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**Preface:**

Entrepreneurial activities, that include the creation of new firms and the creation and distribution of value assuming the calculated risks, have been associated with economic growth, employment generation, innovation, the acceleration of structural changes, the improvement of the competitive position of a nation and an increase in national productivity. Start-ups do not resist change, they are flexible and innovative. Entrepreneurs play a central role in the process of creative destruction by recognizing new opportunities and turning them into business ideas and by bringing new technologies and concepts into real commercial use, which is especially important in periods of economic crisis.

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# 1. Study of an Entrepreneur:

## 1.1 Entrepreneur Story:

Ford Motor Company was founded by the late Henry Ford in 1903. A century after, the company withstood wars, depression and competition. It is the fifth largest company to date based on worldwide car sales. But just like most businesses, Ford started small. The company had to overcome a lot of struggles and pass several stages and changes in its history.

Henry Ford left home at an early age and worked as an apprentice in some automotive companies until he decided to have one of his own. He founded the Detroit Automobile Company in 1899 and renamed as the Henry Ford Company in 1901. As cases with most starters, he encountered financial difficulties and had to leave the company.

Leaving the company paved the way to his success. As Ford once said, “Failure is simply the opportunity to begin again, this time more intelligently**.**” Living with this principle, he tried again and founded what we now know as Ford Motor Company. He also introduced the then unheard of ‘assembly line’ for his car manufacturing and changed the game for the car industry.

Cars at that time were limited to people of wealth. Though transportation was a daily cadence by people from all walks of life, it was considered an expensive toy for the rich. Car production was still in its infanthood, and production costs were sky high. Thus, owning a car was exclusive for the rich. Until Ford’s assembly line.Henry Ford founded Ford Motor Company with the vision of making quality cars generally available and affordable for the majority. This American dream was not as easy as it sounded. The company started producing automobiles the traditional way, but with the time it was taking to finish a unit along with the materials needed, they had no choice but to compensate these expenses towards the price of their cars. Each automobile needed roughly 12 hours to complete which was costing the company labor and time.

So, Ford started another approach on making cars. He identified stages or steps to creating a unit. Then, he disseminated his workers to specialize on a certain stage. And using a machine similar to a conveyor belt, the cars were moved from one stage to another until all parts were placed. This method significantly decreased labor from the traditional 12-hour period down to 2 hours and 30 minutes. The system decreased the costs and so the car price. Model T, their most popular car unit, had its price reduced from $850 to $290. This new system totally changed the game of automobile industry, from cars being a luxury item exclusive for the rich to being an affordable necessity available for everyone. Ford Motors sales skyrocketed until they were supplying 50% of all cars in the US. But, contrary to the positive reaction of the consumers, other car companies’ sales plummeted to rock bottom.

When Ford implemented the new system, the entire car industry was indignant at Ford for changing the eco-system of the industry. When the Great Depression struck America, 183 out of 200 automobile companies declared bankruptcy. Other car companies knew they had to do something to survive. GM went to the route of creating more personalized cars, Chrysler and Chevrolet started manufacturing automobiles with more creative features while others looked for better ways of assembling cars. Ford survived the Depression.

Introducing new ways of doing things will always create a ripple in the pond. When things are doing great, everyone is adamant to change, no matter how sensible and better it is. It takes a brave and obstinate individual, with a will of steel to disturb an orderly setup. Early on, the game-changer is always looked upon as a dissident, an annoying disturbance, a newbie about to fail. It is later, when the system is adapted and accepted, that many will recognize it as an innovation and a legacy, and the game-changer a brilliant trendsetter and leader.

Ford Motor Company is history itself. It has experienced successes and failures, but through the collective effort of all the people behind it, the company has survived even the greatest war. Along with it, they’ve learned to be innovative, versatile and adaptable to the changes of the world. These have made Ford the mighty company we now see 103 years after it was founded in 1903.

## 1.2 Venture Details:

Henry Ford was nearly 40 when he founded Ford Motor Co. in 1903. At the time, "horseless carriages" were expensive toys available only to a wealthy few. Yet in just four decades, Ford's innovative vision of mass production would not only produce the first reliable, affordable "automobile for the masses," but would also spark a modern industrial revolution.

Ford's fascination with gasoline-powered automobiles began in Detroit, where he worked as chief engineer for the Edison Illuminating Co. The automobile offered the promise of a bright new future.a future Ford wanted to part of. So in 1891, Ford began devoting his spare time to building what he called the "Quadricycle"a crude contraption that consisted of two bicycles placed side by side, powered by a gasoline engine. After working on the Quadricycle for nearly a decade, Ford took Detroit lumber tycoon William H. Murphy for a ride in his hand-built automobile. By the time the ride was over, they were in business.

The Detroit Automobile Company opened in 1899 with Ford as superintendent in charge of production. But the venture only lasted a year. Ford could build a car, but he couldn't build them fast enough to keep the company afloat. Undaunted, Ford hatched a new plan-to build a racer. Ford saw racing as a way to spread the word about his cars and his name. Through the notoriety generated by his racing success, Ford attracted the attention of the backers he needed to start Ford Motor Co. in June 1903.

Ford set up shop in a converted wagon factory, hired workers, then designed and produced the Model A, the first of which he sold to a Chicago dentist in July 1903. By 1904, more than 500 Model A's had been sold. While most other automakers were building luxury-laden automobiles for the wealthy, Ford had a different vision. His dream was to create an automobile that everyone could afford. The Model T made this dream a reality. Simpler, more reliable and cheaper to build than the Model A, the Model T-nicknamed the "Tin Lizzie"-went on sale in 1908 and was so successful within just a few months that Ford had to announce that the company couldn't accept any more orders-the factory was already swamped. Ford had succeeded in making an automobile for the masses, but only to create a new challenge. how to build up production to satisfy demand.

His solution ? The moving assembly line.

Ford reasoned that if each worker remained in one assigned place and performed one specific task, they could build automobiles more quickly and efficiently. To test his theory, in August 1913, he dragged a chassis by rope and windlass across the floor of his Highland Park plant-and modern mass production was born. At peak efficiency, the old system had spit out a finished Model T in 12 and a half working hours. The new system cut that time by more than half. Ford refined and perfected the system, and within a year it took just 93 minutes to make a car.Because of the more efficient production, Ford was able to cut hundreds of dollars off the price of his car. Cutting the price enabled Ford to achieve his two aims in life-to bring the pleasures of the automobile to as many people as possible, and to provide a large number of high-paying jobs.

