

Driving the Future:

How Autonomous Vehicles Will Change Industries and Strategy

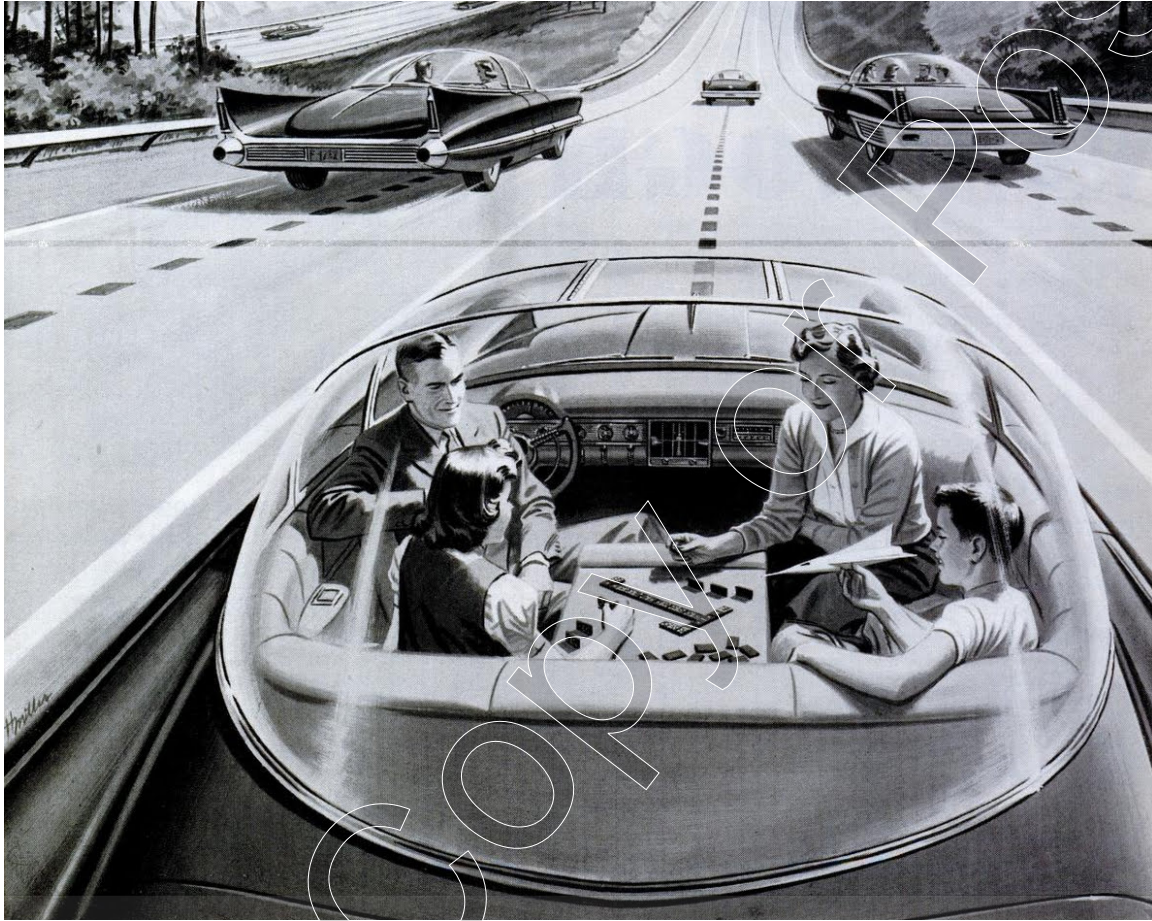
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This case was written by Guoli Chen, Associate Professor of Strategy at INSEAD, and Michael Olenick, Institute Executive Fellow, Blue Ocean Strategy Institute, under the supervision of W. Chan Kim and Renee Mauborgne, Professors at INSEAD. It is intended to be used as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

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Feb. 25, 1957 Life Magazine Advertisement. Caption: "One day your car may speed along an electric highway, its speed and steering automatically controlled by electronic devices... Travel will be more enjoyable. Highways will be made safe – by electricity! No traffic jams ... no collisions ... no driver fatigue."

... I can remember when there wasn't an automobile in the world with brains enough to find its own way home. I chauffeured dead lumps of machines that needed a man's hand at the controls every minute. Every year machines like that used to kill tens of thousands of people.

The automatics fixed that. A positronic brain can react much faster than a human one, of course, and it paid people to keep hands off the controls. You got in, punched your destination and let it go on its way.

