UNIVERSITY OF OREGON
Lundquist College of Business

Areeb Alam
Elijah Raffo
Lauren Powell
Maggie Li
Tim Motsiff

Teaching Notes: **AI and the Legacy of Tim Cook**

Under Steve Jobs, Apple constantly produced innovative/world changing products. In 2013, nearly 1.5 years after his death, stakeholders are growing worried that Apple will not be able to continue to innovate as new CEO Tim Cook continues to optimize projects Apple was working on under Jobs. Tim Cook believes that he may have an opportunity to create an innovative new product and leave his mark on the world by ensuring that Apple produces a self-driving car. Apple can enter this industry through their coding/software skills and large amounts of cash on their balance sheet. They are certain however to face stiff competition from capable competitors such as Google, Tesla Aptiv, Ford and other large car manufacturers. Tim Cook will need to assess what the self-driving car industry will look like and ultimately determine what strategic decision Apple should make, or whether they should enter the self-driving car industry at all.

Case Questions

- Pros/cons of entering AI market early?
- What will be the primary challenge for Apple to overcome entering AI industry?
- How do consumers acclimate to the idea self-driving technology?
- What does Apple bring to the self-driving industry that no other company can?

Introduction (Total: 3 mins)

- Introduce each member
- Teaching objectives - Tim
    - Define the self-driving car industry
    - Understands Apple' value proposition
        - Need to differentiate -->strengths as a tech company with brand recognition

    - Decide the strategic path Apple should take
- Road Map - Lauren (1 min): Here is a synopsis of what we'll be doing in the next 50 minutes...
    - Tim Cook and Steve Jobs - Optimization vs. Innovation
    - Brief History
    - Opportunity/SWOT
    - Apple's Competitive Advantage
    - Dissection of self-driving cars
    - Industry Analysis (PESTEL)
        - Class Activity
    - Competitive Analysis
    - Porter's 5 Forces
        - Class Activity
    - Blue Ocean and the AI Industry
    - Strategic Alternative
    - Postscript
- Who, What, Where, When, and Why: Our case begins with Apple's current CEO Tim Cook in 2013. Cook has a background in operations and has brought a lot of optimization and efficiency to the company; however, he has yet to cultivate innovation in the same way Jobs has. The company's stream of new and revolutionary products has started to stagnate...
- What do you think should Apple do? (conclude with open-ended question)
    - Posed to the class to think about as we go through case facts.

Tim Cook vs. Steve Jobs - Elijah (Total: 3 mins)

- Setting up the story of Tim Cook's motivation (1 min)
    - After setting up the overview about how we are presenting our case we want to engage the audience. Our story centers around Tim Cook, and his motivation to make his mark on Apple. Our story starts two years after Steve Jobs death in 2011, and Tim Cook is looking for how to innovate.
- Optimization vs. Innovation (1 min)
    - After engaging with the audience, we want to describe the two sides of the story we are portraying. Tim Cook is one side, and his background as the operational specialist, and working side by side with Steve Jobs to optimize Apple's profit. The other side is Steve Jobs, and the legacy he left as an innovator, CEO, and the reason Apple has succeeded.
- Steve Jobs Legacy and video (1 minute)
    - https://youtu.be/WiD3N-tTG4o

- This video captures a lot of feeling, and is only one minute long. The purpose of the video is to show a glimpse of Steve Jobs character, and for the audience to understand the "boots" Tim Cook is filling. At this point the audience is engrossed in the presentation emotionally, and is open to more information.

Brief History (Total: 3.5 min)

- 1976 -1979 - Areeb (2 mins)
  - Inception of Apple: Beginning with the inception of Apple in Steve Jobs and Steve Wozniak's garage, we'd like to describe some of the products first introduced by Apple and what the business model looked like.
- 1980 - 1990
  - Growth of Apple: Now we would like to discuss Apple's rise to stardom and their success including an IPO which lead to further public offerings.
- 1990 - 1997 - Maggie (1.5 mins)
  - Failure of Apple: Strong competition with the tech industry and lawsuit made Apple no longer an industry giant.
- 1997 - 2013
  - Steve Jobs Saving Apple - his death: Jobs came back as interim CEO in 1997 and made Apple great again. In 2011, he died of cancer.

