Case Study: Effect of Rideshare and Autonomous Vehicles on Parking Requirements in the Bay Area

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With our streets becoming over crowded with many different modes of transportation, parking has followed this trend and proven to be much more difficult for people. This has frustrated citizens and developers alike because there never seems to be enough parking when it′s needed and finding the space and resources necessary to provide sufficient amounts is becoming increasingly difficult. The objective of this report is to create more awareness of how rideshare and autonomous vehicles are affecting parking requirements imposed by cities. The world we live in can change very fast and in order to accommodate for these changes, we need to be planning our cities proactively. This paper will specifically reference two instances where cities accommodated for such inventions. This will provide more information on how rideshare and autonomous vehicles have affected the transportation market and the repercussions of these changes.

Keywords: Rideshare, Autonomous Vehicle, Parking, Transportation, Requirements

Introduction

When the car was first invented back in the late 1800's, peoples lives were changed forever. This allowed for people to easily travel farther distances in shorter times than what was previously thought as possible. Easier commutes then also made it more appealing for families to move away from big cities into more confortable suburbs. Cars have come a long way since their inception and are continually changing the way people and goods move about the world. They have also had a major impact on how we plan our cities to be as efficient as possible, even though it may not feel this way when we are sitting in traffic. Roads have gotten much more congested because a significant increase in car sales during the 1970's and 1980's. During these times it became common for every household to have at least one car, and this is still true for most single-family homes. With housing prices becoming very expensive in California, we have seen a large portion of the population migrate back into major cities to escape the high cost of living and be closer to work: "95% of Californian live in a Census-classified urban area. Urban areas comprise only 5.28% of the state -- which means that almost all of California's residents are packed into less than 6% of the geography" (Pricenomics, 2015). This mass movement of people back into urban cities has also brought a lot of cars along with them. Having a car is supposed to make life easier for people, but it does come with its own difficulties and parking

has proven to be one of the most common. For the general public there never seems to be enough parking when you need it, while developers struggle to provide enough due to cost, schedule, and space constraints. To mitigate this issue, inventions such as rideshare and autonomous vehicles have been adopted into our culture and will continue to have major impacts on how we travel. Awareness of these alternatives should be increased because "As parking is built where real alternatives to driving exist, more people are encouraged to drive and those San Franciscans that must drive find it ever more difficult and expensive to do so" (City of San Francisco, 2018). These changes in how people get around are being recognized by developers and city planners alike and are driving factors for how parking requirements are going to be changed in the near future.

Define Terms

Rideshare:

To understand how rideshare applications and autonomous vehicles are affecting the world we live in, it is important to first have a clear definition of what each of these mean. Dictionary.com defines rideshare as "of or relating to a car service with which a person uses a smartphone app to arrange a ride in a usually privately owned vehicle" (Dictionary.com, 2018). Ever since rideshare applications have first hit the market, there have been two companies competing with each other to be top dog: Uber and Lyft. Uber has taken an early lead in this race by generating $6.5 billion in revenue compared to Lyft's $700 million (Business of Apps, 2017). Similar to how most companies start, the founders of Uber came up with the idea by simply trying to fix a problem they would find themselves in on a regular basis. They then took the idea of ordering a driver from your smartphone to San Francisco and completed their first UberCab trip in July of 2010. Since then Uber has taken the transportation industry by a storm and has no signs of slowing down. Uber now has many different options for what type of car you request based off number of seats, level of luxury, and even a specific category for people needing special assistance. Before ordering an Uber, the application will show the user exactly how much it is going to cost and give an accurate estimate of when pick-up and drop-off times are supposed to happen. In 2016 Uber had approximately 50 million active users and this number has doubled in the past two years, pushing it close to 100 million users.

From 2012-2015 the average number of car sales per year was 7,668,599. In 2016 and 2017 the average number of car sales dropped down to 6,8718,759. (Statista, 2018). With the strong economy that we have had in recent years, one would expect car sales to rise, but this has not been the case. I believe this massive drop in car sales is mainly due to the fact that there are many other viable options for modes of transportation rather than individual car ownership. While car sales continue to drop, rideshare usage has increased dramatically since its inception and is forecasted to follow this bullish pattern.

