bottom two models are peer-to-peer where the cars owned by local individuals. The detailed ranking of criterias to each alternative are shown in Appendix 4.

5.5 Overall HDM Results

The following fig. 6 shows the results of our HDM. The objective of this project is to identify the best carsharing alternative for tourists around the Portland area based on multi criteria decision model. We utilized HDM to structure the decision into objective, perspectives, criteria, and alternatives. More details can be found in Appendix 2.



Fig. 6. Final result of HDM

5.6 Top Factors for Consumers

After the evaluation of the criteria by the experts, we came up with the weights of the importance of each criterion under each perspective to the overall objective. The following table 3 shows the most important factors for consumers when selecting best carsharing alternative.

Table 5. Important factors for consumers									
Top important criteria	Perspective	Weight							
Insurance coverage	Safety	0.15							
Reliability	Safety	0.12							
Rental Cost	Economic	0.9							
Drop-Off Options	Convenience	0.07							
Gas Cost	Economic	0.07							

Table 3. Important factors for consumers

The top factors should give insight to the carsharing companies about the criteria the consumers base their decision on when selecting a carsharing option.

6.0 Implications

6.1 Recommendation

In this project, a Hierarchical Decision Model (HDM) is utilized to identify the best carsharing alternative for tourists around the Portland area. We have determined that "ReachNow" is the best alternative for tourists around Portland area. It outperformed the other alternatives based on the consumer's criteria of choice such as the insurance coverage, drop-off options, and gas cost. Our result indicate that the convenience perspective is shown to be the most important in achieve the object and carsharing should put more focus in improving areas related to convenience. The following table 4 shows the most important criteria to consumers and the alternative that met these criteria and the once need and improvements

Top important criteria	Perspective	Weight	Top Alternative	Bottom Alternative
Insurance coverage	Safety	0.15	Turo & ReachNow	GetAround
Reliability	Safety	0.12	ZipCar	Car2Go
Rental Cost	Economic	0.9	GetAround	ReachNow
Drop-Off Options	Convenience	0.07	Car2Go & ReachNow	ZipCar
Gas Cost	Economic	0.07	ZipCar & Car2Go & ReachNow	GetAround&Turo

Table 4. The most important criteria for alternatives to improve

The above table show the top criteria preferred by the consumers and give insight to the consumers who base their decision on certain criteria. For example, if the consumer only based their choice on the insurance coverage, then Turo or ReachNow are considered as the best alternative. If the consumers only care about the rental cost, then GetAround is considered to outperform the other carsharing options. Also, companies should pay attention to these factors in order to stay competitive with the other companies and win the consumers' trust. GetAround and Turo were ranked the lowest among other alternatives in terms of Gas Cost since some other companies include the gas cost with the rental so they need to put more effort in this area to satisfy the customers. Furthermore, the top three alternatives are company-owned cars while the bottom two are peer-to-peer model with locals renting their cars. Thus, Turo and GetAround should try to adjust to meet the consumers' preferences.

6.2 Future Directions

In this project, we have looked at five different carsharing companies that operate in Portland. Other companies may join the competition that can be evaluated with this model.

Also, incorporating judgments from real customers into this model would enhance and validate the model either for the criteria selection or for the pairwise comparison evaluation. Researchers and professionals in the carsharing area can add tremendous inputs in term of alternatives ranking.

7.0 Conclusion

In conclusion, the hierarchical decision model in conjunction with the pairwise comparison method gave us the best carsharing alternative for tourists in and around Portland. This model can be utilized for other cities and a variety of consumers by altering the weights assigned to the perspectives and criterias as those were the expert's personal preference for this particular project.

Our research includes five alternatives which are Zipcar, Turo, ReachNow, Car2go, Getaround and a ranking was assigned to these alternatives based on the experts' opinions. Based on the weights assigned to the perspectives and Criterias, we came up with the conclusion that ReachNow is the best alternative for our model, followed by Zip car. Insurance Coverage was the most important criteria followed by Reliability and Rental Cost as shown in Table 3. It is worth mentioning that the experts had given convenience the maximum weightage while travelling in Portland city followed by Economical perspective.

