GOOGLE SELF-DRVING CARS

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1 Abstract

The **Google self-driving car** is a project by Google that involves developing technology for driverless cars. The project is currently being led by Google engineer Sebastian Thrun, director of the Stanford Artificial Intelligence Laboratory and co-inventor of Google Street View. Thrun's team at Stanford created the robotic vehicle Stanley which won the 2005 DARPA Grand Challenge and its US$2 million prize from the United States Department of Defense. The team developing the system consisted of 15 engineers working for Google, including Chris Urmson, Mike Montemerlo, and Anthony Levandowski who had worked on the DARPA Grand and Urban Challenges [1-2, 8, 10].

The Google **self-driving car** is equipped with an autopilot system, and capable of driving from one point to another without aid from an operator [3-4]. Our focus in this marketing plan will be on enterprise businesses, rather than only solutions for individual end users. Google is already in the enterprise market. Our marketing plan starts with the product itself and product analysis. And then, a Technology Assessment is discussed and the product propose, components, features, and values provided to enterprise customers are explored. The market analysis shows potential customer segmentations. The decision of choosing targeted early adapters and early majority is explained, and the technology's adoption lifecycle curve and crossing the chasm are illustrated. In the customer analysis section, the targeted customers in depth by giving a definition and exploring their activities are explained. The role of self-driving technology in the work process is shown, and the customer perceptions are investigated. The competitor analysis section gives a competitive landscape to map Google's competitors by giving an in-depth elaboration on every competitor's pros and cons and their place in the landscape position and uses the SWOT analysis to show Google's points of strengths, weaknesses; current and potential opportunities and source of threats. The market strategy talks about positioning, promotion, and distribution. The finance section illustrates the product pricing, costs, revenues, revenue allocation estimates, expenses budget, and customer value pricing.

2 Company Overview

Larry Page and Sergey Brin, two PhD students from Stanford University, founded Google because they wanted to help solve really big problems using technology. Google, incorporated in September 4, 1998, is a global technology company focused on improving the ways people connect with information.

The Company generates revenue primarily by delivering online advertising. The Company's business was focused on areas, such as search, advertising, operating systems and platforms, and enterprise [5]. In order for Google to achieve their goals, it strategically acquired more software and internet companies. The Company competes with Microsoft Corporation, Yahoo! Inc., Facebook, Inc., Twitter Inc., Amazon.com, Inc. and eBay Inc.

Google X, located in Bay area of San Francisco, is a secret facility to experiment with futuristic ideas. It has about 100 employees and generates hundreds of ideas each year. The lab selects only one or two ideas each year and implement those selected ideas. It birthed such as the augmented reality glasses, self-driving car, space elevator, and Web of things [6-7].

3 Partnerships and Strategic Alliance

Google implements the same business strategy as Nexus business model to their Google self-driving business model and initially they partner with Toyota to cultivate their self-driving technology in the automobile industry. Google and Toyota create horizontal partnerships, and provide jointly used and complementary products. This will lead Toyota to revolutionize its car industry to bring the new experience of driving to its customers. Partnering with Toyota, gives Google an access to the automobile market by using the Toyota's distribution channel, reducing the primary investment for them to enter the market. This will further cut down their risk of investing alone in this new innovation. Toyota as partner will provide the services such as updating the software, maintenance of the self-driving car.

4 Product Analysis

4.1 Product value

According to the World Health Organization, more than 1.2 million lives are lost every year in road traffic accidents. We believe our technology has the potential to cut that number, perhaps by as much as half. We're also confident that self-driving cars will transform car sharing, significantly reducing car usage, as well as help create the new "highway trains of tomorrow." These highway trains should cut energy consumption while also increasing the number of people that can be transported on our major roads. In terms of time efficiency, the U.S. Department of Transportation estimates that people spend on average 52 minutes each working day commuting. Imagine being able to spend that time more productively.

We've always been optimistic about technology's ability to advance society, which is why we have pushed so hard to improve the capabilities of self-driving cars beyond where they are today. While this project is very much in the experimental stage, it provides a glimpse of what transportation might look like in the future thanks to advanced computer science. And that future is very exciting.

Advocates of self-driving cars promote the safety of computer controls and the environmental benefits of more efficient travel. For his part, Ford envisions that the features of self-driving cars will change transportation as much as the various new types of powertrains, from electric to hydrogen, which will propel them. He underscored the urgency of figuring out self-driving because of sheer population growth as well [6].

4.2 Technology Assessment

The Google self-driving cars use video cameras, radar sensors and a laser range finder to "see" other traffic, as well as detailed maps collected using manually driven vehicles to navigate the road ahead. This is all made possible by Google's data centers, which can process the enormous amounts of information gathered by the cars when mapping their terrain.

The system combines information gathered for Google Street View with artificial intelligence software that combines input from video cameras inside the car, a LIDAR sensor on top of the vehicle, radar sensors

on the front of the vehicle and a position sensor attached to one of the rear wheels that helps locate the car's position on the map. The system components are:

1. **LIDAR**
2. **Video Camera**
3. **Position estimator**
4. **Radar**

Mostly everyone has seen or heard about Google's driverless car. People want to know what is on top of the now famous cars. The cars navigate by a technology called LIDAR and the device seen on the roof is a LIDAR sensor.

Though it may seem futuristic for a car to run on total autopilot, actually the technology behind it has been in use for several years.

The Google driverless car is predated by "Stanley" which was developed in 2005 by Sebastian Thrun, the director of the Stanford Artificial Intelligence Laboratory, who is now employed by Google. The car won a $2 million prize, taking first place in the 2005 DARPA Grand Challenge, which is a Department of Defense sponsored competition for driverless vehicles.

Thurn is also responsible for developing Google Street View. The Google car combines GPS, video information from Street View with the LIDAR sensors information and information sent from radar sensors on the front of the car. The car also has an additional sensor on the rear wheel which locates the vehicles position on the map. Currently, Google is testing seven driverless cars. Six of the cars are Toyota Priuses and one is an Audi TT

LIDAR is an acronym for Light Detection And Ranging. It is similar to radar, but instead of using radio or microwaves it uses light in the form of laser pulses. It can determine distances by measuring the time between when a pulse is sent out and when it is reflected back.

One main advantage of LIDAR is the ability to discern and detect smaller objects than radar. It can pinpoint objects that are invisible to radar and also provides much higher resolution than radar which enhances mapping of physical features.

LIDAR has become better known because of Google's driverless car. But it really is not some futuristic technology that Google has developed. In fact, some cruise control systems are already taking advantage of this technology. These systems use a LIDAR sensor, which is mounted on the bumper. The device measures the distance between the car and any cars in front of it. If the distance is too close the system automatically adjusts its speed downward.

You will probably have to wait a while before you can buy a driverless car. Google's driverless car is still in the experimental stage. Google has said it has no plans to develop the car commercially at this time. Some of the knowledge and data gained may begin to make its way to auto manufacturers and may start to be implemented.

There could be some legal problems with the cars as well. The California Department of Motor Vehicles said that all laws assume a car is human operated and the driverless cars are "ahead of the law in many areas."

The Figure 1 shows a self-driving car and explains its components.