Opportunity - SWOT (Total: 5 mins) ---

- Strengths- Lauren (2 mins): Now that we have considered Apple's long history of innovation and commercial success, we can dive into how these facts apply to their current venture. Apple has many applicable strengths in the market for driverless tech as a well-established luxury tech brand. A key part of commercializing AI-led driving technology will be the emphasis of a luxury experience, with a room-like interior setting. The combination of artisanship, vertical integration and global presence solidify Apple as a luxury brand, positioning them perfectly to market driverless technology.
  - Brand recognition/value
  - Capital/cash flow - result of price premiums
  - Software/coding ability
  - Device compatibility & iOS (proprietary technology)
- Weaknesses - Elijah (1 min)
  - Apple's strengths are self-evident; however, they are not infallible. The weaknesses we would like to highlight are:
    - Apple is focused behind providing excellent value for consumer products
    - There has been a lack of recent innovation since Steve Jobs death
    - Apple's size limits the availability to create instantaneous innovation

        - Apple's supply chain is efficient and effective; however, it is not malleable or proactive.
- Opportunity - Tim (1 min)
    - Apple Car
        - Has an Opportunity to create an innovative product and be a key player in a huge new industry of the future
    - Blockchain technology
        - Allows all parts of a mobility system to communicate and create links
    - Other AI opportunities
- Threats- Areeb (1 min)
    - Lawsuits
        - Two main lawsuits we would like to discuss:
            - Apple sued for violating antitrust laws with monopoly of Apple Store
            - Apple phones accused of slowing down as phones get older, prompting customers to buy newer phones when unnecessary.
    - Rising costs
        - Working conditions in China have been called into question in recent years, which has increased labor costs for Apple's large manufacturing plants run by Foxconn. Furthermore, manufacturers have begun shifting from China to other countries as wages increase even within the giant manufacturing company
    - Increased competition
        - Apple faces increased competition from Samsung, Google, Huawei, and other mobile retailers as the industry grows

Apple's Competitive Advantage - Maggie (Total: 2 mins) 16.5 ---

- Valuable: create valuable products
- Rare: luxury electronic technology
- Cost to Imitate: Large investments over years & unique software
- Organized to Capture Value: strong incentives for employees
- Summary of VRIO: Apple successfully transfers its brand into a luxury brand

Video Orienting the Class to Self-Driving Cars - Elijah (Total: 5 min) 21.5

- https://youtu.be/HgF7E5q9sU4
    - Before this section we have focused on the Apple, and the current paradigm of their company. Tim Cook is thinking about where to take Apple in the future, and

specifically with entering the self-driving car industry. The video about with light commentary from Elijah will help orient the class to understanding the opportunity and industry.

- https://youtu.be/tiwVMrTLUWg?t=465
    - This video is a more technical TEDx looking at self-driving cars. Elijah will start this video 7 min 45 seconds into the video where the presenter explains and shows the logic behind self-driving cars.

Industry Analysis ---> PESTEL for Class (Total: 10 min including activity) 31.5

- Class Activity - Elijah (4 mins)
    - The student's imaginations are oriented to Apple and the self-driving car industry. Next, we want to get the students engaging, and participating. We left the PESTEL analysis out of the Case Analysis because we want to divide the classroom to help us. Each section will be given a PESTEL segment, and after 4 minutes we will ask each section what they came up with. Our presentation will work in parallel with each group. In other words, as we engage with the Political class section, we will describe our understanding of the Political section. We will then move on to our environmental section, etc.
- *Our* PESTEL Analysis (4 mins) - Lauren & Elijah: After allowing the class to formulate their own hypothesis about macro environmental factors affecting Apple, we will briefly review our own findings from the case.
    - Political:
        - Wage gap could lead to higher corporate taxation.
        - Trade wars between U.S. and China.
        - The national government's reaction to self- driving cars is unknown, legislation and regulation could delay a market introduction.
    - Economic:
        - Potential increased cost of labor in China.
        - Disparity between middle and upper class Americans decreases the potential market Apple as we market luxury items.
        - Government taxation and spending ⇒ self-driving cars in civil service, and military use.
    - Social: Social norms and fears could lead to a slow release of self-driving cars and negative news could cripple commercial opportunities; however, self-driving cars are perceived as the "future" of the AI and automobile industry and will attract customers upon initial release.
    - Technological:
        - Apple's technology has the potential to be mimicked.