We take it for granted now, but I remember when the first laws came out forcing the old machines off the highways and limiting travel to automatics. Lord, what a fuss. They called it everything from communism to fascism, but it emptied the highways and stopped the killing, and still more people get around more easily the new way.

Of course, the automatics were ten to a hundred times as expensive as the hand-driven ones, and there weren't many that could afford a private vehicle. The industry

specialized in turning out omnibus-automatics. You could always call a company and have one stop at your door in a matter of minutes and take you where you wanted to go. Usually, you had to drive with others who were going your way, but what's wrong with that?

“Sally” by Isaac Asimov, 1953

Self-driving cars, also known as autonomous vehicles (AV), are rapidly accelerating from science fiction to showroom fact. Every major auto manufacturer, auto parts maker, and several large technology companies are racing to commercialize AV technology.

In 2001, the US Congress mandated that one third of all military air and ground vehicles drive unmanned by 2015.¹ The Congressional mandate was for “unmanned, remotely-controlled enabling technologies” – remote-controlled cars – but the military wanted vehicles that required no driver at all. Initial progress was slow. Vehicles produced by traditional military contractors never exceeded 10mph (16kph) and required multiple human interventions every kilometre.

Frustrated by the lack of progress, the US Defense Advanced Research Projects Agency (DARPA), the organization that created the internet, announced the *DARPA Grand Challenge*, a series of robot-car races. In 2004, DARPA challenged robot builders to a 142 mile (228.5 km) race with no driver and a \$1 million prize. Fifteen teams qualified and Carnegie Mellon University’s robot travelled the furthest, 7.32 miles (11.78 km). Nobody won. Undeterred, DARPA announced another race for 2005: 132-miles (212k m) with a \$2 million prize. Nearly 200 teams applied and, after qualifying obstacle courses, 43 remained. More tests whittled that to 20 teams and five robots finished.² Stanford won, completing the race in just under seven hours; Carnegie-Mellon came second. In 2007, DARPA issued an “urban challenge” for cars to navigate a mock city, with prize money of \$2 million, \$1 million, and \$500,000 (for first, second, and third place).³ Six teams finished. Carnegie Mellon won, Stanford came in second and Virginia Tech third.

Google co-founders Sergey Brin and Larry Page attended the 2005 race, in disguise, then hired Stanford team lead Sebastian Thrun to continue developing the technology.⁴ By 2007, Thrun’s car, built in cooperation with Stanford, finished second in the Urban Challenge, after Carnegie Mellon. By 2010 Google had created a research lab, “Google X”, with self-driving cars as the first project.

While the army was interested in ambush-proof resupply missions, civilian scientists focused on reducing accidents and increased productivity. In 2015 (the last year for which data is available), there were 35,092 traffic fatalities in the US, 1.1 fatality for every 100 million miles driven. That

1 <https://www.gpo.gov/fdsys/pkg/PLAW-106publ398/html/PLAW-106publ398.htm>

2 Stanford won. Carnegie-Mellon fielded two autonomous vehicles that finished in second and third place. The Gray Insurance Company of New Orleans, LA, created a car that finished fourth, and a group of defense contractors led by Oshkosh Truck Corporation, finished fifth.

3 DARPA provided \$1,000,000 of pre-race funding to each of 11 teams considered most like to build a viable autonomous vehicle.

4 Google never indicated if the firm initially intended to build a self-driving car or wanted Thrun for his talent as a technology visionary with strong engineering skills.

was a vast improvement on 1921, when there were 24.09 fatalities for every 100 million miles driven. The figure declined almost every year thanks to improved safety technology.

Autonomous vehicles are a natural evolution. Experts believe vehicles will inevitably evolve to be autonomous, connected, and primarily driven by electricity rather than internal combustion engines.

“There are so many negatives to owning and operating a car: having to drive it, having to park it, having to fuel it, having to shop for it,” said University of Michigan Professor Larry Burns, former Chief Technology Officer of GM and a consultant with Waymo (Google’s self-driving car spinoff) since 2010. “What we’re really doing is moving a person from one point to another. But actually the automobile is a lot more than that. It’s about having freedom to go where you want, when you want, and who you want to travel with. It became clear to me there’s this convergence of connected, driverless, shared, tailor-designed electrically-driven vehicles. The innovators’ business model was converging with technology and design that is dramatically better at significantly lower cost.”

Autonomous driving, more than any factor, will change the entire driving experience.