But there was one problem Ford hadn't foreseen. Doing the same task hour after hour, day after day quickly burned out his work force. The turnover rate became such a problem that the company had to hire close to 1,000 workers for every 100 jobs it hoped to fill. To solve the problem, Ford decided to pay his employees $5 per day-nearly twice the going rate. Workers flocked to Ford's gates.

His labor problems solved, Ford turned his attention to another matter-the issue of who really controlled Ford Motor Co. Believing they were parasites who continually interfered with his plans, Ford bought out all his stockholders in 1919. Free to lead the company as he chose, Ford explored a number of different ventures. In addition to building tractors and single-passenger planes, Ford also operated an early mail route and the first regularly scheduled passenger flights. Undoubtedly the grandest of Ford's ventures was The Rouge-a factory that was in itself one giant machine. Built on the Rouge River, the 1,096-acre plant was the largest industry complex of its time.

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When World War II erupted, the government asked Ford to build the B-24 Liberator Bomber. Ford had suffered a stroke in 1941, and due to his rapidly deteriorating physical and mental health, supervision of the project fell largely to Ford's only son, Edsel. Optimistic Ford spokespeople predicted that B-24s would roll out of the factory at the rate of one per hour. But by the end of 1942, only 56 planes had been built. Plagued by medical problems of his own, the project and the pressure proved to be too much for Edsel. In May 1943, 50-year-old Edsel Ford died. So at the age of 80, in spite of his clearly diminished capacities, Henry Ford once again took up the reigns of Ford Motor Co.

The news alarmed President Franklin D. Roosevelt. As the nation's third-largest defense contractor, Ford was a major part of the war effort. Aware of Ford's increasing mental incompetence, Roosevelt toyed with the idea of bringing in outside managers, or even nationalizing the plant. Instead, in August 1943, the Navy sent Ford's 26-year-old grandson home in hopes that Henry Ford II could bring order to the chaos that Ford had become. For months Clara Ford tried to convince Henry to step down and let their grandson take over. But Ford held out. Finally, Edsel's widow, Eleanor, threatened to sell her considerable holdings in the company if her son wasn't immediately named president. Henry Ford relented, and in September 1945 the crown was passed to Henry Ford II.

After stepping down as president, Ford went into seclusion, appearing only occasionally at company events. The raging fire that him driven him for more than eight decades had died out. On an April evening in 1947, Ford laid his head on his wife's shoulder and died of a cerebral hemorrhage at the age of 84. Tens of thousands of people lined up to view Henry Ford's body as it lay in state. Some factories closed, while others shut down for a moment of silence. In all, it's estimated that several million workers were involved in some kind of demonstration of sympathy for the man who had irrevocably changed their lives and taught America to drive.

Ford Motor Co. was the last major automaker to unionize. Initially, Henry Ford kept his workers from organizing by paying nearly twice the going rate, cutting the workday from 10 hours to eight hours and introducing the five-day workweek. But Ford couldn't keep the United Autoworkers Union (UAW) out forever. When generosity failed, he turned to intimidation.

Ford formed the Service Department to ensure workers did their jobs and to keep the union out of his factory. Under the direction of Henry Bennett, a notorious figure with underworld connections, this group of ruthless thugs brutally repressed any attempt by UAW to organize Ford workers. In 1937, the Service Department mercilessly beat a group of union organizers attempting to pass out leaflets at the Ford factory. The beating left the union leaders battered, but undaunted. It took another four years of pushing before something broke.

On April 1, 1941, Andy Dewar, a worker in the Rouge River plant's rolling mill, changed labor history at Ford. After an argument with a foreman over working conditions, Dewar began yelling "Strike! Strike!" The call echoed through the plant, and the entire rolling line walked out.

Ford was preparing to do whatever it took to keep the UAW out of his factory until his wife, Clara, demanded he settle with the union. Clara rarely interfered in Ford's business dealings, but she was genuinely afraid that the situation would explode into real violence. She threatened to leave Henry if he didn't end the strike. In May 1941, Ford Motor Co. became a union shop. The agreement led to a new era of labor relations in the automobile industry, as workers turned away from their dependence on Ford's paternalism and fear of Bennett's Service Department, and toward the union shop steward and the skills of UAW negotiators.

## 1.3 Challenges Faced:

Ford faced challenges to his vision from his competitors and their business practices. Political leaders with differing social visions often put him at odds when it came to current events. And his defiance of working with organized labor meant legal trouble for his company. Henry Ford faced a somewhat limited access market when he began his company in 1903. Gasoline engines were patented and licensed only to members of what was called the Association of Licensed Automobile Manufacturers. Rather than join the association, he fought for the right to produce his own engines and won - the association collapsed shortly after.

Ford was deeply skeptical of government intervention in business. He had been pleased with the court decision to break the monopoly of the ALAM, but was not in favor of other measures, especially those he thought were leading the U.S. into war. Ford was a committed pacifist up to the outbreak of World War I and lapsed back into anti-war mode between World War I and World War II. Moreover, he was deeply anti-Semitic and had ties to Nazi officials. This put him at odds with political leaders, and many citizens when America became involved in the wars, and his business declined for some time in response.

Finally, he was the last of the big three automakers to sign on to a contract with the United Auto Workers. In Ford's early years, he was known for paying high wages in order to retain workers and reduce turnover. By the end of the 1920s, Ford fought the union (sometimes with paid enforcers). Ford's decline as the result of his pro-Nazi stance, and the growing popularity of the union at the time, meant Ford ultimately lost and had to acquiesce, and negotiate with the UAW.

## 1.4 Marketing Strategies:

Being in the business of cars, trucks, crossovers, Financing and utilities, founded by a legendary Henry [Ford](https://www.marketing91.com/swot-analysis-ford/) and incorporated in 1903 the company have emerged as a front-runner in most of the developed nations in their respective segment of the businesses. With more than 1,90,000 employees and 68 plants worldwide, Ford is using these resources in designing manufacturing, financing and marketing the cars, trucks, SUV’s, Crossovers and Lincoln luxury vehicles in different parts of the world.

