

[CDS Fellow Research]

Autonomous Vehicle and its value creation to user experience

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Intro

The autonomous vehicle has a wide range of social and business implications from urban design to car ownership. The paradigm shift on mobility attracts businesses, capital, and talent to the new ecosystem. Moreover, while incumbents in the automobile industry figure out the right business model for self-driving cars, new entrants such as Google, Uber, Mobileye and Zoox, are pushing hard to take leadership in this promising space. Currently, the main agenda of the industry is to build a machine that drives more efficiently and safer than humans through advanced technologies in sensing, communicating, processing, and decision making.

Even though the technology promises unprecedented social benefits, more than 50% of U.S adults are doubtful about the adoption of self-driving cars.ⁱ For the self-driving car to be fully adopted, it should provide distinctive value to users. Just freeing up the resource for driving might be indifferent with taking a taxi or using existing ride hailing services.

In this research, I study the self-driving car's path to adoption by benchmarking the case of smartphone adoption. Then, I explore the value creation opportunity of autonomous vehicles and potential business models to capitalize on the hype.

The strategy of iPhone for smartphone adoption:

A good proxy to attitudes and adoption for self-driving car

In 2000, nearly 23% of U.S adults responded that they would not own a cell phone.ⁱⁱ In 2005, after 10 years since the first smartphone, the penetration of smartphones in U.S were only 2%.ⁱⁱⁱ The telecommunication industry had invested to establish 3G mobile networks to accommodate anticipated internet transition from PC to mobile. But they struggled to monetize their new infrastructure due to low adoption of mobile internet devices.

It was the iPhone that changed the mobile landscape. In January 2007, Apple launched its first iPhone with a revolutionary design with touchscreen and a large display. Since then, 'Mobile' has come at the center of people's lives. Now, U.S adults spend 3.3 hours a day using mobile devices.^{iv}

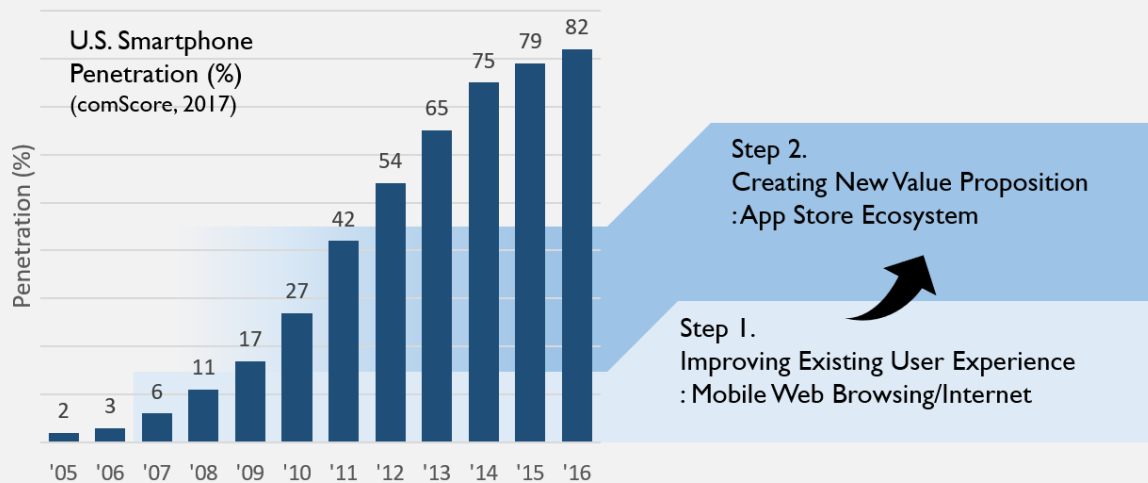
The iPhone's success to mobile transition can be attributed to its value creation to user experience. First, the iPhone enabled services on the device that customers had primarily used through a PC, the Internet. With breakthrough hardware design, it created a mobile Internet experience closer to a PC than any previous mobile phone. In early 2008, Google reported that the iPhone had 50 times more internet searches than any other mobile phone.^v

Second, Apple launched the App store, which opened enormous new user experiences and dynamic use cases, with a wide range of innovative business models. To list a few, users are now able to monitor their health, get instant updates about their community, manage their assets, and shop at their fingertips. The ecosystem for applications attracted developers to experiment with new services and eventually drove the adoption of smartphones by creating a greater value proposition for users.^{vi}

In the following chart, we can observe how iPhone's mobile internet experience and the App store ecosystem dramatically drove adoption for smartphone in U.S.

Figure 1. U.S. Smartphone Penetration and Path to Adoption

In 2007, iPhone introduced breakthrough mobile web browsing capability to users. The adoption of smartphones exploded in the following years as customers experienced distinctive value from smartphones through the app market ecosystem.