“In the historical ecosystem of roadway transportation, a company like General Motors would spend a half billion dollars to develop a new Malibu,” said Professor Burns, who emphasizes the division between “making things and making value”. “They’ll do that over a three-year development period then they’ll put that Malibu on the market and sell it through dealers for 6-10 years and Exxon-Mobile will sell gasoline and Allstate will insure it and GMAC will finance it and somebody else will do the service. Now what we’re seeing are these different models where we’re selling miles, trips, and experiences. It’s a whole different business model. You make money off of every mile sold rather than one time on every car.”

Besides lower cost, self-driving cars are safer and change the entire driving experience. “Imagine that you subscribe to Mercedes for a one-year period and have exclusive use of a Mercedes,” said Professor Burns. “You have a condominium and your exclusive-use vehicle will show up at the front door of your condominium and then will go park itself; it’s smart enough to do that on its own. It won’t need to be charged or it’s gas tank topped-off: Mercedes has your back by – when you’re not using your vehicle – making sure that your vehicle’s being fuelled, washed, and maintained. Then Amazon wants to deliver you a package and your vehicle is parked in some area near where you work one day. Amazon can deliver that in your secured vehicle. Now you have an interplay between package delivery. Another thing that may happen that day is you need to pick up your dry cleaning. You’re at work so you dispatch your little robot exclusive-use vehicle to the dry cleaners to pick-up your dry cleaning. On the way to pick you up (at work), it stops to get a take-home meal. Now your trip home doesn’t include picking up dinner and dry-cleaning. Your trip home is going home. This car, this machine, has been your servant during the day.”

Except for interior comfort, self-driving cars are likely to be a largely undifferentiated commodity. What happens when “The Ultimate Driving Machine,” BMW’s tagline, ultimately drives itself and does so like every other car? “The ultimate driving machine in a traffic jam is like any other car,” answered BMW’s Andreas Klugescheid, Head of Steering Governmental and External Affairs and

Sustainability Communications, when asked that question. “I would claim the majority of my driving would be ideal for autonomous driving but there are times I still love to drive.” Klugescheid highlights that automotive technology is continually changing and that self-driving technology is one of many changes. “In the last 100 years the car always had fuel in the tank and a combustion engine under the hood. In 5-10 years they won't. So there's clearly change.”

Prof. Burns summarizes the challenge succinctly: “What I'd set out to do if I were BMW is make a machine where you feel better when you get out of it than you felt when you got into it. Maybe you feel better because you had productive time. Maybe you feel better because you were able to spend some time with your kid. Maybe you feel better because you took a nap. Maybe you feel better because you were able to just sit and relax. The benefit of the vehicle isn't about 0-60 (how fast a car can accelerate); it's about acceleration that's not even perceived. It's about cornering in a way where you would never get carsick. It's about being able to stretch out and be comfortable. It's about lighting and sound and quietness and all of those things are so important to this new riding experience.”

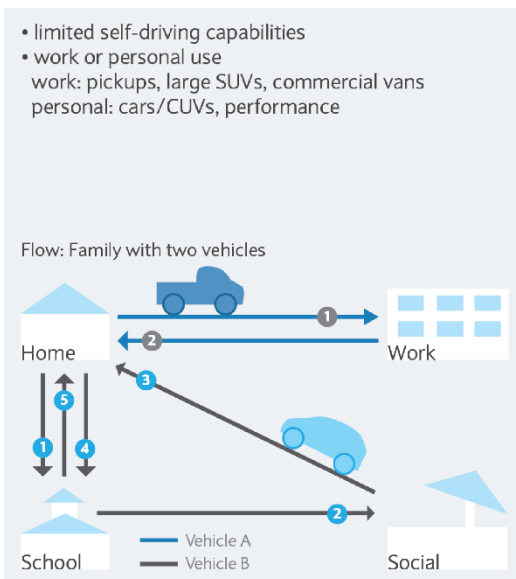
But it remains unclear how automobile manufacturers might meaningfully differentiate their offerings. Acceleration? – irrelevant. Handling? – many won't have a steering wheel. Safety? – they will never crash unless a traditional car runs into them, and even then will be more likely to avoid reckless drivers than human-driven cars could. Customers can own one, summon one from a taxi service like Uber or Lyft, or from fleets owned by auto manufacturers.