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Appendix

	Car2go [14][15][16][17]								
Economic	Subscription Cost	\$5 (plus tax) registration fee, no monthly fees [14] [17]							
	Rental Cost	Included in [16]							
	Gas Cost	Membership covers Fuel/charging for gas and electric vehicles [17]							
	Parking Cost	Park for free in Portland Home Area [17]							
	Miscellaneous	• additional miles from \$0.45							
	Cost	• damage fee of up to \$1,000 [15]							
		• cancellation \$0 up to 15 minutes before							
Convenience	Ease of	More Information can be found in [17]							
	Access								
	Mileage Limit	Mileage up to 150 mi/200 km per trip [17]							
	Parking	Portland Home Area							
	Availability								
	Duration	Rent per minute (no minimum)							
	Options								
	Fleet Size	Around 300							
	Drop-Off Options	Simply park your car2go on public, on-street parking within the Portland Home Area. [17]							
Safety	Reliability	Car2Go's technology system not being reliable [15]							
v	Insurance	Covered by car2go, see detail [17]							
	Coverage								
Feature	Car Model	smart fortwo, Mercedes-Benz GLA, CLA							
	Car Size	smart fortwo = 2, Mercedes-Benz GLA = 5, Mercedes-							
		Benz $CLA = 4$							
	Interior	some have GPS, two models are AWD							
	Features								

Appendix 1 – References of alternative ranking table

Zipcar [18][19][20][21][22][23]									
Economic	Subscription Cost	Membership from: \$7/mo or \$70/yr [23] \$25 application fee [23]							
	Rental Cost	Driving rates from: \$8-10/hr [22]							
	Gas Cost	included [23]							
	Parking Cost	Included [18]							
	Miscellaneous	 additional miles from \$0.45 							
	Cost	• damage fee of up to \$1,000 [19]							
Convenience	Ease of Access	Well distributed around the city							
	Mileage Limit	180 miles/day [19]							
	Parking	More than 60 available locations [20]							
	Availability								
	Duration	Per hour or per day [21]							
	Options								
	Fleet Size	Reserve available cars from 1 hour to 7 days [22]							
	Drop-Off	Drop off in the designated pick-up parking spot [22]							
	Options								
Safety	Reliability	• Rates include Gas, insurance and 180							
		miles/day							
		• More than 60 parking locations around							
		Portland							
		• 24/7 access							
		• Zipcars come in all car models and sizes [23]							
	Insurance	Insurance covered by Zipcar [23]							
	Coverage								
Feature	Car Model	Zipcars come in all shapes and sizes – compact sedans,							
		luxury SUVs, spacious van [23]							
	Car Size	From 4 to 9 seats, and cargo [23]							
	Interior	Standard							
	Features								

Getaround [24][25][26][27][28][29][30]									
Economic	Subscription	Free to join. No monthly or annual fees. [24]							
	Cost								
	Rental Cost	Starts from \$5 per hour. and Daily rates vary by owner							
		[30]							
	Gas Cost	Gas is not included. [30]							
	Parking Cost	Renters must park in a location that the car may stay for							
		24 hours after their trip. Renter to pay for these fees[25]							
	Miscellaneous	\$50 per hour late fee. \$0.50 per mile overage fee.							
	Cost	\$750-\$2,500 damage fee (insurance deductible)[30]							
		Cancellation less than 24 hours before the trip starts:							
		50% of Trip price [26]							
Convenience	Ease of	Depends on cars locations shared by people in your							
	Access	neighborhood. [24]							
	Mileage Limit	25 miles per hour, up to a daily total of 200 miles. [27]							
	Parking	car should be picked and returned within 0.5 miles of							
	Availability	the car's listed home location.[28]							
	Duration	Hourly and daily rentals. [24]							
	Options								
	Fleet Size	Depends on cars shared by people in your							
		neighborhood. [24]. on-demand reservation service.							
		[30]							
	Drop-Off	car should be returned within 0.5 miles of the car's							
	Options	listed home location.[28]							
Safety	Reliability	Members are required to pass several security							
		checkpoints to make sure their Getaround experience is							
		simple, safe and secure—every time. 24/7 roadside							
		assistance[29]							
	Insurance	Insurance coverage is included. [24]							
	Coverage								
Feature	Car Model	offers wide variety of makes and models available [30]							
	Car Size	offers different sizes such as convertibles, luxury,							
		exotic, vans [30]							
	Interior	Depends on rented car.							
	Features								