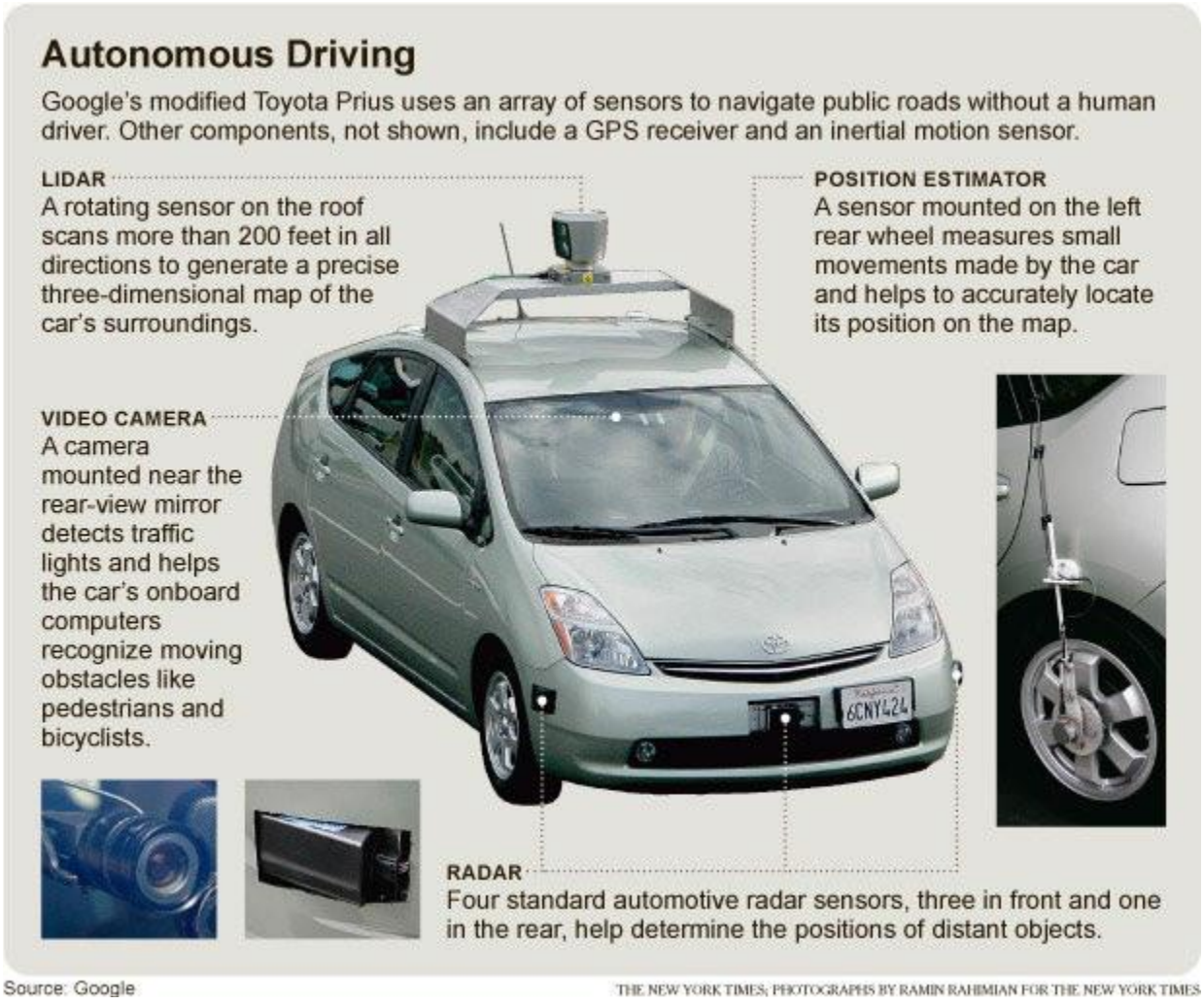

Figure 1: A self-driving car

4.3 SWOT analysis

The name says it: **S**trength, **W**eakness, **O**pportunity, and **T**hreat. A SWOT analysis guides us to identify the positives and negatives inside the technology (S-W) and outside of it, in the external environment (O-T). Developing a full awareness of the technology can help with both strategic planning and decision-making.

Strengths

- Google/Toyota brand - Google owns one of the most powerful brands in the world, so popular that the company´s brand name is used as a verb. Toyota was the first car brand in the world [21-22].
- Pioneering driverless technology – self-driving pioneer (Sebastian Thrun)

- Existing Google Products [13] – Google owns some supporting technologies such as google map
- Financial stability [14] - Google is financially very solid, it generates big cash flows from its online advertising business.

Weaknesses

- Privacy issues - Driverless Cars may create a thread to personal privacy [17]. In the driverless mode, you immediately start exposing sending great quantities of revealing information.
- The lack of credibility - Google isn't a car manufacture, so it should partner with other car manufactures.
- Climate constraints [9, 20] - Snow on the road causes the car not to able to stay positioned on the road; the car encounters a change in a road that is not yet reflected in its onboard map.
- Lack of awareness of manual instructions - The car drives though construction zones, accident zones, or other situation which a human control is needed.

Opportunities

- Advertising business - Google has a very valuable and unique asset in online advertising business. Google can expand the advertising business into every Google powered self-driving cars.
- Revenue from services - Google self-driving technology can help Google integrate Gmail, Chrome, Google Docs and Google Maps into the car services. The company owns an enormous ecosystem of services and applications which offer plenty of opportunities for further growth.
- Adaptability – Google self-driving technology can be used in any cars technically.

Threats

- Prone to be hacked [19]: self-driving cars pose new safety risks, because computers are vulnerable to something that human drivers are not -- hackers.
- Competitors [8, 11, 12]:
    - Mercedes: Mercedes-Benz claims it is in the best position to win the race to create the world's first customer-ready self-driving car. Mercedes' first self-driving car or 'autonomous car' will be available to consumers in 2013 in the all-new S-Class series with a starting price tag of $US235,000 [16].
    - Audi: Audi shows off self-driving, self-parking A6 Avant and RS7 Sportback [24].
    - Cadillac: Cadillac of the General Motor Company is working over its "super cruise" feature would be a step to semi-autonomous cars [15].

- Nissan, Volvo, and BMW: They also have plan to provide to self-driving cars [25].

- Legal Issues: Robo-cars may face a new threat from lawyers and Union [18, 23].

Figure 2: SWOT analysis

5 Value Proposition

"Wheels On Demand - Safe, Economic, Productive"

The value proposition statement above says it all. The Google driverless car provides safe, economic and productive transportation to anyone. People who are disabled and people without a driver's license can travel using a Google car.

5.1 Safety

We believe that the Google driver-less car will provide safe transportation to customers and save millions from death and injury by reducing traffic accidents. We estimate that the Google car can reduce accidents by 90%. In fact, we also estimate that the Google car can reduce, wasted commute time and the number of cars on the read by 90%.

To put those claims in perspective [27]:

About 5.5 million motor vehicle accidents occurred in 2009 in the U.S., involving 9.5 million vehicles. These accidents killed 33,808 people and injured more than 2.2 million others, 240,000 of whom had to be hospitalized.

Adding up all costs related to accidents—including medical costs, property damage, loss of productivity, legal costs, travel delays and pain and lost quality of life—the American Automobile Association studied crash data in the 99 largest U.S. urban areas and estimated the total costs to be $299.5 billion. Adjusting those numbers to cover the entire country suggests annual costs of about $450 billion.

Now take 90% off these numbers. We are claiming that the Google car will save almost 30,000 lives each year on U.S. highways and prevent nearly 2 million additional injuries. We also claim that it can reduce accident-related expenses by at least $400 billion a year in the U.S. Even if we are way off, the improvement in safety will be startling.

5.2 Economics

The economic advantages of owning a Google car or a fleet are plenty. Following are just a few of the benefits for fleet owners or for businesses operating in the personal transportation segments.

1. Better use of cars
    a. Since the cars can drive themselves to the customer, it will be easier to keep them utilized at any given time.
2. Reduced land usage
    a. For customers that own fleets of cars, while most cars are parked in large parking lots waiting to be driven, a Google car can drive itself to the customer and hence land can be used more economically.
3. Reduced cost per trip
    a. The Google car can be programmed to operate at the best fuel efficiency. Since there is no human driver involved, fuel efficiency is guaranteed.
    b. Billions of dollars saved in fuel costs
4. Wider geographic boundaries
    a. Some businesses like the Zip Car are limited by accessibility to customers. Owning a fleet of Google cars obliterates this drawback, because Google cars can drive themselves to customers wherever they are. Thus, the geographic footprint can be increased dramatically.

5.3 Productivity

Every trip in a Google car can be a productive one. Business travelers as well as individuals can now do a lot more during a commute. Following are just a few examples:

- Catch up on e-mails during the commute
- Read the Wall Street Journal (or any newspaper/magazine for that matter)
- Watch your favorite TV show on Netflix

In essence, while the Google car chauffeurs the customer around, they can indulge in any distraction that is considered illegal while driving today.

The following figure summarizes the value proposition of Google cars. The 'Solution' is a solution for our immediate customers i.e. Avis, Hertz and ZipCar. On the other hand, the 'Experience' is an experience for our secondary customers i.e. people renting cars from Avis, Hertz and ZipCar.

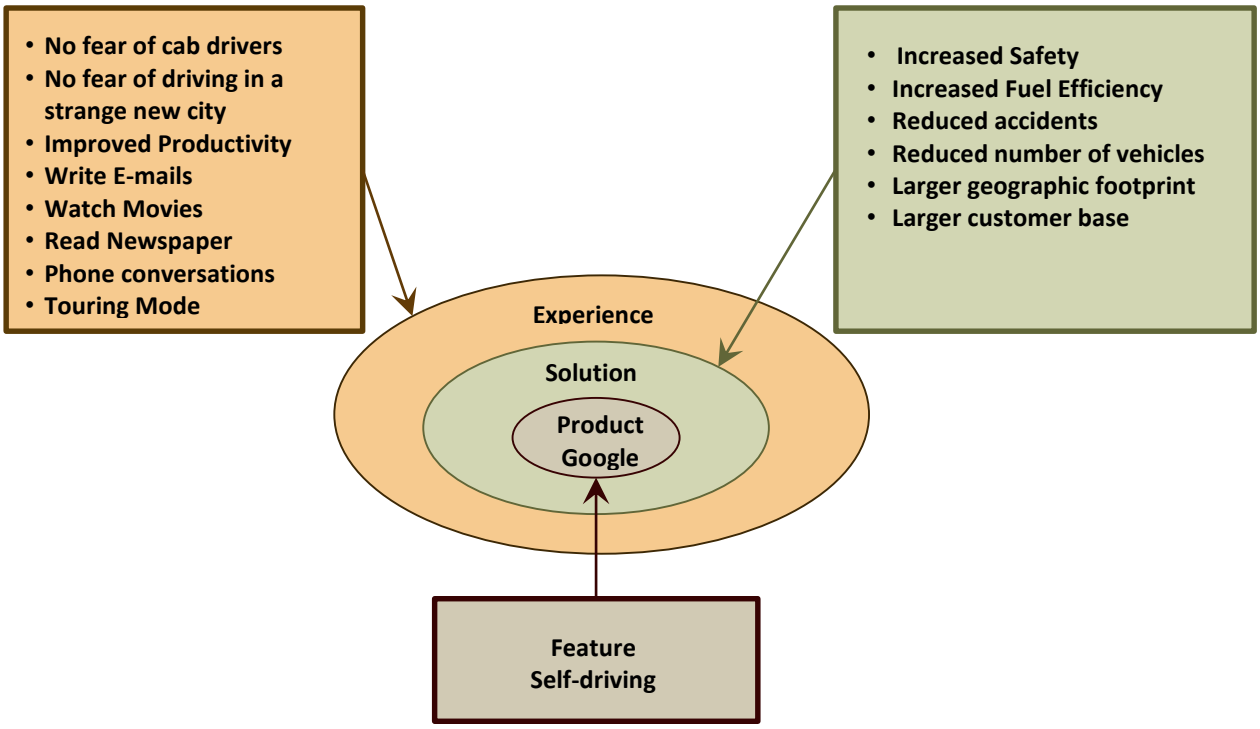

Figure 3: Value proposition pictorial summary

6 Market Analysis

6.1 Market Demographics

In an effort to find the right match of customers, the team decided to analyze and to find states and cities that have the densest population. Our research determined that Zipcars have more rental cars in dense populations unlike cities that have a smaller population. Using a similar model, we are hoping to launch self-driving cars within a dense population so that customers will be more aware of the product and be willing to adapt to this technology. According to the Census Bureau in 2010, five states (California, Texas, Florida, Illinois, and New York [46]) were labeled to have the largest populations in the United States. We intend to follow the state laws recently put into place for users to utilize self-driving cars on public roads. As of September 2012, there are only three states (California, Florida, and Nevada [48]) have passed laws permitting self-driving cars. A law has been proposed in Texas to establish criteria that would allow self-driving cars to be driven on roads [49-50]. Nevada doesn't have a heavy dense population compared to the other major states as it roughly has a population of over 2.7 million people [46]. Even though the other two states have nearly over 10x the amount of Nevada's population, we don't want to just limit ourselves