Let's review a list of high-end and mass market automaker taglines:

BMW	“The Ultimate Driving Machine”
Mercedes	“Unlike Any Other”
Lexus	“The Passionate Pursuit of Perfection”
Audi	“Advancement Through Technology”
Chevrolet (GM)	“Find New Roads”
Toyota	“Let's Go Places”
Honda	“Start Something Special”
Ford	“Go Further”

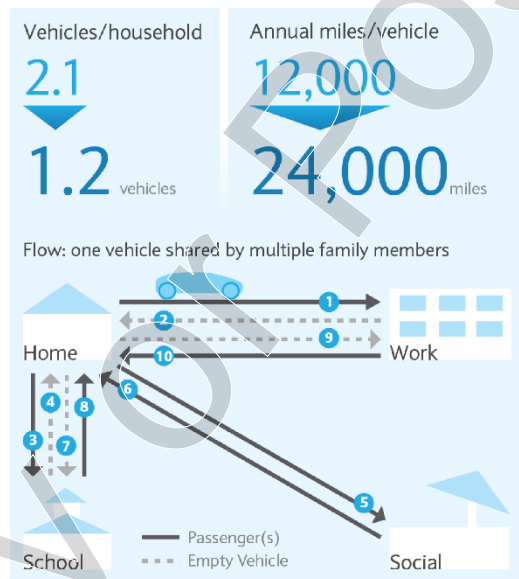
One area virtually all experts agree upon is that fewer overall units will be produced and sold because AV's encourage sharing. A privately-owned AV can service an entire family, dropping spouses off at different offices and driving children around. Shared AV's fulfil the same function and, as computer algorithms match people going in the same direction, might do so in comparable commute times as privately-owned vehicles. The most optimistic estimate for the auto industry, by far, is from McKinsey, which predicts that vastly increased auto sales in developing countries will offset declining sales in developed countries, leading to a flat market. Barclay's estimates a 40% decline in units produced and sold before the market stabilizes. Prof. Burns and other experts predict the decline in vehicle sales will be closer to 75%.

Traditional Two-Car Family

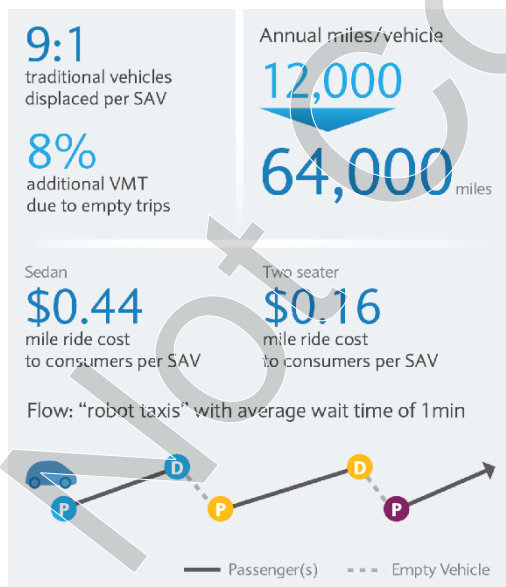


Source: Barclays Research

Family Shared Self-Driving Car (FAV)

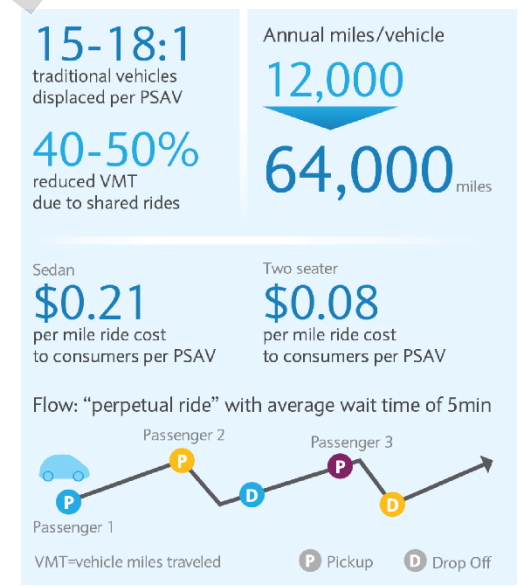


Self-Driving Taxi (SAV)



Source: Barclays Research

Self-Driving Shared Ride Taxi (PSAV)



Questions to discuss

- What do you think about the trend towards autonomous vehicles (AV)? Is it decisive and irreversible? Why or why not?
- Choose an industry you understand and explain how autonomous vehicles might impact that industry. Think about a “to-be” new opportunity autonomous vehicles enable and briefly explain your idea using Kim & Mauborgne’s Eliminate-Reduce-Raise-Create Grid.
- Use autonomous vehicles to discuss the industry evolution, the roles of different players, and the shift of the profit pool.
- Is autonomous driving technology a blue ocean opportunity? Why or why not?
- What, if anything, is the difference between technology innovation and value innovation?