		Turo[31]
Economic	Subscription	None
	Cost	
	Rental Cost	\$34 starting daily rates + 10% rental fee
		\$10 -150 per day
	Gas Cost	Renters responsibility
	Parking Cost	Renters responsibility
	Miscellaneous	• \$50 per hour late return fee (up to \$200)
	Cost	• \$0.75 per mile overage fee (owners set their
		mileage limits)
		• \$500-\$3,000 damage fee
		Very inflexible cancellation
Convenience	Ease of	Doorstep pickup and drop off
	Access	
	Mileage Limit	200 miles/day Overage fees .75 miles
	Parking	parking at self-cost
	Availability	
	Duration	Daily Rentals
	Options	
	Reservations	Needed
	Drop-Off	Doorstep of owner
	Options	
Safety	Reliability	24*7 roadside assistance
	Insurance	Basicchoice of Premium , basic or decline coverage
	Coverage	
Feature	Car Model	From basic to luxury(cars, SUVs, minivans, trucks and
		vans)
	Car Size	varies
	Interior	Depends on rented car.
	Features	

ReachNow [9][10]										
Economic	Subscription	\$39 lifetime membership								
	Cost									
	Rental Cost	Driving rate from \$5.88 to \$27/ hr								
	Gas Cost	Included [9]								
	Parking Cost	Included within the Home Area.								
	Miscellaneous	Responsibility for Damage and Loss per case: \$500								
	Cost	\$0.45/mile after mileage limit (400 Miles)								
Convenience	Ease of	The availability of vehicles is currently first come, first								
	Access	served. A scheduled reservation functionality will								
		follow in the near term								
	Mileage Limit	400 miles								
	Parking	Any legal parking spots within home area in Portland								
	Availability	[10]								
	Duration	Per day, Per hour, or Per minute								
	Options									
	Fleet Size	360 vehicles @ PDX								
	Reservations	Using ReachNow App or Find vehicle on street								
	Drop-Off	Flexible: Pick up a car at A and drop it off at B								
	Options									
Safety	Reliability	• Rates include Gas, insurance and 400 miles/day								
		 360 vehicles availability in Portland 								
		• The ability to rent a vehicle for as long as 14								
		days (with a scheduled reservation).								
		• Free parking in residential zones within								
		ReachNow home area.								
	Insurance	Vehicle insurance costs included in rate.								
	Coverage									
Feature	Car Model	3 options:								
		BMW i3, BMW X1 Sports, or MINI Clubman								
	Car Size	coupe (2), sedan (4), or SUV								
	Interior	Depends on the car model								
	Features									

Appendix 2 – HDM result table

		Convenience					Economic					Features			Safety		
	Drop-Off Options	Duration Options	Ease of Access	Fleet Size	t Mileage limit	Parking Availability	Gas Cost	Parking Cost	Miscellaneous Cost	Rental Cost	Subscription Cost	Car model	Car size	Interior Features	Insurance coverage	Reliability	Inconsistency
Expert 1	0.04	0.06	0.03	0.03	0.05	0.02	0.09	0.06	0.12	0.18	0.04	0.04	0.09	0.02	0.07	0.06	0.02
Expert 2	0.03	0.05	0.05	0.03	0.05	0.03	0.13	0.06	0.06	0.1	0.04	0.02	0.04	0.02	0.19	0.1	0.01
Expert 3	0.09	0.06	0.03	0.02	0.04	0.03	0.08	0.07	0.04	0.1	0.05	0.06	0.05	0.03	0.17	0.07	0
Expert 4	0.11	0.09	0.05	0.04	0.03	0.16	0.02	0.01	0.01	0.03	0.01	0.06	0.02	0.01	0.13	0.24	0.01
Expert 5	0.06	0.04	0.05	0.03	0.08	0.05	0.02	0.02	0.04	0.05	0.01	0.04	0.09	0.08	0.21	0.11	0.02
Mean	0.07	0.06	0.04	0.03	0.05	0.06	0.07	0.04	0.05	0.09	0.03	0.04	0.06	0.03	0.15	0.12	
Minimum	0.03	0.04	0.03	0.02	0.03	0.02	0.02	0.01	0.01	0.03	0.01	0.02	0.02	0.01	0.07	0.06	
Maximum	0.11	0.09	0.05	0.04	0.08	0.16	0.13	0.07	0.12	0.18	0.05	0.06	0.09	0.08	0.21	0.24	
Std. Deviation	0.03	0.02	0.01	0.01	0.02	0.05	0.04	0.02	0.04	0.05	0.02	0.01	0.03	0.02	0.05	0.06	
Disagreement																	0.033