to states that have the heaviest populations. Great data can be collected from a state that doesn't have such a large population. At this moment, we will allow Google and Toyota to decide their course of action and which cities and states they choose to launch their vehicle. We are hoping that after phase 1 that other states follow California, Florida, and Nevada (phase 2) and implement their own laws to allow self-driving cars to be driven on their public roads.

6.2 Market Trends

Over the years, car manufacturers have been making automobiles more automated with technologies such as self-parking and adaptive cruise control. Our focus here is to highlight some of the major semi-autonomous technologies that have reached the early majority on the Technology Adoption Life Cycle (TALC) model over the last decade. We are aiming the early majority due to the fact that this group is motivated by evolutionary changes to gain productivity enhancements. The semi-autonomous vehicles that we have identified have become reliable and proven results on the market so much that many car manufacturers have followed each other's footsteps to implement changes into their own vehicles. As of 2013, many models only have features that offer narrower functionality as fully autonomous vehicles have not yet been available to the public. These functionalities include: night vision (increases a driver's perception and seeing distance in darkness), adaptive cruise control (automatically adjusts the vehicles to maintain a safe distance from vehicles ahead), self-parking (assists the driver in the task of parallel parking), and lane guidance (monitors the vehicle's position in the lane and either warns the driver when the vehicle is leaving its lane, or less commonly, takes corrective actions). We have constructed a timeline that illustrates how automobiles are becoming more sophisticated over time. Our research indicates that by 2015, Google will have a functional self-driving car that the public can purchase.

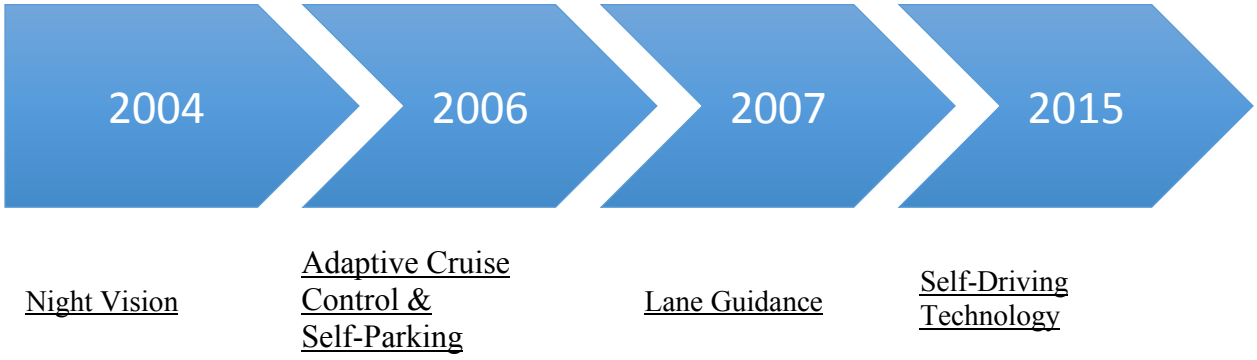

Figure 4: Market trends

6.2.1 Changing Laws

One of the concerns in getting the Google car to market has been that the traffic laws were designed with the assumption that there is a human driver behind the wheel. With self-driving technology this landscape changes completely. Google has been lobbying in Washington D.C. and at other agencies to modify the laws to promote self-driving. As a result, the U.S. Department of Transportation's National Highway Traffic

Safety Administration (NHTSA) has already announced new policies concerning vehicle automation, including its plans for research on related safety issues and recommendations for states related to the testing, licensing, and regulation of "autonomous" or "self-driving" vehicles [42].

A summary of the NHTSA's policy recommendations are as follows [42]:

- Ensure that a driver understands how to operate a self-driving vehicle correctly.
    - A driver licensing program (or a separate driver's license) that authorizes the operation of self-driving vehicles.
    - The prerequisite to a self-driving car license should be that the driver passes a special training course concerning the safe operation of a self-driving vehicle.
    - The training course should include an understanding of the basic operation and limits of self-driving vehicles and knowledge of how to resume control in the event it cannot continue to operate automatically.
- Recommendation for State regulations governing testing of self-driving vehicles
    - Ensure that on-road testing of self-driving vehicles minimizes risks to other road users.
    - Limit testing operation to roadway, traffic and environmental conditions suitable for the capabilities of the tested self-driving vehicle.
    - Establish reporting requirements to monitor the performance of self-driving technology during testing.
- Recommended basic principles for self-driving test vehicles
    - Ensure that the process of transitioning from self-driving mode to driver control is safe, simple and timely.
    - The self-driving test vehicle should alert the driver when the driver must take control of the vehicle in the event that the automated system cannot operate due to road conditions, environmental conditions, a malfunction or any other condition or circumstance that would require manual driving for safe operation.
    - Ensure that installation and operation of any self-driving vehicle technologies does not disable any federally required safety features or systems.
    - Ensure that self-driving vehicles record information about the status of the automated control technologies in the event of a crash or loss of vehicle control.
- Regulations governing the operation of self-driving vehicles for purposes other than testing
    - The NHTSA does not recommend that states authorize the operation of self-driving vehicles for purposes other than testing at this time.
    - Should a state nevertheless decide to permit such non-testing operation of self-driving vehicles, at a minimum the state should require that a properly licensed driver (i.e., one licensed to drive self-driving vehicles) be seated in the driver's seat and be available at all times in order to operate the vehicle in situations in which the automated technology is not able to safely control the vehicle.

Although the NHTSA has expressed safety concerns and does not recommend that states authorize self-driving cars at this time, we believe that getting the NHTSA's attention on this topic is already a win for self-driving vehicles. This is a step in the right direction and it is only a matter of time before all of the NHTSA's concerns are addressed to bring the self-driving technology to the masses.

6.3 Market Needs

After a thoughtful assessment of customer perceptions and expectations, survey questions were created to fully understand the expectations of self-driving cars. Our expectations of the survey include learning

about the attributes that customers favor and whether or not those attributes are conclusive with the research already done. The feedback results received from the survey have confirmed our findings that customers desire features of self-driving cars.

For consumers, the features that make self-driving cars valuable include:

- Safety
- Reliability
- Accuracy
- Price
- Ease of use
- Accessibility

The preferred features weren't surprising due to the fact that the product is still in the Innovations stage of the TALC model. Safety and reliability were the top most wanted features out of the entire list at 64%. Even though most of the users yearn to have these features in self-driving automobiles, and would like to buy a Google car at some point in the near future, they won't be early adopters, but more so the early majority. This means that most people prefer to wait and see if other people are using a product before purchasing or renting it themselves. Many of the people surveyed also want to wait for the price to drop since most users won't pay more than $10,000-$20,000 for the self-driving technology as an add-on package. Conducting this survey has helped us identify key value factors to better understand which features of self-driving automobiles are more important to users.

6.4 Customer Segmentation

Figure below summarizes the plan to break down the Total Addressable Market (TAM) down to the Selected Addressable Market (SAM). Each market segment has a corresponding deployment plan and our prediction on the number of years it would take to deploy the plan. We anticipate that the deployment plan will take a total of 10 years with the first two phases taking up 4 years each and the next two taking up 3 years each.