        - "Self-driving" has yet to be defined by a specific product. (Blue Ocean)
        - Self-driving cars, and artificial intelligence could be pivot in world history.
        - Development of 5G.
    - Environmental: Disposal of electronic parts and outdated goods is under scrutiny. Apple is highly affected by electricity prices in manufacturing of the consumer goods. Climate change initiatives have government and society prioritizing products that produce a benefit for the environment more than the alternative. Renewable technology is a trend which can be leveraged in electronics.
    - Legal:
        - Self-driving cars will be heavily regulated which could lower expected profits depending on the regulation of manufacturing and R&D.
        - Legal ramifications of holding a user's data.
        - Legal protection for the operating systems software.
        - Negative ruling in favor of legal protection for AI software could heavily impact Apple.

Competitive Analysis, 4 Competitors, Apple (Total: 5 min) ---

- Google - Tim (1 min)
    - Has more cash than Apple, began working on Self-Driving cars earlier,
- Tesla - Maggie (1 min)
    - Tesla is not a director competitor of Apple, but if it chooses to enter self-driving car industry, it will be a formidable player. Tesla's challenges lies within its logical capabilities.
- Ford - Areeb (1 min)
    - Ford has invested a considerable amount into electric vehicles and is looking towards the future.
    - Could pivot and become a mobility solutions company, as it has already worked on some projects including autonomous vehicles and smart cars.
- APTIV - Elijah (1 min)
    - The slide to accompany this point in the presentation will be the SWOT - APTIV analysis, and a picture of their product.
        - APTIV is different than most competitors because of their early presence in China
        - Less recognizable Brand is a weakness
        - They have an ability to be the first to market, and have partnered with Lyft
        - They can be acquired due to their size

- Apple - Lauren (2 mins)
    - How do we differentiate ourselves from such strong competitors? By utilizing Apple's strengths as a company, we can develop products for AI-led driving that set us apart from the competition.
        - Brand recognition
        - iOS
        - Device compatibility
        - Unique combination of features
    - Want to repeat Apple's success in high margins in the self-driving car venture (87% of revenues, 20% of market share)

Porter's Five Forces - Elijah (Total: 5 min)

- Class Activity (5 min)
    - The student's imaginations are oriented to Apple's competitors and the self-driving car industry. We believe the students have enough information to decide if the industry has low to high levels of competitive force. First, we will let students' groups talk amongst themselves to, and decide which force they will consider and what level of threat is present within the force. As a class we will work through each force, and in the process asking students to elaborate on their opinions.

Blue Ocean (AI Industry) & Strategic Alternatives, Questions & Our Idea (Total: 10 min)

- Blue Ocean (Why it is attractive) - Tim
    - Large dollar industry in future, solve environmental/mobility solutions
- Strategic partnership - Tim (1 min)
    - Can partner with an existing car companies, focus on strengths, minimize risks
- iCar - Areeb (1 min)
    - Apple can create its own car, the iCar, and introduce it as part of the Apple Brand
- Mass Market (sell software) - Areeb
    - Apple could develop proprietary software, which is compatible with different kinds of vehicles, and license the software to car manufacturers or directly to consumers
- Rideshare services - Maggie (1 min)
    - Apple can develop self-driving car technology and then sell it to ride sharing services.
- Public Transportation/Trucks - Lauren (3 mins)
    - Good alternative if Apple develops technology that is too expensive for the mass market.

    - Rewrite the code for specific users who can afford to enter large contracts (i.e. campus shuttles for colleges or airports and large corporate campuses).
    - Examples include self-driving shipping trucks, self-driving public transportation buses, taxis, delivery trucks and other large-scale users that rely on trucks and buses.
    - Could allow Apple to earn revenue from early AI-led driving tech while commercial and consumer uses have yet to become mainstream.
    - Let's consumers become comfortable with Apple as a representative for driverless tech.
- Do Not Enter Market - Lauren
    - Technology company, *not* a car company.
    - Invest funds another project such as a content streaming service.
    - However, if we decide to enter self-driving market later, we could be missing out on significant cash flows as late movers.
    - Invest in a startup then acquire it later when relevant.
    - HINT AT RECOMMENDATION: Could not enter market but develop software alongside another company so that iOS products are highly compatible. (i.e. Apple maps)
- Now that we have concluded our hypothesized strategic alternatives, we will synthesize the facts discussed during the lecture to give our team's recommendation.