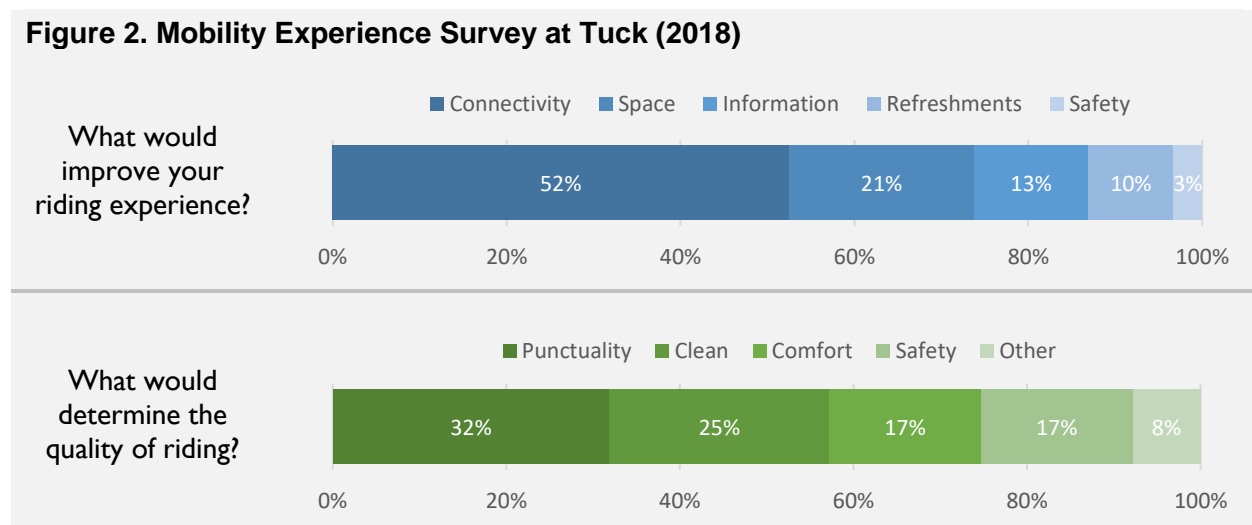
As examined above, there are the two key factors that drove smartphone adoption, which are also applicable to self-driving cars. First, attract users by improving existing experiences. Second, create new user experiences that offers unprecedented customer value.

Factor 1: Improving the Existing Mobility Experience

One of the largest drawbacks of self-driving cars is safety concerns. As it can be observed from the Uber incident in Arizona in March 2018, the public was frightened by mal-functioning self-driving car that led to a human casualty. A majority of Americans are doubtful about the technology because of a lack of trust and safety concerns.^{vii} Also, one industry expert shared his observation that people are not tolerant of machine error as much as to human error. Hence ensuring safety or proving advanced safety will be the absolute foundation of adoption for self-driving cars.

In addition to safety, autonomous vehicle should be able to improve current mobility experience that users have. As a proxy to the riding experience in autonomous vehicles, I conducted a survey of Tuck students to understand their current mobility experience outside of driving cars. More than 65% of participants responded that they do activities which required wireless connectivity while in vehicle such as communicating with others, streaming services, and social network services. Moreover, users identified that connectivity is the most important feature to improve their riding experience. Detailed improvement opportunities and expectation of current mobility services appear in Figure 2.

Figure 2. Mobility Experience Survey at Tuck (2018)



How to Strengthen the Current Mobility Experience

There are three outstanding features that would strengthen users' current mobility experience.

- **Connectivity & Continuum:** People want to stay connected and continue to use their personal device seamlessly while moving.
- **Time Sensitive:** People want to control their riding experience from vehicle arrival time, to route selection, to estimated time of arrival. They don't want to waste time on the way.
- **Quality Space:** The preference for space varies by person. But they fundamentally want a space that satisfies personal needs. Privacy, Productivity, Sanitary condition, etc.




Industry leaders should focus on improving these features so that they can be a bridge for users to find initial value from the driverless car experience. As self-driving technology redefines the

notion of cars, it has potential to better serve users by tackling unmet needs. The technology industry has already experimented with various products and services, including 5G communication, mirroring technology, navigation service, voice recognition and smart homes, applicable to self-driving cars that would enhance the mobility experience.^{viii} For instance, Uber and Spotify have partnered to deliver more a pleasant riding experience by bringing in customer’s favorite music lists. The collaboration simply activates the playlist of rider when they get in the Uber ride.^{ix} It is merely one step into bring-in, beam-in, and built-in applications. With new interior design, driverless cars will ignite more possibilities. Large built-in displays would project rider’s media from a mobile device. Additional in-vehicle computing power may allow users to continue their work without carrying heavy devices. A car can be linked to rider’s calendar thoroughly so that it can be ready for them whenever they need mobility services.