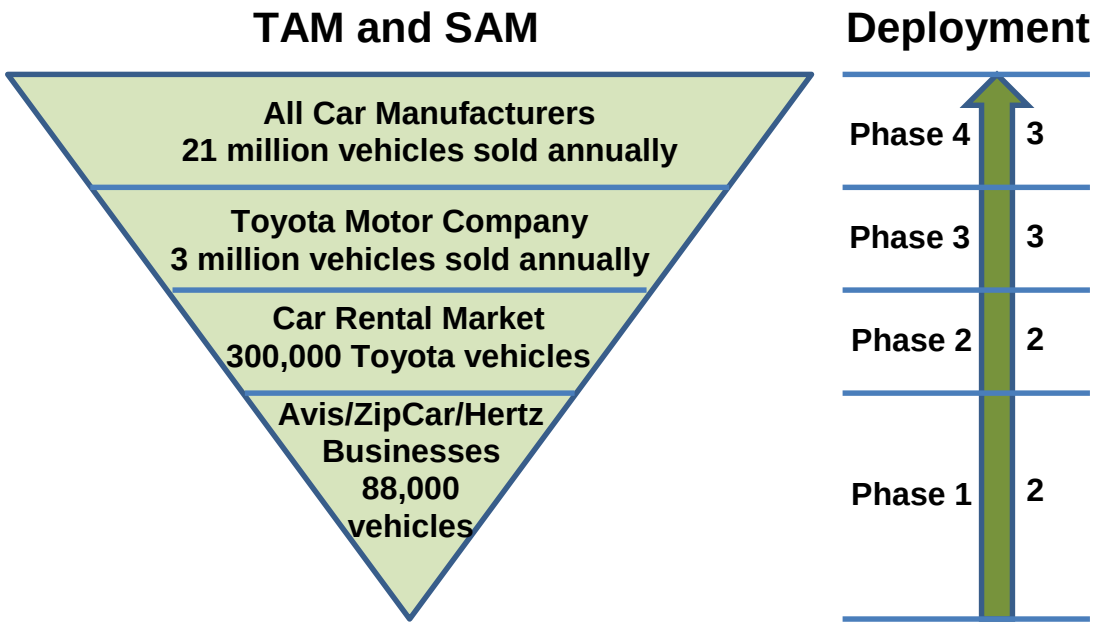

Figure 5: TAM and SAM with Deployment Phases

6.4.1 First Segment

The first segment of the market is all auto manufacturers selling cars in the U.S. market. According to the Department of Transportation Statistical Records office there are 250 million registered vehicles in the U.S. in 2007 and approximately 16 million new vehicles are sold annually [38]. Our ultimate goal is to have the Google self-driving technology in each of these 16 million cars that are sold annually in the U.S. We hope to target this huge market in phase 4 of our deployment plan.

6.4.2 Second Segment

The second market segment we have identified is Toyota Motor Company. During the initial phases, we plan on partnering with Toyota to deploy the self-driving technology in some models of their cars. Google has already prototyped the technology on a Toyota Prius and a Lexus. Hence, partnering with Toyota is a natural next step. As an incentive for Toyota to partner with us, the plan is to work with Toyota to deploy the technology and Google earns a percentage of the profits from cars sold with the self-driving technology. This reduces Toyota's risk in licensing the technology and gives us a better understanding of the end market and control over how the self-driving car gets advertised and marketed.

Toyota Motor Company operates twelve manufacturing plants in the U.S and sells roughly 2.5 million vehicles in the U.S. each year [39]. Our goal is to have the self-driving technology in each of the 2.5 million vehicles sold by Toyota. This target will be achieved in phase 3 of our deployment plan.

6.4.3 Third Segment

The third target market segment is the rental car business in the U.S. We believe that the market segment that best benefits from the self-driving technology is the rental car business. It is estimated that about 9% of Toyota's U.S. sales in 2009 went to the rental car fleets [40]. This amounts to 225,000 cars (9% of 2.5 million car sales). This is a sizable number and our goal for Phase 2 of the deployment strategy.

6.4.4 Fourth Segment

The fourth market segment and our target customer for phase 1 deployment is the ZipCar, Avis and Hertz rental car businesses. ZipCar is by far the world's largest car-sharing company. It is reported that in 2013 ZipCar has 760,000 members – up from just 50,000 in 2007. It is a leader in a market that is expected to be $10 billion in a few years [41]. In 2013 ZipCar was bought by Avis for approximately $500 million and will be operated as wholly owned subsidiary under the ZipCar brand.

Table 1 shows that in 2012, ZipCar had a fleet of 9000 cars and about 7% of these cars are Toyotas. We also know from Table 1 that Avis had a fleet of 300,000 cars and Hertz had a fleet of 366,000 cars. Our research has shown that the fleet for each rental company increases by about 10% ever year. Hence, in 2015, our target year for phase 1 deployment, we expect ZipCar to have 11,979 cars, Avis to have 99,300 cars and the Hertz to have 475,000 cars.

We also know that about 10% of ZipCar's fleet are Toyotas, we will estimate that at least 10% of Avis and Hertz fleets will also be Toyotas. Based on these assumptions we can come up with an approximate number of cars we will be targeting in phase 1. As shown in Table 1 this happens to be approximately 88,000 cars.

Table 1: Selected Addressable Market (SAM) for Phase 1

Rental Company	Cars in 2012	Expected increase in 2015 @ 10% every year	Total Cars in 2015	Target for Phase 1 Deployment 10%
ZipCars	9000	2979	11,979	1198
Avis	300,000	99,300	399,300	39,930
Hertz	366,000	109,800	475,800	47,580
Total				**88,708**

The market segment we are targeting in the initial phases falls in the personal transportation business category. In addition to the reasons mentioned in the previous sections, there are several other reasons for this choice:

- The personal transportation business model fits very well with the advantages of a self-driving car
- Zip Car, Avis and Hertz already has a highly sophisticated reservation system in place
- At this time, a business rather than individual owners can justify the cost of owning one or more Google self-driving cars
- The Google driverless car expands the geographic footprint of these businesses tremendously
- The Google driverless car also expands the customer base of these businesses dramatically.
    - Cars will be accessible to people with disabilities and older citizens who cannot or don't want to drive.
    - Customer base also expands to people who cannot drive because they don't have a driver's license (Example: tourists and teenagers).

At this point we don't have any statistics on accident rates from car rental companies. But from Figure below we know that losses from car accidents, wasted time in commuting and lack of car utilization is very high. With the Google car, engineers anticipate a 90% reduction in accidents, 90% reduction in wasted commuting and 75% increase in car utilization. All of these factors are an incentive for rental car companies to invest in the Google car. Using these attributes, our customers can easily charge a 100% premium to rent a Google car. For example a mid-sized car that rents for $150/day can easily be rented for $300/day, a 100% premium. After all, with the option to rent a Google car, people don't have to worry about renting a cab and potentially getting cheated in a new city. They also don't have to worry about finding parking spots in a new city if they drove by themselves. During their entire commute, they could catch up on their work or perhaps just enjoy the scenery without having to pay attention to the road. All of these are huge selling points for car rental companies and a worthwhile investment in the Google car.

The following figure summarizes our claims based on data collected by various transportation agencies [28].

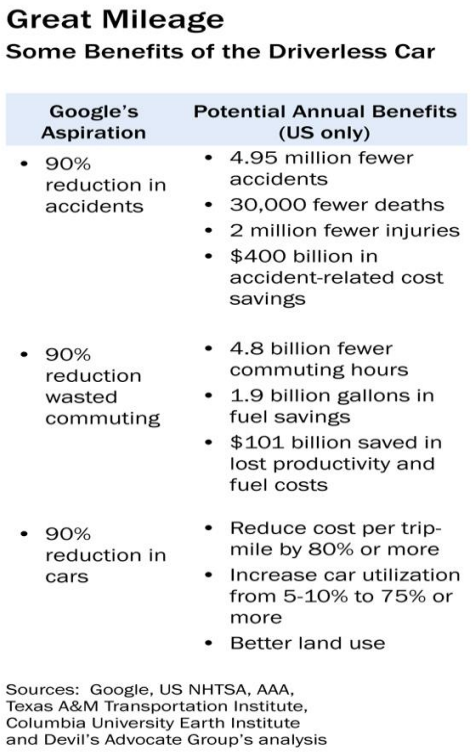

Figure 6: Benefits of the Google car related to safety and transportation

7 Marketing strategy

Marketing strategy is defined by Prophet's David Aaker as a process that can allow an organization to concentrate its resources on the optimal opportunities with the goals of increasing sales and achieving a sustainable competitive advantage. In order to reach the desired market, we intend to develop existing car dealership to distribute Google self-driving cars. We use the concept of 4 P's – product, price, place, and promotion.

7.1 Positioning

Google Car: Google has collaborated with Toyota (prius), Lexus and Audi for the self-driving cars. Synchronization with the Google navigation system through its mail will keep the car updated about the user creating an experience, which has empathy. Estimated cost 100,000$.

Mercedes: Company has plans to launch the self-driving technology with S-class model. Company intends to update the technology step wise starting with parking, queuing up in stop and go situations and then next step will be autobahns. This will be a move into 100 percent autonomous driving. Estimated cost 235,000$.

Cadillac: Cadillac of the General Motor Company is working over its "super cruise" feature would be a

step to semi-autonomous cars.

Honda: It offers basic features in its existing range of cars with additional features at certain extra cost.

Hyundai: basic features with some addition to music and ambience inside the cars.

Volvo: Few luxury features in addition to the basic attributes. Company is in progress of developing self-driving technology.

The table below represents the positioning of Google car compared to the other cars considering the cost and feature factors. Many companies have started working on the new technology after Google took this innovation to new heights.

X-axis represents the technology from manual driving to left and self-driving to the right. While y-axis represents the cost of this technology from low at the bottom to high at the top. The car companies in the left bottom quadrant are the ones, which don't have any R&D going in the field of self-driving technology. It even covers the other car companies that haven't initiated in this new technology. These companies can be the future customers for Google self-driving technology.

This graph is to give a glimpse of technology development by various automobile companies in the market.