Group Recommendations - Elijah (Total: 1-2 mins)

- At this point students know about Apple and the self-driving car industry up to the present. We will work with students and talk with them about what they believe Apple will do. Then we will present our recommendations as are outlined below in the recommendation section.
    - 1st iteration - distribution
    - 2nd iteration - luxury consumer use
    - 3rd iteration - IoT: strategic partnership; AI and autonomous integration; do not enter market option

	Objectives	**Measures**	**Targets**	**Initiatives**
Financial	Set commercial goals Develop revenue model for either software or iCar	Company financials Costs associated with developing car//software	Create a profitable autonomous driving product	Create marketable self-driving software/cars by 2023

Customer	Improve customer image of AI	Customer surveys	45% of consumers would consider using an autonomous vehicle	Emphasize the luxury of a “traveling-room” type car
Internal Processes	Create self-driving car or software	Ability to develop necessary technologies	Develop car or leasable software by 2023	Form a strategic partnership or develop an autonomous car
Learning & Growth	Differentiate software/car from competitors	Compare features and customer reviews	Select distinguishing features for Apple’s technology	Develop car or software that integrates Apple’s unique features and AI technology Solidify competition against Waymo and GM

Postscript (Total: 10 min)

- What competitors have done - Tim
    - Google, other car companies not mentioned
- What has Apple done since 2013? - Lauren (3 mins)
    - Attempted to buy Tesla in late 2013
    - Created Project Titan in 2014 to facilitate developments in driverless technology.
    - Once rumored to be centered around an Apple-branded electric car, but the project's focus has shifted to developing self-driving car software instead.
    - In 2015, an Apple employee working on Project Titan was arrested by the FBI for attempting to leak proprietary information to a rival company developing AI-led driving tech in China
    - Physical car project possibly still in the works.
    - Deep integration with iOS and Apple products expected.
    - Autonomous testing permit received from DMV in 2015/2016 in California.
    - Self-driving software being tested.
    - Building autonomous driving system which could potentially be used in the cars of various partner companies.
    - Hired Tesla engineer Doug Field in August 2018

    - Apple has removed around 300 employees in total that were working on the project (Project Titan) initially; speculated to be the result of restructuring under Field's leadership
    - "We're focusing on autonomous systems. It's a core technology that we view as very important. We sort of see it as the mother of all AI projects. It's probably one of the most difficult AI projects actually to work on." - Apple CEO Tim Cook on Apple's plans in the car space (2017)
    - Had about 70 autonomous vehicles on the road as of May 2018
- What self-driving cars look like in future - Tim?
- Questions - Maggie: Open questions
- ***Thank you*** - Team

Postscript

Business Environment

Refer to Exhibit C for PESTEL Analysis

As I analyze Apple, self-driving cars, and the changing business environment, I hope to understand opportunities and risks present in the marketplace. At a cursory level Apple should focus on all factors of the PESTEL model[1]; however, I hope that with my analysis I will be able draw conclusions on the environmental factors most important to our company in this endeavor[2].

Political Factors

As the wage gap increases corporations could be taxed at a higher rate. In recent years there has been a political push both at a grass roots level and nationally. Trade wars between China and America can increase the cost of Apple using Chinese labor. However, ill-advised trade wars are possible as China and America have a tumultuous relationship. The national government's reaction to self- driving cars is unknown, and is dependent on who is in power when the technology is finished. Either way the government will be heavily lobbied for better or worse. National legislation and regulation will be slow. This could delay a market introduction for years. If the government is persuaded into giving subsidies, we will be able to scale production.

Economic Factors

An increased cost of labor in China would majorly decrease the profits of Apple due to our heavy reliance on Chinese manufacturing. Heavy disparity between the middle and upper class of America decreases the potential market Apple as we deliver premium products. Self-driving cars performance is heavily tied to the economy it is released in. A downturned economy would lead to low sales, and a prosperous economy would lead to high sales. Government taxation and spending will predict the use of self-driving cars in civil service, and military use.

Social Factors

Apple is popular in 1st world countries; however, the largest increase of consumer spending is in developing countries which Apple is not deeply rooted in. Consumers are becoming more socially conscious and are paying attention to the way in which their products are being produced. Apple's iTunes has created tension within the music industry and negative publicity.