Segmentation, targeting and positioning in the Marketing strategy of Ford – Like any other [automobile](https://www.marketing91.com/swot-analysis-of-automobile-industry/) company, Ford uses a mix of [psychographic,](https://www.marketing91.com/psychographic-segmentation/) [demographic,](https://www.marketing91.com/demographic-segmentation/) and [geographic](https://www.marketing91.com/geographic-segmentation-segmenting-geography/) [segmentation](https://www.marketing91.com/6-advantages-segmentation/) variables to cater to the changing [needs](https://www.marketing91.com/needs-wants-and-demands/) of the customers of the industry.

Ford uses differentiated [targeting](https://www.marketing91.com/how-to-make-a-targeting-strategy/) [strategy](https://www.marketing91.com/marketing-and-strategy-models-and-concepts/) for offering the specific [products](https://www.marketing91.com/types-of-products/) to the specified segments of customers.

[Positioning](https://www.marketing91.com/quick-guide-positioning/) is where the products or services stand in the mind of the consumers, what image is built in their mind when they hear the [brand](https://www.marketing91.com/what-is-a-brand/) name. Ford motors use value-based positioning strategy to create emotional and inspirational touch with the customers. Competitive advantage in the Marketing strategy of Ford – Intellectual properties– Ford motors have approximately 38000 active patents which are helping the company in the conduct of its business and it keeps the company technologically ahead of peer companies in the industry.

Stronghold in the developed nations – Ford has large [product](https://www.marketing91.com/what-is-a-product/) [portfolio](https://www.marketing91.com/product-portfolio/) in the developed nations which are helping the company in having deep knowledge of these [markets.](https://www.marketing91.com/types-of-market/)

Manufacturing units – It has 68+ plants worldwide which are helping the company in keeping the price of their offerings low as compared to the peer companies in the market.

BCG Matrix in the Marketing strategy of Ford – It’s business segments i.e. Cars, SUV and crossovers are question marks in the [BCG matrix](https://www.marketing91.com/bcg-matrix/) due to the decline in the market share in the developed nations and not having a focusing operation in the emerging markets.Lincoln Luxury vehicles are stars in the BCG matrix as it is present in the selected markets.

Distribution strategy in the Marketing strategy of Ford – Ford uses the different [channel](https://www.marketing91.com/channel-levels-consumer-industrial-marketing-channels/) of distributions such as authorised dealerships/ service centres, DSA (direct selling agents), resellers, and the [e-commerce](https://www.marketing91.com/e-commerce-segmentation/) sites. Moreover, most of its distribution centres & warehouses are on a lease which is helping the company in reducing its operational cost.

Brand equity in the Marketing strategy of Ford – Ford motors have positive word of mouth and high TOMA (top of mind awareness) in the developed nations but the [brand architecture](https://www.marketing91.com/brand-architecture/) of the company in the developing nations have failed to attract the customers in these markets.

Competitive analysis in the Marketing strategy of Ford – Since the developed nation’s market is already saturated and companies are eating up each other’s market share while some companies like Fiat Chrysler Automobiles, Suzuki motor corporation, [Honda](https://www.marketing91.com/swot-honda-motors/) motor company and many others are targeting emerging/developing nations as these are the market with lots of potential and growth. Increasing price-based competition and declining [demand](https://www.marketing91.com/types-of-demand-2/) are major problems companies in this industry are facing. Its truck division is performing well in some of the developing nations who are modernising their transportation system.

Market analysis in the Marketing strategy of Ford – The automobile market faces several bottlenecks whether it is government regulations, market factors such as labour cost, infrastructure cost, volatility in the fuel prices, currency fluctuations, or the competition in the market. The automotive industry is already crowded with a large number of MNC’s players with no single company in a dominant position worldwide.

Customer analysis in the Marketing strategy of Ford – Customers of Ford motors are the upper middle & middle-income group and transportation enterprises, which are looking for technologically advanced automotive solutions.

# 2. Area Study and knowing the interested field for Start-up

## 2.1 Description of the field:

Driverless cars used to be the sort of thing you’d see in sci-fi films - but in 2018 they’re becoming a reality. Autonomous car technology is already being developed by the likes of Lexus, BMW and [Mercedes,](http://www.autoexpress.co.uk/mercedes/90921/what-s-it-like-to-ride-in-mercedes-f-015-driverless-car) and we've even tested [Tesla’s driverless Autopilot system on UK roads.](https://www.alphr.com/tesla/1003022/tesla-model-s-autonomous-review-we-go-hands-off-with-autopilot-on-uk-roads) Across the Atlantic, Google is developing its automated technology in the wild, and [Apple is rumoured to be working with BMW on its own – probably automated – car.](https://www.alphr.com/apple/1001701/apple-car-steve-wozniak-thinks-project-titan-makes-total-sense-for-apple)

Fully-driverless tech is still at an advanced testing stage, but partially automated technology has been around for the last few years. Executive saloons like the [BMW 7 Series feature automated parking,](https://www.alphr.com/cars/1000940/bmw-s-new-7-series-can-park-itself-via-remote-control) and can even be controlled remotely. Autonomous tech is also enjoying heavy investment around the world, especially in the UK. In 2015, [the government announced new laws](https://www.alphr.com/cars/1001210/the-government-just-put-the-uk-at-the-forefront-of-autonomous-car-testing) for testing driverless vehicles on our roads and, with them, an unprecedented £20 million investment into the technology.

With so much investment and interest in driverless technology, it’s easy to assume that self-operating cars are imminent, but they’re much further away than we might think. Before our roads are flooded with driverless vehicles, manufacturers must tackle a range of technical and ethical challenges, and combat the biggest threat to autonomous technology: humans.

Autonomous vehicles rely on a range of sensors to interact with the world around them, with the [Google Car](https://www.alphr.com/cars/7038/how-do-googles-self-driving-cars-work) prototype coming equipped with eight. The most noticeable is the rotating roof-top LIDAR – a camera that uses an array of either 32 or 64 lasers to measure the distance between objects, building up a 3D map at a range of 200m and allowing the car to "see" hazards. The car also sports another set of “eyes”, a standard camera that points through the windscreen. This looks for nearby hazards like pedestrians, cyclists and other motorists, as well as reading road signs and detecting traffic lights. Speaking of other motorists, bumper-mounted radar, already used in intelligent cruise control, tracks other vehicles in front of and behind the car.