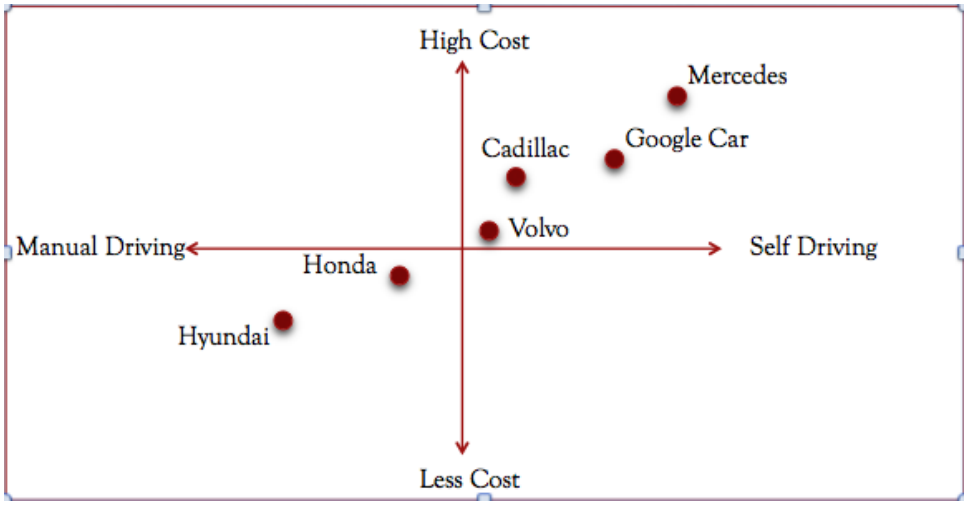

Figure 7: Positioning with market competitors

7.2 Position on TALC

Google Self-driving car is the new innovation in the automobile industry, which is yet to be seen on the market, so this technology falls under the innovators phase. Over the years, this technology will soon move from the innovators phase to early adopters and then the majority. Crossing the chasm will be an initial challenge, but looking at the way this technology is developing, it will be difficult for it to cross it soon. Google aspires that by year 2025, a majority would have adopted these cars.

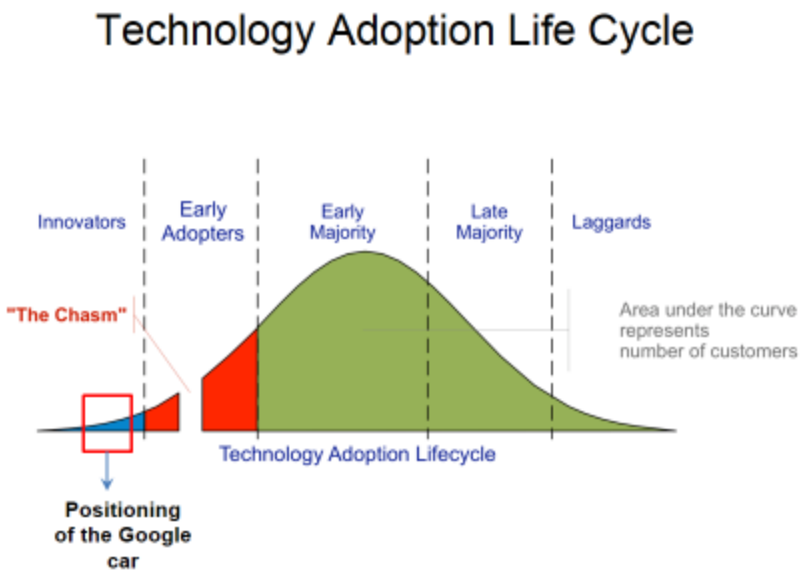

Figure 8: Position on TALC

7.3 Product and/or service attributes.

New product development process, decisions about what to sell and what features to include, branding strategies, packaging decisions, warranty, and ancillary services

As we have few prototypes of this innovative technology already covering the geographic footprint, it's now the step to consider how to offer this product to the customers. Having considered the target segment as zip cars, the next step is to decide the features, benefits and technology to be offered to them. Zip cars already having fleets of cars in multiple parking lots, just the self-driving technology will be more appealing to them. With add-on features, which would benefit them in attracting more customers, making their business model even vaster.

Google Self-driving car is the new innovation in the automobile industry which will ripe the complete working of this industry. Being the first to develop this technology many competitors have jumped in. It offers amazing experience of commuting to your destination while doing business, or having food or nap during the drive.

7.3.1 Product life cycle

The Product Life Cycle (PLC) is used to map the lifespan of a product. There are generally four stages in the life of a product. These four stages are the Introduction stage, the Growth stage, the Maturity stage and the Decline stage. The following graph illustrates the four stages of the PLC [31]:

In the Introduction Stage, the product has just been introduced, growth observed is minimal, market size is small and marketing costs are steep. Thus, introduction stage is an awareness creating stage and is not associated with profits! However, strict vigilance is required to ensure that the product enters the growth stage. Identifying hindering factors and nipping them off at the bud stage is crucial for the product's future.

Once the introductory stage goes as per expected, the product gets into the growth stage. We have managed to gain the consumer's attention and works on roping in loyal customers, and work on increasing our product's market share, by investing in aggressive advertising and marketing plans. We will also use different promotional strategies like offering discounts, etc. to increase sales. With the increases of sales, economies of scale are seen and better prices come about, conducing to profits in this stage. The marketer maintains the quality and features of the product (may add additional features) and seeks brand building. As sales increase distribution channels are added and the product is marketed to a broader customers. Thus, rapid sales and profits are characteristics of this stage.

The maturity Stage views the most competition as different companies struggle to maintain their respective market shares. Companies are busy monitoring product's value by the consumers and its sales generation. Most of the profits are made in this stage and research costs are minimum. Any research conducted will be confined to product enhancement and improvement alone. We should improve our product and make it stand out among the competitor's products. The main aim is to lure non-customers towards our customer base and increase the existing customer base. Since consumers are aware of the product, promotional and advertising costs will also be lower, as compared to the previous stage. In the midst of stiff competition, we may even reduce our prices in response to the tough times. The maturity stage is the stabilizing stage, wherein sales are high, but the pace is slow, however, brand loyalty develops, thereby roping in profits.

After a period of stable growth, the revenue generated from sales of the product starts dipping due to market saturation, stiff competition and latest technological developments, and the product gets into the decline stage. The consumer loses interest in the product and begins to seek other options. This stage is characterized by shrinking market share, dwindling product popularity and plummeting profits. This stage is a very delicate stage and needs to be handled wisely. The type of response contributes to the future of the product.

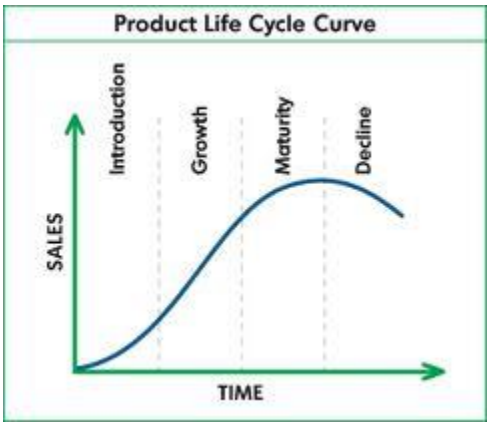

Figure 9: Product life cycle curve

7.4 Place

Google has collaborated with Toyota, Lexus and Audi for its new self-driving technology. As these partners already have an existing distribution channel, the Google car will be made available through the same platform of their normal cars, with upgrades in the working technology. This channel will get much simpler and less complex with the increasing adaption of the self-driving cars, reducing the end retail showrooms, which currently need to be in a reachable distance of the customer. But slowly the number of showrooms will reduce, as the cars will drive to the people.

The figure below describes the existing distribution channel for the automobile companies, which would be almost same for the self-driving cars with certain upgrades in the working environment and the method of this channel.

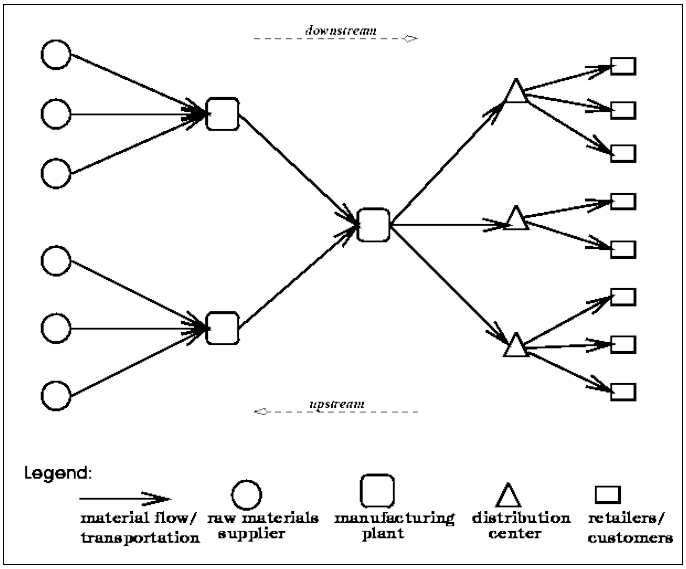

Figure 10 - Distribution Channel

7.5 Promotion

Consider the following statistics [26]:

- 41% of consumers research products online before purchasing
- 80% of all Web traffic begins at search engines
- 66% of all consumers regularly use TV and the Internet simultaneously

We believe that paying attention to such facts provides the greatest reward from marketing and advertising campaigns. As described in the following sections and in Figure 11 below, our plan is to integrate the online and offline efforts in a synergistic fashion.