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[1] Contributor, PESTLE analysis. "Apple Inc. PESTLE Analysis." *PESTLE Analysis*, 21 June 2016, pestleanalysis.com/apple-pestle-analysis/.

[2] "Apple Inc (NMS: AAPL)." *Mergent Online*, www.mergentonline.com.libproxy.uoregon.edu/companydetail.php?pagetype=business&compnumber=12161.

Social norms and fears could lead to a slow release of self-driving cars. The first wave of self-driving cars will face a large backlash, and any negative news will cripple the effort of release. However, self-driving cars are perceived as the "future" of the AI and automobile industry and will attract customers upon initial release.

Technological Factors

Unfortunately, other technology companies have an ability to recreate Apple products once they have been introduced to the market. Apple's proprietary code and information can be marketed to other industries. Apple's ability to defend against cyber-attacks helps further its position in the consumer electronics industry. Self-driving cars are being developed in many companies; furthermore, "self-driving" has yet to be defined by a specific product. Self-driving cars, and artificial intelligence has the potential to change the tech industry, and the world. 5G is being developed and would offer faster data transfer for all devices connected to the internet of things (IoT).

Environmental Factors

The disposal of electronic parts, batteries, and outdated goods is expensive, and under scrutiny. Apple is highly affected by electricity prices in manufacturing of the consumer goods. Climate change initiatives have government and society prioritizing products that produce a benefit for the environment more than the alternative. Renewable technology is a trend which can be leveraged in electronics.

Legal Factors

Apple Pay is connected to the financial industry and susceptible to new regulations that could affect profit. Self-driving cars will be heavily regulated for safety, and that could lower the expected profitability of the project depending on the regulation effect on manufacturing and R&D. The legal ramifications of holding a user's data could affect how self-driving cars operate, and how Apple finds profit from this venture. Legal protection for the operating systems software could lead to an increase in revenue. However, a negative ruling in favor of legal protection for AI software could heavily impact Apple by allowing for more competition in the marketplace.

Industry Analysis

Refer to Exhibit D for an outline of Porter's Five Forces Analysis

This self-driving car industry is overall attractive to enter, but it is also an industry that has limitations to enter since its technology driven.

New Entrants

The threat of new entrants is low in the self-driving car industry. Since this industry needs technology and capital, it's difficult for some companies to enter because most companies have limited capital and software development. Thus, the entry-barrier is high. Also, building a reputation among customers is challenging because the safety of the car is still a large factor, especially for the self-driving car industry. Luckily, established players in this industry such as Apple have a reputable brand and the trust of customers, which means high brand loyalty for companies. This can be a competitive advantage for Apple against new companies. Lastly, it is easy for the government to regulate it because the companies in this industry must apply for a permit from the US Department of Transportation (USDOT) to test their cars.

Buyers Power

The bargaining power of buyers is relatively low because there are only a few companies developing self-driving cars. On the other hand, customers are worried about safety issues surrounding self-driving cars, which makes the customer base potentially small. A study released by the AAA (American Automobile Association) on how quickly consumers' confidence in self-driving car has eroded shows that 73% of U.S. adults surveyed saying they would be too afraid to ride in a fully self-driving vehicle. Its most recent study also reveals a majority of U.S adults surveyed aren't thrilled about sharing the road with self-driving cars or trucks with 63% saying "they would actually feel less safe sharing the road with a self-driving vehicle while walking or riding a bicycle."[3] If companies want to have continuous growth, the first thing to do is figure out how to eliminate customers' worries to increase acceptance ratio. The switching costs are also high. Usually customers are price sensitive, so they will compare prices among different products, but the information they can get is limited. Therefore, most of customers are not willing to buy self-driving cars.

Supplier Power

The bargaining power of suppliers is high because there is a limited number of suppliers, especially software suppliers such as Apple or Google. Software is the core technology of self-driving cars. Apple's mature systems will help its development a lot. In addition, the cost of switching suppliers is high because there are a limited number of suppliers.

Substitutes

[3] Garsten, Ed. "Sharp Growth in Autonomous Car Market Value Predicted but May Be Stalled by Rise in Consumer Fear." *Forbes*, Forbes Magazine, 13 Aug. 2018, www.forbes.com/sites/edgarsten/2018/08/13/sharp-growth-in-autonomous-car-market-value-predicted-but-may-be-stalled-by-rise-in-consumer-fear/#3bc49c74617c.