Externally, the car has a rear-mounted aerial that receives geolocation information from GPS satellites, and an ultrasonic sensor on one of the rear wheels monitors the car’s movements. Internally, the car has altimeters, gyroscopes and a tachometer (a rev-counter) to give even finer measurements on the car’s position, all of which combine to give it the highly accurate data needed to operate safely. Using these arrays, the Google Car can read the road like a human, but these sensors come with their own limitations. Autonomous cars simply replace the human eye with a camera, leaving them vulnerable to extreme sunlight, weather or even defective traffic lights. In current autonomous cars, the way this selection of pixels is analysed could be the difference between a safe journey and death.

Since Google unveiled its self-driving car, it has spun off this part of the business into a separate arm under the name [Waymo.](https://www.alphr.com/cars/1005433/waymo-is-suing-uber-for-stealing-driverless-car-tech-secrets) The name comes from Google's mission to find “a new way forward in mobility.” Many believe a connection between cars and traffic infrastructure is needed to combat this problem. “Car-tocar and car-to-infrastructure communication is essential for enabling autonomous driving,” says Christoph Reifenrath, senior manager in technology marketing of Harman’s infotainment division, who supply in-car tech to the likes of [Audi, BMW and Mercedes.](https://www.alphr.com/technology/1001302/bmw-daimler-and-audi-s-31-billion-here-maps-deal-has-dented-apple-and-google-s-in)

The German automotive industry is one of the most powerful advocates of a connected car-traffic infrastructure. Earlier this year, manufacturers including [Daimler, BMW and Audi paid $3.1 billion](https://www.alphr.com/technology/1001302/bmw-daimler-and-audi-s-31-billion-here-maps-deal-has-dented-apple-and-google-s-in) for the Nokia Here mapping service, which will be used as a platform for a connected-car environment. A joint statement released by the consortium reads:

“[Nokia] Here is laying the foundations for the next generation of mobility and location based services. For the automotive industry, this is the basis for new assistance systems and ultimately fully autonomous driving. Extremely precise digital maps will be used in combination with real-time vehicle data in order to increase road safety and to facilitate innovative new products and services.”

To become a viable solution, these systems will be required in every vehicle, including those still used by humans. It’s likely that emergency vehicles like ambulances and police cars will continue to use human drivers, so they’ll need a method of communicating with the autonomous cars around them. “You have to know where an emergency vehicle comes from and when it will be there, so the information is shared between this car and your car,” adds Reifenrath.

## 2.2 Practicability:

Currently, there are no legally operating, fully-autonomous vehicles in the United States. There are, however, *partially*-autonomous vehicles—cars and trucks with varying amounts of self-automation, from conventional cars with brake and lane assistance to highly-independent, self-driving prototypes. Though still in its infancy, self-driving technology is becoming increasingly common and could radically transform our transportation system (and by extension, our economy and society). Based on automaker and technology company estimates, level 4 selfdriving cars could be for sale in the next several years.

Layers of autonomy:Different cars are capable of different levels of self-driving, and are often described by researchers on a scale of 0-5.

* **Level 0**: All major systems are controlled by humans
* **Level 1:** Certain systems, such as cruise control or automatic braking, may be controlled by the car, one at a time
* **Level 2**: The car offers at least two simultaneous automated functions, like acceleration and steering, but requires humans for safe operation
* **Level 3**: The car can manage all safety-critical functions under certain conditions, but the driver is expected to take over when alerted
* **Level 4**: The car is fully-autonomous in some driving scenarios, though not all
* **Level 5**: The car is completely capable of self-driving in every situation How they work:

Various self-driving technologies have been developed by Google, Uber, Tesla,Nissan, and other major automakers, researchers, and technology companies. While design details vary, most self-driving systems create and maintain an internal map of their surroundings, based on a wide array of sensors, like radar. [Uber’s](http://www.popsci.com/uber-raffi-krikorian-driverless-car) self-driving prototypes use sixty-four laser beams, along with other sensors, to construct their internal map; [Google’s](https://www.google.com/selfdrivingcar/) prototypes have, at various stages, used lasers, radar, high-powered cameras, and sonar.

Software then processes those inputs, plots a path, and sends instructions to the vehicle’s “actuators,” which control acceleration, braking, and steering. Hardcoded rules, obstacle avoidance algorithms, predictive modeling, and “smart” object discrimination (ie, knowing the difference between a bicycle and a motorcycle) help the software follow traffic rules and navigate obstacles. Partially-autonomous vehicles may require a human driver to intervene if the system encounters uncertainty; fully-autonomous vehicles may not even offer a steering wheel. Self-driving cars can be further distinguished as being

“connected” or not, indicating whether they can communicate with other vehicles and/or infrastructure, such as next generation traffic lights. Most prototypes do not currently have this capability.

**Impacts:** The costs and benefits of self-driving cars are still largely hypothetical. More information is needed to fully assess how they’ll impact drivers, the economy, equity, and environmental and public health.

**Safety:** is an overarching concern. Many thousands of people die in motor vehicle crashes every year in the United States (more than [30,000 in 2015)](https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812332); selfdriving vehicles could, hypothetically, reduce that number—software could prove to be less error-prone than humans—but cybersecurity is still a chief concern. **Equity:** is another major consideration. Self-driving technology could help mobilize individuals who are unable to drive themselves, such as the elderly or disabled. But the widespread adoption of autonomous vehicles could also displace millions of Americans employed as drivers, negatively impact public transportation funding, and perpetuate the current transportation system’s injustices.

**Environmental:** impacts are a serious concern, and a major uncertainty. Accessible, affordable, and convenient self-driving cars could increase the total number of miles driven each year. If those vehicles are powered by gasoline, then transportation-related climate emissions could skyrocket. If, however, the vehicles are [electrified—](https://www.ucsusa.org/node/4521)and paired with a [clean electricity grid—](https://www.ucsusa.org/node/345)then transportation emissions could drop, perhaps significantly.