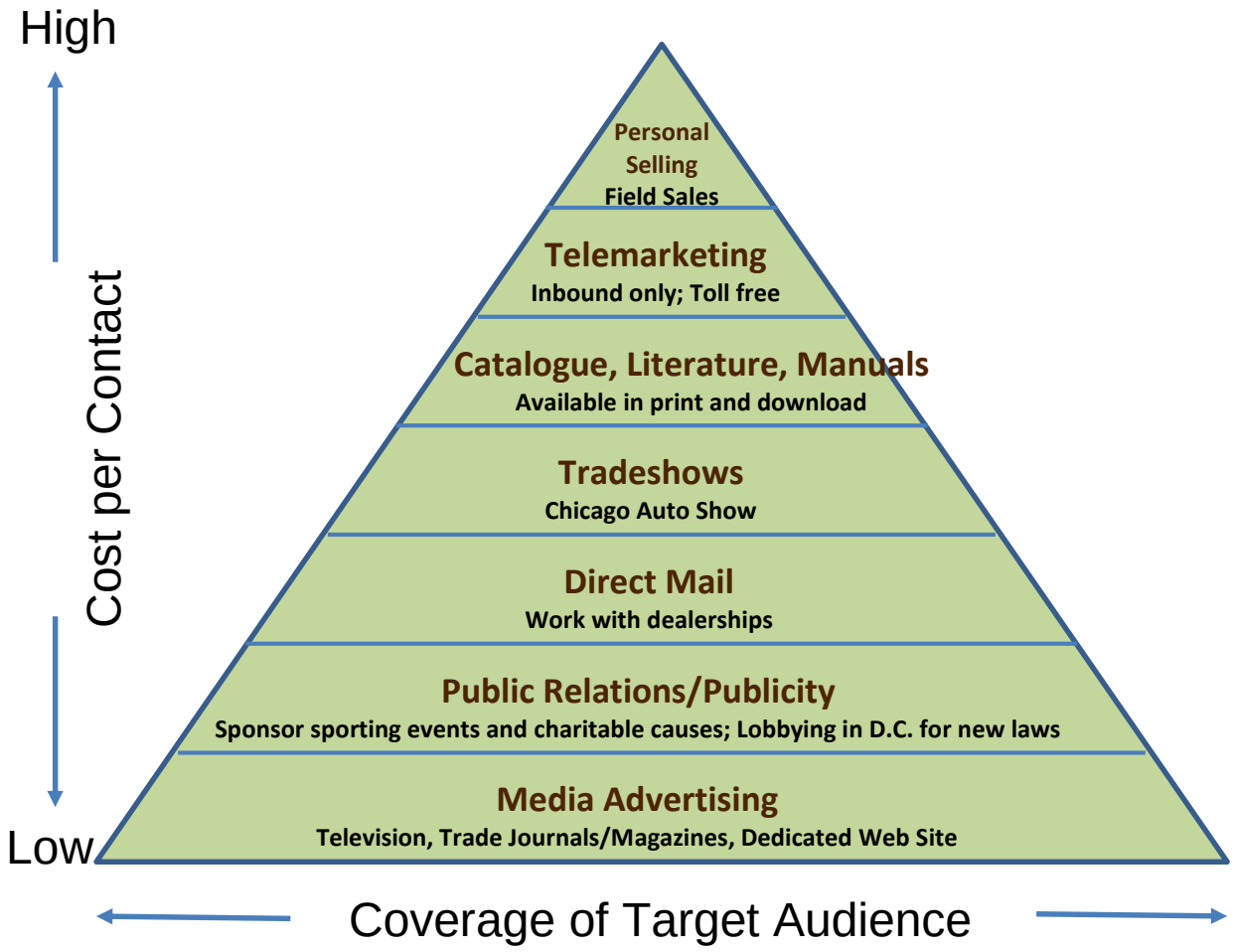

Figure 11: Advertising and Promotion Pyramid [26]

7.5.1 Media Advertising

This is a mass-media form of communication. In this category of advertising, we plan on utilizing the following three channels:

- Television
- Trade Journals/Magazines
- Dedicated Web Site

We will be advertising the Google Car on television during Super Bowl commercials and other sporting events as well as during family friendly TV shows. The novelty of a self-driving car appeals to families as well as individuals interested in the safety features of the car.

Advertising in trade journals and magazines such as "Popular Mechanics" and "Car Guide" is an important part of the advertising campaign. These magazines are usually subscribed by car aficionados and would be a great tool to educate people on the benefits of a self-driving car compared to other cars.

Building a meaningful web presence is a strategic priority for our marketing campaign. We believe that much of the interest created by television, print or public relations will result in interested consumers doing web searches and participating in online conversations.

7.5.2 Public Relations and Publicity

We believe that maintaining good relations with the media is the key to nurturing a positive public image. The Google self-driving car will be a proud sponsor of sporting events and charitable causes. We also plan on having periodic press conferences to proactively update the media on the various metrics that would be important for adoption of self-driving cars.

A strategic Public Relations initiative that Google has already undertaken is in setting up an office in Washington D.C. For self-driving technology to be adopted widely there is a need to overhaul traffic laws, insurance laws and traffic infrastructure among many other things. Google is proactively working with law-makers to remove obstacles in the adoption of self-driving cars.

7.5.3 Direct Mail

Since the Google self-driving car will be available for purchase from Toyota dealerships throughout the U.S., we will work with car dealerships to send targeted mail to their customers. For the first two phases of deployment this form of advertising is not as important since we are not targeting individual consumers. However, the importance will increase as we go into phases 3 and 4 of deployment. Advertising budget will be adjusted accordingly at that point in time.

7.5.4 Trade Shows

Since self-driving cars are a new concept, it is important for us to participate in trade shows. But trade shows reach a narrow group of customers at a proportionately higher cost. Hence, during the first 2 phases of deployment we will only participate in the "Chicago Auto Show". This is the nation's largest and longest running trade shows. After reaching phase 2 of deployment, we will re-visit the budget allocation for tradeshows and make adjustments accordingly.

7.5.5 Catalogs, Literature and Manuals

This form of communication builds on earlier communications with customers. This form of communication will showcase the key benefits of the self-driving car in simple terms that customers can understand. Topics such as advantages, service and warranties will be addressed here. These will be available in print form as well as on our web site for download.

7.5.6 Telemarketing

There are two forms of telemarketing – outbound and inbound. We will not be participating in outbound telemarketing. However, we do plan on participating in inbound telemarketing. We will set up a dedicated toll free number to answer questions from customers. This will also provide tremendous benefit to field engineers and salespeople.

7.5.7 Personal Selling

This form of promotion is the most expensive and targets the smallest number of customers and yet this is very important. We plan on having field sales personnel assigned to different geographic areas and working with every location of Avis, Hertz and ZipCar. This team of field account managers will be responsible for fulfilling our target quotas every year.

7.6 Price

Three C's pricing methodology is used to analyze the price and determine the price for the Google self-driving car.

7.6.1 Costs

It's difficult to estimate the car's price tag, but the cost of the equipment in the latest version of Google self-driving car is at least $150,000 [32]. However, the R&D cost isn't included. Generally, the start-up costs will be substantially higher [26]. J.D. Power [33] found that 20% of vehicle owners say they "definitely would" or "probably would" purchase it in their next vehicle after learning the estimated market price of $3,000. Before learning the price, interest for this technology was at 37%. Based upon experience curves, the cost of production per unit should be decreased each time manufacturing volume doubles [26]. It is most important to keep the self-driving kit price much lower than the car itself. Respondent technology

innovation has been developed to decrease the technology cost. The expensive 3D radar, a part of the Google self-driving car suite of sensors, adds roughly $75,000 to the price of the car, and has been decreased that cost to $4,000 [34], but the overall price for the self-driving technology is still high at this early stage.

Our survey shows that customers would like to pay $40,000 - $50,000 premium for the Google self-driving technology. The limitation here is that we cannot estimate how low the self-driving kits can go, and we could not find published doc for the price estimation.

7.6.2 Competition

Mercedes' first self-driving car or 'autonomous car' will be available to consumers still this year in the all-new S-Class series with a starting price tag of $US235, 000 [16].

Tesla CEO Elon Musk [35] is determined to bring the cost of Tesla's cars down so that the company can sell to mainstream consumers. Tesla's Model S sedan has a $69,900 base price, and Musk says the company still intends to squeeze expenses to offer a model for about $30,000 within a few years. The Roadster, the company's first offering, started at $109,000.

Cadillac of the General Motor Company is working over its "super cruise" feature [15], but its technology is at the same level as that of Google self-driving. Super Cruise is not intended to be at the level of the Google self-driving car, which can make more decisions for the driver and handle more complex urban driving. That hardware is already on the full-size Cadillac XTS and the compact Cadillac ATS; order the Driver Assist Package ($2,400-$3,600).

Audi [24] and BMW [36] have all revealed that they have entered the self-driving car arena and inserted self-driving technology in their high end car models, but we cannot find the cost.

Google self-driving technology is based upon the top car company Toyota and its third best-selling car model Prius, so that the size of market will be large, and manufacturing volume can further drive the cost down.

The average cost of owning a driver in United States ranges from $25,000 to $30,000, which is similar amount of money to have a self-driving technology in the car. Moreover, the initial lack of credibility on the Google car can make the customers focus on this option of not driving a car by themselves.

7.6.3 Customers

The survey guides us to determine how much additional cost customers would like to pay for the self-driving kits. The benefits include discount of insurance premium, increasing safety, improving efficiency, and etc. We determine that additional $45000 is acceptable.

By considering all three C's pricing factors, it is determined that the price of the Google self-driving car is that the car price plus the self-driving kits. The average price of Toyota is about $30,000, so the price of Google self-driving Toyota Prius is about $75,000.

7.7 Branding

Because the self-driving technology is a part of a car, it won't exist on its own. By analyzing strategies for branding in the high-tech environment, we determined to use the ingredient branding strategy to brand the Google self-driving cars.

Ingredient Branding describes a concept in marketing, which involves creating a brand for an ingredient or component of a product. With this kind of product policy the idea is to project the high quality and performance of the ingredient perceived by the customer onto the end product, thereby taking advantage of the customer's brand awareness.