The threat of substitutes is high as existing transportation such as sedan, truck, or van can satisfy people's demand for work and travel. Customers would like to buy self-driving cars, but the problem is that it won't be that cheap enough to entice many customers when these cars first enter the market.

Competitive Rivalry

The rivalry among existing competitors is high. There are some famous players in this industry so far, including Apple, Waymo (Google), General Motors, Daimler, Tesla and so on. The common feature that existing players in this industry have, are that they are either technology companies or automobile companies. In addition, the growth of self-driving car industry is rapid. The global self-driving car market size is expected to be around 6.7 thousand units in 2020 and is predicted to expand at a compound annual growth rate (CAGR) of 63.1% from 2021 to 2030.

Strategic Alternatives

Refer to Exhibit F for Apple's Balanced Scorecard

Despite having narrowed my focus to driverless tech, there are a multitude of options for Apple's position in the AI-led driving market. Primarily there is the dilemma of just developing software versus the automobile in its entirety. While developing an Apple-branded car means I have total control over the project, automobile manufacturing is something we have very little experience in. Alternatively, leasing software to other companies means losing our proprietary advantage.

To make this idea profitable we must convince consumers that autonomous cars are not only safe, but a luxury item that can improve their daily lives. Luxury is a feeling Apple has succeeded in conveying to its customers time and time again. Developing a car or software that integrates Apple's unique features and AI technology will solidify our place against competitors.

Tim begins rapidly jotting down Apple's potential routes for entering the driverless tech market.

Strategic Partnership

One option Apple has is the opportunity to form a Partnership with an existing car manufacturer. This would mean that Apple would develop and code the self-driving software and then it would be installed only in cars produced by one manufacturer. This would allow our company to only focus on our strength (software) and pass off the rest to a car company. Additionally, this would allow Apple to take advantage of an existing car manufacturers production and distribution infrastructure, as well as their skilled workforce.

This option would keep Apples self-driving car somewhat unique/limited to only one model/line of cars. This could allow our company to select a certain car segment such as luxury cars, and partner with BMW to control what market their self-driving car lives in. Because we would be working with a partner, Apple would be giving up direct control of the final product that the customers would use, a move that would be hard for me to make as I like to retain as much control as possible. By limiting our product to only one car model or line, we would also be shutting ourselves off from a lot of potential buyers. This could allow other competitors such as Google to make their own partnerships with car manufacturers and compete directly with Apple.

This option would somewhat mitigate Apple's risk in this venture as it would be much simpler and less costly to completely shut down the program if we had to. It would also allow them to take advantage of the car manufacturer's relationship with dealers, so customers could go to the same dealers they have already been going to. Car maintenance costs would not be as high for the customer as opposed to if we created our own car as mechanics would be used to dealing with the partner car manufacturers cars.

Acquisition

Along the lines of a strategic partnership, Apple also can acquire a company specializing in autonomous vehicle development. Apple holds a large sum of cash which it could utilize by acquiring another company. Reasons for acquisition include gaining market penetration, market share, proprietary research and development, talent acquisition, and eliminating competition. This option would be an extension of the strategic alliance and allow Apple to retain full control of the capabilities of a separate, specialized, company.

iCar

Another option Apple has is to develop the self-driving car software and design/manufacture their own car. This would be a huge decision for our company as we currently do not possess the knowledge, skilled labor force or manufacturing capabilities to build cars. We should be hesitant to make this jump after watching Tesla face many serious production challenges for the past several years. Apple would also have to figure out how we would deliver our cars to customers *and* customers would probably have to go to costly specialized mechanics for maintenance as this would be a completely new type of car.

This option would allow Apple to retain control over the entire product life cycle which is something we do traditionally. More customers may also be more attracted to a car that is branded as an Apple car then a car branded as an existing manufacturer as consumers may be biased against certain car manufacturers. This option would be much harder for Apple to shut

down and we would have to make key decisions on how to develop the car design, production and distribution aspect of it.

Our company could choose to hire existing car designers and manufacturers away from their current employers and create a whole new Apple division. This would take a lot of time as it would be awhile before the entire division was put together and working on the same page. Apple is sitting on a large amount of cash so one way we could speed up this process is by acquiring a car company or a car companies division.