To the extent that electrified self-driving cars enable more shared rides (for example, through services such as Lyft or Uber), emissions could drop even further. The Union of Concerned Scientists has worked on transportation-related policy issues for decades, and advocates for equitable, low-pollution vehicles, fuels, and infrastructure. In February 2017 we released a [policy brief that outlines the challenges and benefits of self-driving technology,](https://www.ucsusa.org/node/9909) and that includes seven principles for policy makers, companies, and other stakeholders to use as guides. [Learn more about our work here.](https://www.ucsusa.org/clean-vehicles/self-driving-cars)

## 1.3 Relevance:

First of all, people tend to be very bad drivers, so anything that would remove the human from control of the machine will improve the accident rate by a lot. And US drivers are worse than most, because they have almost no real training in driving before they get their license, and lose most of the training that they do have over the next several years. And then when drivers get old, and they tend to lose their focus on what they are doing, they get into even more accidents. Secondly, driving stuff as a living is very expensive. So by having self driving vehicles (trucks, cars, buses, delivery vans, etc.) will reduce costs a lot and make for cheaper transportation. Thirdly, because of so many accidents, insurance for drivers is expensive, and that creates a huge profitable industry to collect those funds and dole them out to the victims of accidents.

Finally, a large number of the victims coming to emergency wards in hospitals are there from the injuries received in accidents. Eliminating most of those accidents will reduce the load on our health care system, reducing costs for all. And in addition, the biggest cause of traffic jams is from the bad and illogical driving from human drivers. Automated vehicles will be consistent, safe, and avoid traffic jams and construction by knowing how to avoid those situations. And in doing so, traffic will move more smoothly, and we will all get to where we want to go more quickly, and with less aggravation. But of course, there will be some downsides to this, but I’ll let others focus on that. Self-driving cars are poised to revolutionize the transportation industry. There have been many significant shifts in the auto industry since the beginning of commercial auto production roughly eight decades ago, but the basic formula of a human operator guiding a vehicle using a steering wheel and pedals has held pretty steady across that time span. That's changing quickly. Newer cars already have automated features for things like parking and collision detection, and auto and tech companies are hard at work to deliver vehicles that are capable of advanced navigation without input from a human driver.

What can autonomous driving systems do right now?

Automated driving systems (ADS) for cars, trucks, and vans are on the way and set to bring some huge changes and opportunities. Here's a look at what the future might hold, some of the big roadblocks facing [driverless](https://www.fool.com/investing/2019/06/15/4-hard-to-believe-driverless-car-facts.aspx) technology progression, and what the major breakthroughs from the improvement of the tech could mean. Newer cars already feature machine-corrective and machine-assisted technologies like lane correction, potential collision detection, and automated parking. Some cars from manufacturers including Tesla and Audi include semi-autonomous driving features that fall in the Level 3-functionality tier.

Most of the more advanced ADS-enabled vehicles that have been released fall into the Level 2 and Level 3 designations, while commercially available vehicles with true Level 4 functionality are still in the development and testing phases. Ford expects to launch Level 4 vehicles in 2021, and Baidu and Volvo are also teaming to launch Level 4 vehicles in 2021. Some sources suggest that Level 4-capable vehicles will be available even earlier, andAlphabet**'s** Waymo already has a fleet of self-driving vehicles that are seeing limited use as taxis on on public roads. Tesla founder and CEO Elon Musk has stated that his company will have Level 5 electric vehicles ready in 2020.

However, other analysts and industry figures have a more cautious outlook on the technology's development, taking the position that many projections are too optimistic. Steve Wozniak, Apple co-founder and a person who was once bullish on the future of self-driving cars, believes that self-driving car technology is very far away from being good enough to implement at scale. And you might be surprised to hear that Waymo CEO John Krafcik has stated that autonomous vehicles will never be able to drive in all conditions. ADS technology has come a long way, but some significant hurdles and big advancements still must be worked out and implemented before true Level 4 and Level 5 cars are made available to consumers. The diverging range of projections on when these tech advancements will arrive at the consumer level suggests that companies and prognosticators may be using different definitions and grading systems for evaluating driverless functionality.

Are self-driving cars safe?

Some reports and experts suggest that ADS vehicles are already safer than human-operated vehicles when it comes to performing some driving functions. Self-driving cars don't suffer from sleep deprivation, and they can't drive under the influence of drugs or alcohol. They also have wider fields of vision and are designed to obey traffic laws, while human drivers will sometimes disregard laws or fail to follow them due to being distracted.

Self-driving technology has the potential to reduce crashes, but some high-profile accidents have raised questions about risks posed by poorly functioning autonomous-driving systems. In January 2016, a man was killed in China after his Tesla crashed into the back of a cleaning vehicle. The Tesla reportedly had its self-driving features activated at the time of the crash. This marked the first reported death in which a vehicle's ADS features were viewed as a potential contributing factor, although the police did find that the Tesla driver had not been paying attention to the road in accordance with the autopilot rules. In May 2016, a man died in the U.S. after his Tesla hit a truck and its tractor while in autopilot mode. The Tesla's sensors misidentified the truck's white tractor as being part of the sky. There have been instances in which self-driving cars appear to be at fault for crashes, but human operators not paying attention to the road (as is required in Level 2 and Level 3 systems) has also been a factor.

Debate about the safety of driverless cars intensified in 2018 after a woman in Arizona was struck and killed by an Uber vehicle that was reportedly operating in self-driving mode. The accident prompted the ridesharing company to temporarily suspend its testing of autonomous vehicles on public roads. The vehicle involved in the crash was categorized as operating with Level 3 functionality, and reports suggest that the pilot of the car was looking down at the time of the accident -- which means the accident could have partially been the result of human error. Uber resumed testing roughly nine months after the fatal crash. The public data available for evaluating how safe self-driving cars are remains somewhat limited. Most of the cities and states in which autonomous driving testing is taking place tend to have relatively dry weather conditions and simple road systems that make it easier for driverless vehicles to function. California is also the only state in America that requires companies testing driverless cars to submit reports detailing each accident involving autonomous vehicles on public roads. But even California's reporting requirements do not provide a very detailed view into the performance of driverless vehicle systems. It's difficult to make a clear across-the-board assessment about the level of safety that autonomous vehicles provide. Competing automated driving systems also rely on different technology platforms, and some systems are likely safer than others, but it does appear that autonomous driving systems can outperform human drivers in ideal operating conditions. A study from Axios found that humans were responsible for most of the accidents in California involving self-driving cars from 2014 to 2018. However, as noted by Waymo's John Krafcik, the technology still needs improvements to make it more functional in a wider range of scenarios.

Will people accept self-driving cars?