While several of these features might be currently available with conventional cars and services, we can learn from the iPhone that the first wave of adoption was driven by the killer app, web browsing. It guided users to comfortably make the transition to using internet in the mobile interface. Likewise, the initial value that autonomous vehicle should provide is a solution to people’s challenging experience with current mobility services. In this way, the emotional barrier can be lowered and users would easily find out the distinctive value that self-driving cars can provide.

The initial value that driverless car should provide is improving existing challenges with current mobility services, which will help to lower the emotional barrier against widespread adoption and allow users to see the distinctive value self-driving cars can provide.

Table 1. How to improve existing mobility experience?

Feature	Benchmark Business Case	Future Model
 Connectivity & Continuum	<ul style="list-style-type: none"> ▪ In-vehicle wi-fi services ▪ Uber & Spotify Partnership ▪ Apple’s Airdrop & Airplay technology 	<ul style="list-style-type: none"> ▪ Bring-in, Beam-in, Built-in model with 5G Communication and advanced in-vehicle tech infra. ▪ Monetization Opportunity: Advertisement
 Time Sensitive	<ul style="list-style-type: none"> ▪ Google Maps ▪ inRoute Route Planner ▪ Schedule management, Personal assistant 	<ul style="list-style-type: none"> ▪ Optimized route selection to save travel time. ▪ Multi destination planning, Pre-load service ▪ Smart Assistant services linked to personal schedule.
 Quality Space	<ul style="list-style-type: none"> ▪ Alexa/ Google Home Voice Assistant ▪ Smart Home Application ▪ Airline’s passenger service development: personal display, food selection, 	<ul style="list-style-type: none"> ▪ Personalized in-vehicle environment, seat adjustment, temperature/ heat pre-setting ▪ In-vehicle voice assistant ▪ Monetization Opportunity: Premium service

Factor 2: Creating New User Experience

As we observed in the iPhone case, smartphones got the initial attention by improving existing experiences. But it grew explosively and became mainstream because of new, novel experiences that created huge value for users. When the foundational user experience of autonomous vehicle is established, its value proposition should evolve in a way that brings new types of services that fully leverage autonomous capabilities and in-vehicle space innovation. An industry expert remarked “A new economy will emerge around the user experience inside the car”.^x Driverless car technology will allow the vehicle to become a service platform for users.^{xi}

Platform business models are powerful because they leverage network effects to create and manage value propositions. Now, seven out of the top 10 global companies are platform companies based on digital networks. WeWork is another rapidly growing platform company that has a slightly different type of platform, physical workspace. With the space-as-a-service model, it establishes unique network effects for users by cultivating a business community and unique culture for members.^{xii} It presents the type of value that was not readily available through digital-only platforms.

How to Craft New Mobility Experience

The new service platform of self-driving cars will combine three elements.

- Digital Network: Maximizing the value of autonomous vehicle by connecting users, vehicles, and surrounding locations.
- Physical Space: Expanding service offerings to physical space such as preparing snacks, arranging in-person meeting, and customizing in-vehicle spaces.
- Mobility: Leveraging the flexibility that car creates: “users are on-move”

The new platform will unlock countless opportunities by helping people overcome physical barrier and time conflicts. The transit time will not be considered waste but will become a productive and pleasant experience.^{xiii} New possibilities of better utilization of resources will attract customers to autonomous platforms. Some examples of use case scenario appear in Figure 3.

Figure 3. Use Case Scenarios for Autonomous Platform

Primary Care on the Move



Use travel time from work to home for a meeting with your primary care doctor

Concierge Service



Direct your car to pick-up dry cleanings, prepare a cup of coffee, or make it ready whatever you need before you get in the car.

New Entertainment



Enjoy an unforgettable date with your partner on sunset coastal drive with on-vehicle restaurant services

Like existing digital platforms, the autonomous platform will create its value through network effects, encouraging more users and service providers to join the platform. From building a vehicle to be flexible space to connecting diverse actors for self-driving oriented services, the business who can orchestrate the platform to serve the customer with a distinctive value proposition will seize the most value from this rising new economy.

Closure

“You can’t just ask customers what they want and then try to give that to them. By the time you get it built, they’ll want something new.”

- Steve Jobs -

The self-driving car itself does not inherently have a mission. Even though the actors in the industry are now rushing to develop technical capabilities, the technology will be commoditized once it matures. The key value creator will be the autonomous platform and services fully utilizing the new capabilities. As we experienced with the current digital platform gold-rush, first mover advantage is immensely high in platform business models. And, as quoted in above, it will be too late if you wait until the technical readiness is in place.

Hence, it is highly recommended that business leaders should act now and craft right business strategy to extract maximum value from the new ecosystem by taking a two-step approach:

- First, concentrate on solving existing mobility challenges in connectivity & continuum, punctuality, and quality space.
- Second, develop innovative user experiences and business models that leverage the self-driving car’s unique combination of digital networks, physical space, and mobility.

In this way, self-driving car will be accepted by people, and it will empower people to better utilize their resources.

Reference

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