Mass Market

Apple could also solely develop the self-driving car software and then lease it or sell it to any car manufacturers that want to buy it. This would allow self-driving cars with their software to get into as many customers hands as possible. If Apple develops a unique or superior software, it will also put much more pressure on competitors like Google and give them less breathing room. It would also save Apple the hassle of having to worry about procuring the physical design, production and distribution of these cars. This option might allow for a wider growth of self-driving cars as manufacturers that have strongholds in areas besides Europe and North America could also use Apples self-driving car technology and this could potentially allow Apple to get our product to a world-wide market quickly.

Making our software for the mass market could bring in the most amount of revenue but we would also lose control over what market cars with our software are sold in. It could potentially open us up to more regulation from dealing with more governments in all the countries cars using our software. There could be some support issues as well. Self-driving cars around the world requires that customers can access a very strong global network. The revenue from coverage in rural or remote areas may not be more than the costs. We would also have to set up maintenance to be available in all the areas where people use these cars which could be costly.

Rideshare Services

Apple could develop self-driving car technology and then only sell it to ride sharing services. This would require us to turn away a large revenue stream from consumer cars, so Uber and Lyft would have to pay our company a decent sum for this. There is some incentive for rideshare companies to do this as their current business model of humans driving cars may be too costly in the coming age. If people can own their own self-driving cars, groups of friends may just buy one and share it since it can drive itself to whoever needs to use it. This has the power to wipe out the ride share business model. This strategy would work well if Apple is one

of the first companies to develop self-driving software and ridesharing companies are willing to pay to keep the technology in their hands and out of the consumers hands.

Public Transportation/Trucks
This is a good alternative if Apple develops self-driving technology and it is too expensive for the mass market in the early stages. We could then re-write the code for specific users who can afford to pay a lot of money for their transportation device. This could include groups such as campus shuttles for colleges and large corporate campuses. It could also include self-driving shipping trucks that move goods across the country. Our company could also develop code for self-driving public transportation buses, taxis, delivery trucks and other large-scale users that rely on trucks and buses.

This alternative could be one Apple jumps into initially and gains a lot of market share and then waits patiently for self-driving technology to become affordable to the masses. Our company could be making revenue on our investment into this technology and at the same time allow the public to use and become comfortable with self-driving vehicles using Apple technology.

Do Not Enter Market
Apple could decide to not get into the self-driving car business at all. We may decide that we are a technology company and not a car company and take that money and invest it in another project such as a content streaming service. This would be less risky, but it also would leave a lot of potential revenues and future cash flows off the table in the future and if we decided later to get into the self-driving car business we would be a lot farther behind the competition. We could also wait and heavily invest in startups that are developing self-driving car technology and when we find one that we believe can be used immediately to give to consumers, acquire the company and make it our own.

Recommendations

After conducting our case analysis, the most viable path for Apple is to be a late mover within the self-driving car industry. The Porter's Five Forces and PESTEL analysis showed that there is a considerable amount of risk for early movers. The SWOT and VRIO analysis showed that Apple's greatest strength is their unique technology; however, Apple is not positioned to develop a unique self-driving car.

The start of the self-driving car will be by semi and ride share companies. They will be the early movers and deal with the legal and social risks. Next, a luxury brand will bring self-driving cars to market for the consumers. Once, the economies of scale are present and the industry has

matured we believe Apple should enter the market partnered with a car company. We see a future where Apple is integrated into middle-class self-driving cars. Where Apple technology seamlessly integrates into how consumers use self-driving cars. Apple can position themselves to harness artificial intelligence, and have their technology act as a medium between the car and the consumer.

Postscript

In January of this year, Apple laid off over 200 employees from Project Titan team, which is part of restructuring done under the leadership of Doug Field, but nobody knows how this move will affect Apple's autonomous vehicle plans[4]. In February, Apple reported its self-driving disengagement with the California DMV; a report shows that Apple logged 871.65 disengagements per 1,000 miles, which makes for 1.1 miles per disengagement. Apple explaining that its goal is to make autonomous cars safer, smarter and more personalized. Additionally, Apple has recently reported its first ever drop in autonomous cars and now has 69 autonomous cars permitted to test on public road in California and 110 eligible drivers to operate those cars. Compared to last month's number that 72 cars and 144 drivers reported, there is a decline in number[5].