We tried to come up with a logo for the Google self-driving technology, which would be seen on all the cars using the technology, increasing the brand value of the company and even the value of the car featuring this logo after the trim level. This will add excitement to the user for having a logo showcasing the feature of the car which is new and has innovative technology and further differentiate them from the existing cars. This branding will even be beneficial to the end customers like Zip car, Avis and Hertz to promote the new self-driving cars in their fleet.

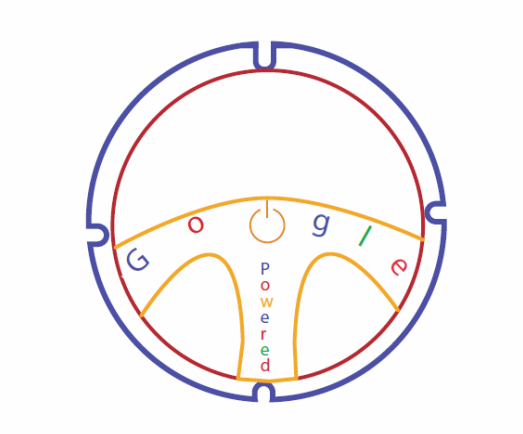

Figure 12: Google self-driving technology logo

Branding Statement: "It's All About The Next Level of Driving Experience"

This statement clearly gives the idea that Google self-driving car is not merely about driving a car, but it will add others driving experiences while commuting from one place to another, such as increased productivity (writing emails, watching movies, relaxing, browsing) and having a personal guide during vacation trip.

8 Sales forecast

The figure below shows the statics of the car rental market of United States of the year 2012 by NADA (National Automobile Dealers Association). Based on the table below and statics of past three years, we tried to come up with the statics for the years we have forecasted. Using rational calculation based on the growth rate in each category over the years, the statics for future years were defined. As the target market is the Zip car, Hertz and Avis, the numbers concerned to them have been only used in the calculation of the phase one. Further only the percent of the Toyota cars of the total fleet of their cars are considered as the target market.

Table 2: the statics of the car rental market of United States of the year 2012

2012 U.S. CAR RENTAL MARKET
FLEET, LOCATIONS AND REVENUE

COMPANY	U.S. CARS IN SERVICE (AVG.) 2012	# U.S. LOCATIONS	2012 U.S. REVENUE EST. (in millions)	2011 U.S. REVENUE (in millions)
Enterprise Holdings (Includes Alamo Rent A Car, Enterprise Rent-A-Car, National Car Rental)	941,064	6,202	$11,500	$11,100
Hertz (Includes Advantage Rent-A-Car)	366,000[3]	2,700[3]	$4,660[3]	$4,241[3]
Avis Budget Group	300,000	2,500	$4,510[3]	$4,500
Dollar Thrifty Automotive Group	122,000	470	$1,563[3]	$1,597
Zipcar[4]	8,800[5]	151[5]	$205[5]	$178[7]
Fox Rent A Car[4]	15,000	17	$170	$140
Payless Car Rental System Inc.	11,000	44	$145	$135
U-Save Auto Rental System Inc.	11,500	325	$118[3]	$115[7]
ACE Rent A Car	9,000	92	$100	$100
Rent-A-Wreck of America	5,600	184	$40	$38
Triangle Rent-A-Car[2]	4,000	28	$40	$40
Affordable/Sensible	3,300	180	$32[3]	$32[7]
Independents[4]	60,000[3]	5,400[3]	$545[3]	$520[7]
TOTAL	1,857,264	18,293	$23.628B	$22.736B

As mentioned in the table below, the initial market size is around 88,000 cars. Considering the 10 percent of the cars of the total cars of Zip car, Avis and Hertz, which are nearly 874,144 for 2015. This figure was obtained from the rational calculation of the figures of 2012 and the 10 percent increase in the rental fleet every year. For the first year of the launch of the Google car, estimate sale is 7 percent of the targeted market. For the second year the market share increases to 16 percent of the target market. Initially the car is prized at $75,000, of which the $30,000 is the average cost of the Toyota vehicles and rest $45,000 is the cost of the self-driving equipment. The profit margin for self-driving equipment will be $5000 initially as the production won't be adopted on large scale. The initial profit isn't enough to cover the R&D cost of this technology but at this cost the first self-driving car will be soon in the market.

Table 3: Sales Forecast Phase 1

Phase 1	Released	
	$75,000	
	First Year (2015)	Second (2016)
Market		
Zip Car, Avis, Hertz	874,144	952,816
Target Market	87414	95281
Unit		
Cumulative Unit sold	6119	15245
Cumulative Units sold (%of market)	7%	16%
Unit Price of the Equipment	$50,000	$50,000
Financial		
Cumulative revenue (1000's)	458,925	1,143,375
Profit Margin (%)	33.333%	33.333%
Cumulative Profit (1000's)	152,975	381,125
Sales growth Rate		149%

For the phase two, as the demand on the self-driving cars increase, the technology expanded to all major the car rental companies in United States. The target in the phase two markets is the 10 percent from the total of major rental car companies. The figures were obtained by rational calculation of increase in the fleet of rental cars by 10 percent every year based on the figures obtained from the NADA (National Automobile Dealers Association) of 2012. The price of the car remains the same in the phase two of the deployment of the marketing plan that is $75,000. The 10 percent of the cars of the total market is the Toyota cars, which were derived, based on the statics of the Toyota's cars in the rental market. The objective is to achieve the 30 percent of the target market by the end of phase two.

Table 4: Sales Forecast Phase 2

Phase 2	Released	
	$75,000	
	First Year (2017)	Second (2018)
Market		
Car Rental Market	2,991,139	3,290,252
Target Market	269,202	296,122
Unit		
Cumulative Unit sold	56,532	82,914
Cumulative Units sold (%of market)	21%	28%
Unit Price	$50,000	$50,000
Financial		
Cumulative revenue (1000's)	4,239,900	6,218,550
Profit Margin (%)	33.333%	33.333%
Cumulative Profit (1000's)	1,413,300	2,072,850
Sales growth Rate		47%

9 Conclusion

The new self-driving car will be beneficial to our community. Our self-driving technology will revolutionize the way cars are being used presently to whole new level of user-interface, as the user will be more productive and can do a lot many activities other than the driving which will be taken care by the car and the users won't have to be worried about focusing on the road, or having their legs pain while driving in the busy commuting time. Self-driving car also helps improve the environment, by saving a large amount of fuel, which gets wasted due to bad driving skills, and be more efficient. From the survey conducted by the Google, to find out the percentage of the total cars used during the busiest commuting hour of the day, it was found that less than 40 percent of the total cars are seen on the road at this time. Most people

own a second car which won't be needed any more as the car can drive back to other places on its own, which means there won't be any need of the second car to be owned by the users as the first can crater to that problem very efficiently and hence reducing a lot of car ownership.

Self-driving car also helps improve the traffic by reducing the density of the car on the road that impact the commuting and also preventing the car accident. From the government census over car accidents over the years, it states that with increase in driving technology the car the death from the car accident has been reduce significantly but the car accident still remain very high, which will be reduced to a much greater extent with the Google Self-Driving technology that will reduce the accidents due to human error, which being the major cause of accidents. This technology also improves the environment because less emission from the car. It also helps reducing the global warming because of emission is one of the biggest contribution to the increase in global warming. Our team picked rental Car Company because it will helps out teams to solve the credibility of the technology. The rental company will maintain excellent service so it will dramatically increase the credibility because the amount of the rental company purchase. Moreover the brand power of Zip car, Hertz and Avis will add a lot more value to the Google car when it is adopted to their fleet of cars.

Further this technology will act as a fulcrum for the future self-driving technology and the innovations, which will take, place in the future years in this field of innovation. This car will also get the first self-driving cars on the road at a very efficient price and value to the customers and developing a complete new level of driving experience in the automobile industry. It will even change the insurance and loan policies for the cars and new laws will be made to cater this technology to the market.

While working on the plan, we even encountered few limitations and restrictions. Major limitation was the pricing of the product, an how to come up with a cost which will make it an adoptable product to the market. Being the first of its kind to be in the market, there were no resources to refer to come up with appropriate pricing nor were there any other research data available of how the pricing of the equipment go down over the years when it is produced in a large scale. So the pricing was decided based on the surveys and research of the cost reduction of the technology of the previous models over the years and even using the gut feeling to decide the price suitable for the product to be in the market. Second limitation was regarding the survey conducted by our team through Internet forms, which left us with the data, which was focused, to individuals rather than to our phase one customers.

While going through the whole process of developing the marketing plan from the scratch to the fuzzy front and then to the final plan, we did learn many new concepts and practically experienced and used many concepts being learnt during the subjective classes. This project gave us ability and enhanced our skill to work as a team and even taught us how to dive deep in the research of the content we worked on. The various tools used to collect the market data, gave us the feel of the present industry condition of the automobile sector. Many insights to the industry were observed and understood with the help of these tools and while practicing them we even learnt how to use them well by making mistakes and learning

from them. This project has been a great tool to better learn and grasp the concepts of this subject deep in our heads.