Appendix 3 – Impact of criteria to perspective

Convenience							
	Drop-Off Options	Duration Options	Ease of Access	Fleet Size	Mileage limit	Parking Availability	
Expert 1	0.04	0.06	0.03	0.03	0.05	0.02	
Expert 2	0.03	0.05	0.05	0.03	0.05	0.03	
Expert 3	0.09	0.06	0.03	0.02	0.04	0.03	
Expert 4	0.11	0.09	0.05	0.04	0.03	0.16	
Expert 5	0.06	0.04	0.05	0.03	0.08	0.05	
Mean	0.07	0.06	0.04	0.03	0.05	0.06	
Economic							
	Gas Cost	Parking C	ost Miscella	neous Cost	Rental Cost	Subscription Cost	
Expert 1	0.09	0.06	0	.12	0.18	0.04	
Expert 2	0.13	0.06	0	0.06		0.04	
Expert 3	0.08	0.07	0	0.04		0.05	
Expert 4	0.02	0.01	0	0.01		0.01	
Expert 5	0.02	0.02	0	0.04		0.01	
Mean	0.07	0.04	0	.05	0.09	0.03	

Safety				
	Insurance coverage	Reliability		
Expert 1	0.07	0.06		
Expert 2	0.19	0.1		
Expert 3	0.17	0.07		
Expert 4	0.13	0.24		
Expert 5	0.21	0.11		
Mean	0.15	0.12		

Feature					
	Car model	car size	Interior Features		
Expert 1	0.04	0.09	0.02		
Expert 2	0.02	0.04	0.02		
Expert 3	0.06	0.05	0.03		
Expert 4	0.06	0.02	0.01		
Expert 5	0.04	0.09	0.08		
Mean	0.04	0.06	0.03		

			_			
Perspectives	Criteria	Zip Car	Car2go	Get around	Turo	ReachNow
	Subscription Cost	0.03	0.15	0.15	0.15	0.09
	Rental Cost	0.27	0.18	0.45	0.27	0.09
Economic	Gas Cost	0.35	0.35	0.07	0.07	0.35
	Parking Cost	0.16	0.2	0.08	0.08	0.2
	miscellaneous Cost	0.15	0.25	0.1	0.05	0.2
Sum		0.96	1.13	0.85	0.62	0.93
	Ease of Access	0.2	0.16	0.12	0.12	0.16
	Mileage limit	0.15	0.1	0.2	0.2	0.25
Convenience	Parking Availability	0.24	0.3	0.12	0.12	0.3
convenience	Duration Options	0.24	0.3	0.24	0.06	0.3
	Fleet Size	0.15	0.06	0.12	0.12	0.09
	Drop-Off Options	0.14	0.35	0.21	0.21	0.35
Sum		1.12	1.27	1.01	0.83	1.45
Color.	Reliability	0.6	0.36	0.48	0.48	0.48
Salety	Insurance coverage	0.45	0.45	0.3	0.6	0.6
Sum		1.05	0.81	0.78	1.08	1.08
Feature	Car Model	0.2	0.12	0.2	0.2	0.12
	Car Size	0.3	0.18	0.3	0.3	0.24
	Interior Design	0.09	0.09	0.09	0.09	0.12
Sum		0.59	0.39	0.59	0.59	0.48
Ranking for Alternatives		3.72	3.6	3.23	3.12	3.94

Appendix 4 – Impact of alternative to overall objective