Autonomous Vehicles:

Since cars were first invented, many people believed the future of travel would occur in the air with flying cars. Accomplishing this feat has proven to be very difficult due to the difficulties that come with producing these types of vehicles and also creating the "laws of the air" for them to follow. A more attainable dream that many people have had is the self-driving car where the operator does not actually control the vehicle. This would allow the driver to use their time spent in the car focusing on something other than driving. In recent years autonomous vehicle is the name that has been given to what was at one time only a dream. Autonomous vehicles can best be defined as a vehicle that can guide itself without human conduction (Techopedia, 2017). Throughout the discovery of autonomous vehicles, people have started classifying the different levels of automation on a 0-5 scale. It starts at no automation where the driver is in control of all functions at all times. Then comes assisted driving where the driver is still in control of all functions at all times, but the car is assisting in some aspects. Partial automation comes in a level 2 where the driver is in control at all times and the car itself may be controlling a function, such as staying in a lane or controlling speed. Level 3 is called conditional automation and this is where the vehicle will control all functions, but a driver is still required to be ready behind the wheel in case of an emergency. After level 3 comes high automation where the car controls all functions in certain times and locations with a safety driver as optional. Finally level 5 is where the car will control all functions at all times and no safety driver is required.

Autonomous vehicles have had a much slower progression, but are expected to have immense impacts on the transportation industry once they become more common. The first autonomous features to be implemented into cars for the public were things such as lane assist and self-parking capabilities. One can now see companies, such as Google and Uber, testing their autonomous fleets in parts of the Bay Area in order to the first company to offer a completely autonomous vehicle fleet available for the public. Similar to the flying car, a main reason why we do not commonly see more of these types of vehicles is because governments are having a difficult time creating laws to dictate this industry. Despite their struggle, the purpose of Article 3.7, Title 13, Division 1, Chapter 1 states, ″The regulations in this articles implement, interpret, and make specific Division 16.6 (commencing with section 38750) of the Vehcile Code, originally added by Statutes of 2012, Chapter 570 (SB 1298), providing for the regulation of autonomous vehicles operated on public roads in California″ (InterRegs, 2018). Uber actually had an autonomous fleet operating in Phoenix, Arizona until there was an accident in March of 2018 where a man was struck and killed by an autonomous vehicle. In this instance, the car did have a driver behind the wheel, but unfortunately they did not have enough time to react and take control of the car before it was too late. Uber immediately halted their autonomous vehicle operations to ensure that something like this would never happen again (Wakabayashi, 2018). Despite having a setback such as this, the trucking and transportation industries are expected to be hit very hard by autonomous vehicles because they will now become much cheaper without having to pay someone to be behind the wheel.

Parking: Why it́s a problem

Parking is one of the biggest difficulties for people on both ends of development projects. Many developers have issues finding the space to meet parking minimums while still being able

to come up with a feasible project that meets there minimum ROI. Parking accounts for 20%-30% of a cities footprint with much of it going unused when people are away at work. This has made it more appealing for developers to provide higher quality housing because they can make higher margins on the same sized property and provide the same amount of parking. Above-grade parking typically costs anywhere from $30,000-$50,000 per stall. This is a lot of money considering how much it can add up to while also taking up multiple floors that could be used for more units or retail space. People are also not going to want to look at parking while they are walking down the street, so why not put the parking underground? Below grade parking can cost more than $60,000 per stall and also add months to the schedule. Other styles of parking have been researched and developed such as CityLift stacker system. This systems works by parking a car on a platform that will then valet your car into a parking structure where cars are stacked like items on shelf. This system is very expensive and still very new to many builders, which keeps many of them at bay. Regardless of all of these issues, people will still need places to live and ways to get around.

Methodology

Research

To get a better sense of how people in the building industry are dealing with this issue, I interviewed many different architects, city planners and developers. In my research there were two distinct questions I would be sure to ask: Have you seen a shift in parking requirements in the past ten years? And how do you think rideshare applications and autonomous vehicles will affect the parking requirements for future projects? Most of the time people would answer by saying they had not seen a major shift in parking requirements yet and that there will be some type of impact from these new forms of transportation, but it was too early to tell exactly what was going to happen. There were instances where I was referred to projects in cities outside of the Bay Area where parking maximums are put in place as opposed to minimums, but still not a significant shift that was noticed across the board. Two interviews I was particularly intrigued by were with regard to the Mission Rock Development in San Francisco and an update to the North Bayshore specific plan in Mountain View.

Case Study

San Francisco: Mission Rock

While conducting my research, I found an on going development that is going to reshape the way people look at San Francisco. This project is located just south of AT&T Park and will consist approximately 1,500 new homes, 8 acres of open space, and the rehabilitation of Pier 48. To gain more insight of how the developers were going to provide all of these amenities in such a small area I interviewed Gerry Tierney, an associate principal at Perkins+Will. His role on this project was acting as the master architect for the entire development as he had previously done for the Treasure Island Master Plan. We talked about parking requirements and how they can be hard to accommodate and make projects more difficult to pencil. During this conversation I found out that the only required parking for this entire development was delegated to the master developer. For this project they are required to provide 2,300 parking spaces to account for the

parking that was already in place for Giants games. To make this happen, the master developer is essentially going to rebuild the existing parking lot underground to create space for the new parks and open space that are to come. This new parking lot is required to have a certain number of charging stations for electric vehicles and dedicated spots for car share companies (ie zipcar). Accomplishing this allowed for the city to impose parking maximums as opposed to the previous parking minimums that were required. This has allowed for the smaller developers that will build the 11 proposed buildings to provide 40% affordable housing to people who qualify as low and middle income. (City and County of San Francisco, 2018).