10 References

1. Wikipedia, "Google driverless car", Internet: en.wikipedia.org/wiki/Google_driver, 2013 [May 5, 2013]
2. John Markoff, " Google Cars Drive Themselves, in Traffic", Internet:www.nytimes.com/2010/10/10/science/10google.html?pagewanted=2&_r=0, 2013[May 5, 2013]
3. Erico Guizzo, "How Google's Self Driving Car Works", Internet: spectrum.ieee.org/automaton/robotics/artificial-intelligence/how-google-self-driving-car-works, 2013[May 5, 2013]
4. Google, Internet:123seminarsonly.com/Seminar-Reports/013/48883406-Google-s-Self-Driving-Car.pdf, 2013[May 3, 2013]
5. Reuters, "Profile: Google Inc (GOOG.O)" Internet:www.reuters.com/finance/stocks/companyProfile?symbol=GOOG.O, 2013[May 5, 2013]
6. Wikipedia, "Google X Lab", Internet://en.wikipedia.org/wiki/Google_X_Lab, 2013[May 5, 2013]
7. Dan Graziano, "Google plans to unveil secret X Lab project 'in the coming moth'", Internet://bgr.com/2013/03/14/google-x-lab-project-374920/, 2013[May 5, 2013]
8. Christian Wüst, "Auto Revolution: A Promising Future for Self-Driving Cars", Internet: abcnews.go.com/International/auto-revolution-promising-future-driving-cars/story?id=18378323#.UYShH2bn-Uk, 2013[May 3, 2013]
9. Henry Blodget, "Here Are Some of The Problems Google Is Having With Its Self-Driving Cars", Internet:www.businessinsider.com/google-self-driving-car-problems-2013-3, 2013[May 3, 2013]
10. Megan Hicky, "Self-driving car aren't too far off", Internet:www.usatoday.com/story/money/cars/2013/04/10/self-driving-cars/2071607/, 2013[May 3, 2013]
11. The Associated Press, "Race for driverless cars is in full throttle ", Interne:www.usatoday.com/story/tech/2013/04/06/driverless-cars-full-throttle/2058637/, 2013[May 3, 2013]
12. Dale Buss, "Ford Sees Future in Self-Driving, but Mass Transit May Be Key", Internet:www.brandchannel.com/home/post/2013/05/03/Ford-Sustainability-050313.aspx, 2013[May 4, 2013]
13. Google, "Analytics Firm Provides Game-Changing Capabilities with Google Big Query", Internt://cloud.google.com/files/Claritics.pdf, 2013[May 5, 2013]
14. Google, "Quarterly Earnings Summary", Internet://investor.google.com/pdf/2013Q1_google_earnings_slides.pdf
15. GMC, "Self-Driving Car Amps Up Competitors: Google vs GMC?", Internet:www.christianpost.com/news/self-driving-car-amps-up-competitors-google-vs-gmc-video-74098/, 2013[May 5, 2013]
16. Mercedes, "Google Self-Driving Car Gets Competition", Internet:www.nodeju.com/4768/google-self-driving-car-gets-competition.html, 2013[May 5, 2013]
17. Doug Mataconis , "Driverless Cars A Threat To Personal Privacy?," Internet: www.outsidethebeltway.com/driverless-cars-a-threat-to-personal-privacy/, MAY 13, 2013 [MAY 26, 2013]

18. John Naughton, "Google's self-guided car could drive the next wave of unemployment," Internet:www.guardian.co.uk/technology/2012/sep/30/google-self-driving-car-unemployment, Sept 29, 2012 [May 26, 2013]
19. Gerry Smith, "Driverless Car Could Be Hacked By '14-Year-Old From Indonesia,' Senator Warns," Internet:www.huffingtonpost.com/2013/05/17/driverless-car-hack_n_3292748.html, May 17, 2013 [May 26, 2013]
20. Henry Blodget, "Google's Problems With Its Self-Driving Cars," Internet: finance.yahoo.com/blogs/daily-ticker/google-problems-self-driving-cars-125324516.html, Mar 5, 2013 [May 26, 2013]
21. Colum Wood, "Toyota Prius Ranked World's Third Best Selling Car so Far This Year,"Internet: www.autoguide.com/auto-news/2012/05/toyota-prius-ranked-worlds-third-best-selling-car-so-far-this-year.html, May 29, 2012 [May 26, 2013]
22. Focus2move, "Top25 car brands ranking at July 2012. Toyota on top of world,"Internet:www.focus2move.com/item/223-top25-car-brands-ranking-at-july-2012-toyota-on-top-of-world, Oct 1, 2012 [May 26, 2013]
23. Declan McCullagh, "Robo-cars face a new threat: Lawyers," Internet: news.cnet.com/8301-13578_3-57578655-38/robo-cars-face-a-new-threat-lawyers/, April 9, 2013 [May 27, 2013]
24. New York Daily News, "Audi shows off self-driving, self-parking A6 Avant and RS7 Sportback," Internet: www.nydailynews.com/autos/audi-shows-self-driving-cars-article-1.1249419, Jan 28, 2013 [May 27, 2013]
25. Wikipedia , "Autonomous car," Internet: en.wikipedia.org/wiki/Autonomous_car, [May 27, 2013]
26. Jakki Mohr et all, *Marketing of High-Technology Products and Innovations*, Upper Saddle River, NJ: Prentice Hall, 2010
27. Forbes, "Fasten Your Seatbelts: Google's Driverless Car Is Worth Trillions," Internet:www.forbes.com/sites/chunkamui/2013/01/22/fasten-your-seatbelts-googles-driverless-car-is-worth-trillions/, [May 5, 2013]
28. Forbes, "Google's Trillion-Dollar Driverless Car -- Part 2: The Ripple Effects," Internet: www.forbes.com/sites/chunkamui/2013/01/30/googles-trillion-dollar-driverless-car-part-3-sooner-than-you-think/, [May 5, 2013]
29. Tyler Gray, " D.C. Car Wars: Zipcar vs. Hertz on Demand vs. Car2Go," Internet: www.beekeepergroup.com/dc-car-wars-zipcar-vs-hertz-vs-car2go/, [May 5, 2013]
30. KPMG, "Self-driving cars: The next revolution," Internet: https://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/Documents/self-driving-cars-next-revolution.pdf, [April 16, 2013]
31. Internet:www.google.com/search?q=product+life+cycle&tbm=isch&tbo=u&source=univ&sa=X&ei=phukUcjiKcf0iQLU7oHIDw&sqi=2&ved=0CEAQsAQ&biw=1680&bih=878, [May 27, 2013]
32. Megan Hickey, "Self-driving cars aren't too far off," Interne:www.usatoday.com/story/money/cars/2013/04/10/self-driving-cars/2071607/, Apr 10, 2013 [May 27, 2013]
33. Jerry Hirsh, "How much would you pay for a self-driving car?" Internet: articles.latimes.com/2012/apr/26/business/la-fi-tn-autonomous-car-20120426, April 26, 2013 [May 27, 2013]

34. Mark Whittington, "Cost of Self-Driving Cars Plummets Thanks to Romanian Teenager's Invention," Internet: voices.yahoo.com/cost-self-driving-cars-plummets-thanks-romanian-12145959.html?cat=15, May 21, 2013 [May 27, 2013]
35. Bloomberg News, "Tesla CEO Elon Musk: Google's self-driving car is too costly," Internet:www.newsday.com/classifieds/cars/tesla-ceo-elon-musk-google-s-self-driving-car-is-too-costly-1.5214591, May 7, 2013 [May 27, 2013]
36. Chris Matyszczyk, "A self-driving car, but thankfully a BMW,", Internet:news.cnet.com/8301-17852_3-57367893-71/a-self-driving-car-but-thankfully-a-bmw/, Jan 28, 2012 [May 27, 2013]
37. Benjamin Davis, Tony Dutzik, Phineas Bazandall, "Transportation and the New Generation," *Frontier Group* (April 2012), pp. 1-28.
38. Wikipedia, "How many cars are currently in the US?" Internet:wiki.answers.com/Q/How_many_cars_are_currently_in_the_US, [May 27, 2013]
39. Wikipedia, "Passenger vehicles in the United States," Internet: www.ask.com/wiki/Passenger_vehicles_in_the_United_States, [May 27, 2013]
40. Chris Isidore, "Toyota's rental car problem," Internet: money.cnn.com/2010/02/19/news/companies/toyota_rental_cars/, [May 27, 2013]
41. Brad Tuttle, "Does Selling Out to Avis Represent Success for ZipCar? Failure? Something Else?" Internet: business.time.com/2013/01/03/does-selling-out-to-avis-represent-success-for-zipcar-failure-something-else/, [May 27, 2013]
42. Karen Aldana, "U.S. Department of Transportation Releases Policy on Automated Vehicle Development" Internet: www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+Department+of+Transportation+Releases+Policy+on+Automated+Vehicle+Development, [June 9, 2013]
43. Wikipedia, "Intelligent Parking Assist System", Internet: en.wikipedia.org/wiki/Intelligent_Parking_Assist_System [May 27, 2013]
44. Wikipedia, "Autonomous cruise control system", Internet: en.wikipedia.org/wiki/Autonomous_cruise_control_system [May 27, 2013]
45. Wikipedia, "Autonomous car", Internet: http://en.wikipedia.org/wiki/Autonomous_car [May 17, 2013]
46. Census 2010, "Interactive Population Map", Internet: www.census.gov/2010census/popmap/ [May 17, 2013]
47. Joann Muller, "It Is California Leading The Way," Internet: citationmachine.net/index2.php?reqstyleid=1&reqsrcid=MLAWebDocument&srcCode=11&more=no&mode=form, 26 09 2012, [Web. 19 May 2013]
48. Wikipedia, "Autonomous Car", Internet: en.wikipedia.org/wiki/Autonomous_car [May 29, 2013]
49. Wikipedia, "Google driverless car", Internet: en.wikipedia.org/wiki/Google_driverless_car#cite_note-16 [May 29, 2013]
50. Mark Whittington, "Law Proposed in Texas to require Licensed Driver in Self-Driving Vehicles [May 29, 2013]