Google has also made significant progress with their self-driving car division. In 2016 their self-driving car unit was renamed Waymo and made its own separate division under Google's parent company, Alphabet. Waymo is both manufacturing their own car and developing their software and seems to be much farther ahead than Apple. In 2015 a Google self-driving car made the first "fully driverless ride on a public road without a test driver or police escort". Google has spent over 1.1 billion dollars on this project between 2009-2015. In 2019 Waymo announced plans for vehicle assembly in Detroit and in the Phoenix area you can become an early rider and be picked up and dropped off by a Waymo self-driving car. Waymo has built its own car but also retrofitted cars such as Priuses, Lexus's and Chrysler minivans.[6]

Aptiv currently has autonomous driving operations in Boston, Las Vegas, Pittsburgh, Singapore and now China. The China expansion is significant because studies report that by 2040 2/3 of the worlds autonomous driving miles will be in this country. Aptiv also had a partnership with

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[4] MacRumors Staff on April 17, 2019. "Apple Car: It's No Secret, Apple's Actively Working on Car Tech." *Apple, Mac, iPhone, iPad News and Rumors*, 17 Apr. 2019, www.macrumors.com/roundup/apple-car/

[5] Miller, et al. "Apple Reports First Drop in the Number of Self-Driving Cars on the Road in California." 9to5Mac, 24 Apr. 2019, 9to5mac.com/2019/04/24/apple-self-driving-car-california/

[6] Clark, Kate, and Kate Clark. "Report: Google's Waymo Seeks Outside Investment and a Sky-High Valuation – TechCrunch." *TechCrunch*, TechCrunch, 11 Mar. 2019, techcrunch.com/2019/03/11/report-googles-waymo-seeks-outside-investment-and-a-sky-high-valuation/.

Lyft here in the U.S and have already begun operations in Las Vegas. They have already provided more than 40,000 autonomous rides in Las Vegas via Lyft. [7]

There are many rumors circulating about Apple's self-driving cars, including Apple's top secret location on this project in the Bay area; Apple targeted a 2020 release of the cars but have since ceased work on developing an actual car, instead working on software and sensor. An Apple analyst Ming-Chi Kuo believes that Apple will launch autonomous cars between 2023 and 2025. Focusing on only software instead of an actual car could be a good strategy. Apple is good at creating innovative technology, so it could leverage this great competitive advantage. After all, software is the core value of self-driving cars. However, it's hard to predict what the unclear autonomous driving car industry will look like soon.

[7] Abuelsamid, Sam. "Aptiv Expands Its Automated Driving Development Into China." *Forbes*, Forbes Magazine, 17 Apr. 2019, www.forbes.com/sites/samabuelsamid/2019/04/17/aptiv-expands-its-automated-driving-development-into-china/#7698dd861e34

Exhibit C: PESTEL Analysis

Political	• Wage gap increases mean corporations could be taxed more. • Trade wars/political battles can increase the cost of Chinese labor • The national government's reaction to self- driving cars is unknown. Either way the government will be heavily lobbied. • National legislation will be slow. • The government could give subsidies.
Economic	• An increased cost of labor in China would affect revenue. • Heavy disparity between the middle and upper class of America decreases the potential market. • Self-driving cars performance is heavily tied to the economy. • Government spending will predict the use of self-driving cars in civil service, and military use.
Social	• Apple is popular in 1st world countries, but not in 3rd world countries • Consumers are becoming more socially conscious. • Apple's iTunes has created tension within the music industry. • Social norms and fears could lead to a slow release of self-driving cars. • Self-driving cars are perceived as the "future" of the AI industry.
Technology	• Once an Apple product is released it can be replicated. • Apple's proprietary information can be marketed to other industries. • Apple's has a great ability to defend against cyber-attacks. • Self-driving cars are being developed in many companies, and the scope "self-driving" has yet to be defined. • Self-driving cars, and artificial intelligence has the potential to change the tech industry, and the world. • 5G is being developed and would offer faster data transfer.
Environment	• The disposal of electronic parts is under scrutiny. • Apple is highly affected by electricity prices in manufacturing. • Climate change initiatives have government and society prioritizing products that produce a benefit for the environment more than the alternative. • Renewable technology is a trend which can be leveraged in electronics.
Legal	• Apple Pay is susceptible to new regulations. • Self-driving cars will be heavily regulated for safety. • The legal ramifications of holding a user's data could negatively affect how self-driving cars operate. • Legal protection for the operating systems used to create a self-driving car could benefit or hurt Apple.

Exhibit D: Five Forces