Self-driving cars have some perception issues to overcome. The 2019 installment of AAA's annual autonomous-vehicle survey found that 71% of people surveyed would be afraid to ride in fully autonomous vehicles -- down slightly from the 73% of respondents in 2018 and up substantially from the 63% of respondents who said that they would be scared to be a passenger in a driverless vehicle in 2017. Just 19% of respondents in the 2019 survey said that they would be comfortable with putting their children and other family members in autonomous vehicles. A report from CivicScience produced similar results, with 72% of respondents indicating that they were "not comfortable at all" with driverless cars. Just 6% of respondents in the CivicScience study reported that they were completely comfortable with the technology.Data shows that people are cautious about ADS technology and that many will need to see evidence that it is safer than having people drive before embracing it. A Reuters Ipsos poll published in April 2019 found that half of people thought that autonomous vehicles were more dangerous than vehicles operated by human drivers. Two-thirds of survey respondents indicated that they thought self-driving cars should have to demonstrate a higher standard of safety than human drivers.

Some experts believe that weak support for driverless vehicles stems from highprofile accidents involving ADS technology and people having little experience with autonomous vehicle technology. Greg Brannon, AAA's director of Automotive Engineering and Industry Relations, laid out this explanation for the current perception surrounding driverless technology and what he expects will improve sentiment. Automated vehicle technology is evolving on a very public stage, and as a result, it is affecting how consumers feel about it. Having the opportunity to interact with partially or fully automated vehicle technology will help remove some of the mystery for consumers and open the door for greater acceptance. AAA's study found that drivers who had experience with automated driving features including lane-keeping assistance, automatic emergency braking, and self-parking were more likely to trust autonomous driving features. If the technology continues to improve and machine-operated driving systems are shown to be reliably safe, favorability ratings for self-driving cars will likely increase over time.

What benefits could self-driving cars offer?

If self-driving technology continues to progress as many analysts anticipate, autonomous vehicles could actually dramatically reduce the occurrence of automotive accidents. Tens of thousands of people in the U.S. are killed in car accidents each year, and many more people are injured. Auto collisions are also hugely costly, causing hundreds of billions of dollars in damage each year in the U.S., according to some studies, and the National Highway Traffic Safety Administration (NHTSA) estimates that 94% of auto accidents are caused by human error. Reducing human input has the potential to result in fewer deaths and injuries and reduced economic damage if automated driving systems are up to the task of taking over. Having self-driving cars could also give people a lot more free time. Commutes might be spent working on projects, talking to other passengers, or watching a favorite television show on an in-vehicle entertainment system. While many people enjoy driving, the opportunity to get things done or enjoy leisure time while in transit could translate to significant productivity and quality-of-life improvements. The average American spends more than 12 days driving each year, and the country's drivers register more than 80 billion

combined hours on the road annually, according to the Federal Highway Administration and the Department of Transportation.

Could driverless vehicles completely replace regular cars?

With a staggering number of deaths and massive expenses stemming from automobile accidents due to human error, some people have asked whether human driving might be phased out if autonomous vehicles are shown to be significantly safer. The argument could be made that failing to fully transition to autonomous transport will result in lives being lost, unnecessary damage being incurred, and energy resources being wasted. Major technological improvements would likely be needed before a full movement away from human-operated vehicles could gain public and legislative support, but some people in the field see the shift happening. Elon Musk stated in 2015 that he believed that cars operated by humans would one day be outlawed because autonomous vehicles would be much safer. Robotics and artificial intelligence expert Rodney Brooks wrote in a 2017 report that he sees a long road to getting driverless cars to the point at which they are as smart as humans and can reliably handle the unexpected anomalies that pop up on the road. However, Brooks also stated that he believed many people reading his report would see autonomous vehicles make human driving disappear within their lifetimes.

Many experts believe that fully autonomous vehicles functioning at scale could be decades away or that the technology might never be capable of fully replacing human drivers. Even if driverless cars were reliably shown to be as safe as or safer than human drivers, many people would not want to give up having the ability to drive. A poll conducted by Gallup in 2018 found that 34% of people enjoyed driving "a great deal," while another 44% enjoyed it "a moderate amount." Those results suggest considerable affinity for having control over vehicles, and it's not unreasonable to think that a hypothetical legislative push to have human drivers completely relinquish the steering wheel would be met with resistance.

As Musk and others have pointed out, it is possible that significant safety improvements brought about by driverless cars could result in government efforts to further regulate or outright ban human-operated vehicles. It might seem farfetched at present, but no one can say with certainty what the future holds, and evidence showing that accidents would be reduced and lives would be saved could be very persuasive.

Is the rise of self-driving cars an investing opportunity?

With automated driving systems on track to continue improving, it's reasonable to think that the technology could be a huge tailwind for companies that are positioned to capitalize. Business Insider Intelligence reports that roughly 10 million cars with automated navigation technology will be on the road in 2020. McKinsey has predicted that roughly 15% of automobiles sold in 2030 could be fully autonomous. Intel has estimated that the global market for autonomous vehicles, or "the passenger economy" as it dubs it, will surpass $7 trillion annually by 2050. Morgan Stanley has estimated that providing service to autonomous vehicles will be a $200 billion industry annually for telecom providers in 2050 and expects that roughly 300 million autonomous vehicles will be on the road at that time. The rise of [autonomous vehicles](https://www.fool.com/investing/2019/08/27/how-to-invest-in-self-driving-car-stocks.aspx) will have big impacts across a wide range of industries, and this means many companies could benefit from the emerging tech. Leading technology companies like Amazon and Apple can be counted on to have product and service offerings in the autonomous vehicle space. Morgan Stanley has referred to smart cars as "iPhones on wheels" - a description that reflects the automobile's potential to emerge as one of the next big consumer-level computing hubs and suggests the potential for services beyond one-time vehicle sales.

What do self-driving vehicles mean for car companies?