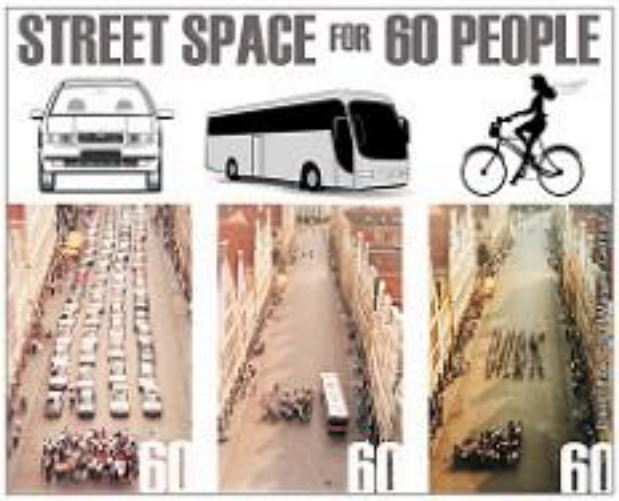

Figure 1 - Street Space of 60 People

After learning more about his the Mission Rock development, I began asking him more questions about where he believed parking was going in the future. He began by saying the best why to minimize the difficulties that come with parking is to first encourage people to use other modes of transportation, specifically walking and biking. Figure 1 creates a good visual representation of how much of an impact individual car ownership can have on available space in cities. (Reid, Carlton, 2011). Now achieving a completely car free society is not feasible, but how rideshare and autonomous vehicles are used in the future can help our societies get closer to maximizing our potential with the space we have. Gerry then went on to mention other studies where he has seen predictions that one autonomous vehicle for public has the potential to take the place of eleven privately owned vehicles. If this forecast proves to be accurate, there would be a 90% reduction in the number of cars by the time autonomous vehicles are adopted into our society. This reduction will allow for more people to move into major cities without creating more pollution. There are similar predictions that show reduction in parking numbers by 85-90% by year 2030. This mentality is one that needs to be adopted now because the buildings that are being built today are going to be around for a long time and having to demolish them only 10 or 15 years down the line would only be inefficient.

Mountain View

Another city I found in the Bay Area that has addressed the impacts of rideshare and autonomous vehicles on the future of our society was Mountain View. While talking to people at their planning office, I was told that they had recently made an update to the North Bayshore precise plan. This is an area east of Highway 101 and is planned to have a lot of construction in both the commercial and residential sectors. With Apple placing their new headquarters in Cupertino, many see this as a great area for growth, but the city is not asking for significant amounts of parking. Under the mobility chapter of the specific plan, the city establishes its key transportation policies that include:

- Setting a district wide single occupancy vehicle mode share target of 45%

- Eliminating minimum parking requirements and setting parking maximums
- Identification of key transportation infrastructure improvements to support SOV target and mode shift

These highlights clearly define the cities stance on how important it is to find alternative modes of transportation. I also think it is extremely important to point out that Mountain View is not like San Francisco, in that it is not a major city. Even though finding the space for parking can be difficult here, there is a lot more available space that could be used for parking when compared to other big cities. The plan then goes on to state that "current City zoning code requires a minimum of 3.33 spaces per 1,000 square feet gross floor area; however, with a 45% SOV mode share target, and a 10% rideshare mode share target as identified in the Shoreline Transportation Study, only 2.7 parking spaces per 1,000 square feet gross floor area would be needed with an employee density of 5.5 employees per 1,000 square feet" (City of Mountain View, 2017). This decrease may seem small, but with office buildings going multiple stories the number of parking spaces can add up fast. Seeing change happen in the Silicon Valley is a very big step in the right direction when trying to solve the issue of parking. It is especially exciting to see change happen in this area because a lot of the technology is being created here, so as rideshare and autonomous vehicles become more common there should be more areas that adopt these types of policies.

Conclusion and Discussion

What's to come

Throughout my research it has become apparent that one thing is for certain: the effect of rideshare and autonomous vehicles is uncertain. This is because there are so many instances where these inventions could improve what is considered to be standard forms of transportation, we will have to wait and see where they are adopted first. But the order in which these alternative modes of transportation become more common should not prevent us from being prepared for their impacts. While planning our cities we do not want to be reactive. To ensure that these types of issues don't get out of hand, such as parking, we need to be addressing them many years in advance. Parking structure can be placed and designed to accommodate future changes in policy, but this will only be done if we begin to see more change in this direction.

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