It's still not clear what the rise of autonomous vehicles will mean for the automotive industry's major players. Cars that are capable of navigating the streets without a human driver could be rented out by their owners for use in ridesharing services -- a trend that might result in a drastic reduction of individual car ownership and work against [auto manufacturers.](https://www.fool.com/investing/how-to-invest-in-car-stocks.aspx) The introduction of selfdriving cars is widely viewed as the key to getting ridesharing businesses like Uber and Lyft into states of consistent profitability. In some markets, labor accounts for roughly 60% of the total cost structure in a traditional taxi business, so there's room for huge efficiency improvements with the shift to autonomous vehicles. If ridesharing services become significantly cheaper, individual car ownership could decline substantially. The convenience offered by individual car ownership won't vanish in the near future, but the value proposition is already changing thanks to ridesharing services, and shifts could be even more dramatic with advancements in ADS technology. Alternatively, some models for how automated driving systems will impact auto manufacturers hold that carmakers and fleet operators like General Motors, Fiat Chrysler, and Waymo will own most of the market's self-driving vehicles, and consumers will simply use them through a ride-hailing service. Others suggest that driverless vehicles could actually increase personal ownership because people would be able to easily rent their vehicle out for ridesharing.

# 3. SWOT Analysis:

## 3.1 Knowledge about field:

Driverless cars used to be the sort of thing you’d see in sci-fi films - but in 2018 they’re becoming a reality. Autonomous car technology is already being developed by the likes of Lexus, BMW and [Mercedes,](http://www.autoexpress.co.uk/mercedes/90921/what-s-it-like-to-ride-in-mercedes-f-015-driverless-car) and we've even tested [Tesla’s driverless Autopilot system on UK roads.](https://www.alphr.com/tesla/1003022/tesla-model-s-autonomous-review-we-go-hands-off-with-autopilot-on-uk-roads) Across the Atlantic, Google is developing its automated technology in the wild, and [Apple is rumoured to be working with BMW on its own – probably automated – car.](https://www.alphr.com/apple/1001701/apple-car-steve-wozniak-thinks-project-titan-makes-total-sense-for-apple)

Fully-driverless tech is still at an advanced testing stage, but partially automated technology has been around for the last few years. Executive saloons like the [BMW 7 Series feature automated parking,](https://www.alphr.com/cars/1000940/bmw-s-new-7-series-can-park-itself-via-remote-control) and can even be controlled remotely. Autonomous tech is also enjoying heavy investment around the world, especially in the UK. In 2015, [the government announced new laws](https://www.alphr.com/cars/1001210/the-government-just-put-the-uk-at-the-forefront-of-autonomous-car-testing) for testing driverless vehicles on our roads and, with them, an unprecedented £20 million investment into the technology. With so much investment and interest in driverless technology, it’s easy to assume that self-operating cars are imminent, but they’re much further away than we might think. Before our roads are flooded with driverless vehicles, manufacturers must tackle a range of technical and ethical challenges, and combat the biggest threat to autonomous technology: humans. Autonomous vehicles rely on a range of sensors to interact with the world around them, with the [Google Car](https://www.alphr.com/cars/7038/how-do-googles-self-driving-cars-work) prototype coming equipped with eight. The most noticeable is the rotating roof-top LIDAR – a camera that uses an array of either 32 or 64 lasers to measure the distance between objects, building up a 3D map at a range of 200m and allowing the car to "see" hazards. The car also sports another set of “eyes”, a standard camera that points through the windscreen. This looks for nearby hazards like pedestrians, cyclists and other motorists, as well as reading road signs and detecting traffic lights. Speaking of other motorists, bumper-mounted radar, already used in intelligent cruise control, tracks other vehicles in front of and behind the car.

Externally, the car has a rear-mounted aerial that receives geolocation information from GPS satellites, and an ultrasonic sensor on one of the rear wheels monitors the car’s movements. Internally, the car has altimeters, gyroscopes and a tachometer (a rev-counter) to give even finer measurements on the car’s position, all of which combine to give it the highly accurate data needed to operate safely. Using these arrays, the Google Car can read the road like a human, but these sensors come with their own limitations. Autonomous cars simply replace the human eye with a camera, leaving them vulnerable to extreme sunlight, weather or even defective traffic lights. In current autonomous cars, the way this selection of pixels is analysed could be the difference between a safe journey and death. Since Google unveiled its self-driving car, it has spun off this part of the business into a separate arm under the name [Waymo.](https://www.alphr.com/cars/1005433/waymo-is-suing-uber-for-stealing-driverless-car-tech-secrets) The name comes from Google's mission to find “a new way forward in mobility.” Many believe a connection between cars and traffic infrastructure is needed to combat this problem. “Car-to-car and car-to-infrastructure communication is essential for enabling autonomous driving,” says Christoph Reifenrath, senior manager in technology marketing of Harman’s infotainment division, who supply in-car tech to the likes of [Audi, BMW and Mercedes.](https://www.alphr.com/technology/1001302/bmw-daimler-and-audi-s-31-billion-here-maps-deal-has-dented-apple-and-google-s-in) The German automotive industry is one of the most powerful advocates of a connected car-traffic infrastructure. Earlier this year, manufacturers including [Daimler, BMW and Audi paid $3.1 billion](https://www.alphr.com/technology/1001302/bmw-daimler-and-audi-s-31-billion-here-maps-deal-has-dented-apple-and-google-s-in) for the Nokia Here mapping service, which will be used as a platform for a connected-car environment. A joint statement released by the consortium reads:

“[Nokia] Here is laying the foundations for the next generation of mobility and location based services. For the automotive industry, this is the basis for new assistance systems and ultimately fully autonomous driving. Extremely precise digital maps will be used in combination with real-time vehicle data in order to increase road safety and to facilitate innovative new products and services.” To become a viable solution, these systems will be required in every vehicle, including those still used by humans. It’s likely that emergency vehicles like ambulances and police cars will continue to use human drivers, so they’ll need a method of communicating with the autonomous cars around them. “You have to know where [an emergency vehicle] comes from and when it will be there, so the information is shared between this car and your car,” adds Reifenrath.

## 3.2 Swot Analysis:

**Strengths:** Arguably the most significant benefit to automated vehicles is the potential for safer transportation. When machines can eliminate human error, the ability to control the flow of traffic is greatly increased. While there are still concerns with machine hardware/software that pose risk, those risks already exist in our current model of transportation (albeit on a simpler scale). Will Handsfield, transportation director for the Georgetown Business Improvement District, claims in his [article](http://greatergreaterwashington.org/post/12955/how-will-self-driving-cars-change-transportation/) that, “Over 80% of [automobile related fatalities] are attributable to human error, either negligence, distraction, incapacitation, malice or other uniquely human quality.” It’s also worth mentioning that a major strength to automated driving are the stresses that would not longer be a part of daily life. The morning commute to work would be relaxing as you drank coffee and read the newspaper. No longer would it be uncouth to be caught using an electric razor or applying mascara by fellow commuters. Now, you’ve got nothing but time as you ride to work.

**Weaknesses:** The weaknesses presented by automated driving come in varied forms. The initial concern would be the reliance on technology. Driving can be a very dangerous task, and to put that task entirely under the control of an automated system is frightening. In an automated transportation system, safety is completely reliant upon the infrastructure of the program. How long will it take to develop such an infrastructure? Regulations need to be determined for manufacturers, and traffic systems may need to modified in order to make automated driving possible in some areas. A massive amount of data needs to be collected and hours upon hours of testing need to be conducted before implementation could be possible. Alexis Madrigal states in her [article](http://www.theatlantic.com/technology/archive/2014/05/all-the-world-a-track-the-trick-that-makes-googles-self-driving-cars-work/370871/) that, “So far, Google has mapped 2,000 miles of road. The US road network has something like 4 million miles of road.” There are other, more abstract, factors to consider as well when talking about weaknesses. What are the legal implications of selfdriving cars? If an autonomous vehicle is involved in a crash, who is held liable? The owner of the vehicle? The manufacturer? And what about the vehicles ability to make tough decisions? Kyle Stock poses a scenario in his [article;](http://www.businessweek.com/articles/2014-04-03/the-problem-with-self-driving-cars-they-dont-cry) “Consider a bus swerving into oncoming traffic. A human driver may react differently than a sentient car, for example, if she noticed the vehicle was full of school kids. Another person may swerve differently than a robot driver to prioritize the safety of a spouse in the passenger seat.”

**Opportunities:** The opportunities presented by autonomous transportation are seemingly limitless. Obviously, business and manufacturing will suffer losses and experience gains. Jobs like taxi and bus drivers will go away, but new occupations will emerge in the industry. Manufacturing itself will change dramatically. Handsfield claims that cars will be parked for 98% of their lives (which currently average 15-26 years). However, autonomous cars would present a new paradigm for transportation; one much fewer cars spend much more time on the road. The opportunity for ride-sharing will present an entirely new lifecycle for automobiles. Handsfield claims, “Automobile manufacturers will have to adapt the volume of vehicles they produce annually. While many fewer cars will be needed across the economy, those that are autonomous will be driving much more frequently. Their replacement cycle would be more similar to police vehicles, which only last around 3-5 years before wear and tear makes replacement a better option than repair.” Alongside this change in the manufacturing paradigm could be the ownership structure. While cars may become more expensive, the need to own one might be less crucial for many Americans. Instead, ride sharing may become much more popular, turning transportation into more of a pay-as-you-go service. As the country prepares to shift towards another system of transportation, this could also become the perfect opportunity to incorporate more electric technology into automobiles, thus reducing carbon-emissions. Handsfield argues that although there are big pushes to spread multiple charging ‘kiosks’ in certain areas, an automated transportation structure would allow for central charging stations instead. IssiRomem, PhD in economics at the University of California, Berkeley, argues there will be indirect impacts on the economy as well. In his [article,](http://cityminded.org/how-will-driverless-cars-affect-our-cities-6526) Romem argues two main points; that autonomous cars will cause cities to expand, and that they will decouple buildings and parking lots, which will make available valuable land for development. By changing the way that we commute, the need to park locally will significantly decrease (if not disappear in some areas). This means that mean areas will be able to develop much more space currently allocated to parking structures. Romem also argues that, alongside developing this unused space, people will be more willing to commute, which will cause cities to grow. He states, “Like suburban rail in the early twentieth century and the mass consumer automobile that followed, driverless cars will generate a gradual, but dramatic expansion of cities.”

**Threats:** While the opportunities to self-driving cars might seem limitless, so might the threats. Perhaps the greatest threat is the potential for injury via unforeseen scenarios. Stock states, “In a crash situation, human drivers are processing a staggering amount of information in fractions of a second. The computer is doing the same thing, but much faster, and its decisions are effectively already made—set months or years earlier when the vehicle was programmed. It just has to process; it doesn’t have to think.” But what happens when a scenario presents itself that the programmers didn’t foresee? Or a set of factors arise that the decision making algorithm cannot process?And what about the job sector that will be altogether eliminated? Autonomous driving would create a transportation revolution, not only economically, but culturally. Handsfield reiterates the common topic of isolationism when he says, “As urbanists, we’ve often succumbed to a gut reaction that cars are bad, transit is good. However, the reality is that it is not cars that are bad, but the singleoccupancy driver paradigm that is so damaging to our environment, urban fabric and quality of life.” While self-driving cars might change the way we own and share automobiles for transportation, will it isolate us further from one another? The technology itself also poses major threats. Will the software systems be tamper-proof? What if someone reprogrammed a self-driving car for malicious purposes? In order to operate efficiently, there must be a single, ultimate network on which these vehicles communicate and operate with one another. Privacy concerns will surely arise when your location can be tracked based on your transportation history. Surely someone will seek to collect and sell that information much the same way your browsing habits are recorded online. Public response to such an invasion of privacy could have a staggering effect on the implementation of a self-driving automobile into society. All of these threats (and many more) will likely become factors in the biggest threat to autonomous driving; the special interest lobby. There are a lot of people with a lot of money that would not like to see the current paradigm of transportation change. Auto manufacturers, driver’s unions, oil companies, etc. The list is potentially endless of influential groups that would see self-driving cars as a threat.

## 3.3 Summry:

Self-driving car technology is advancing every day, and it's only a matter of time before fully driverless vehicles appear on public streets. Almost daily, there's a new development in the driverless car space, and nearly every major car manufacturer, ride-sharing service and tech company from [Apple](https://www.techradar.com/in/news/car-tech/satnav/everything-you-need-to-know-about-the-apple-car-1292674) to [Google](https://www.techradar.com/in/news/waymo) has bought into the driverless car industry. And, if you take all the driverless car chatter at face value, we’re only a couple years away from a utopian society where cars will navigate and park by themselves, and accidents become a rarity. In fact, Google wants to have a self-driving ride-hailing service on the road by the end of this year. [Apple self-driving cars,](https://www.techradar.com/in/news/car-tech/satnav/everything-you-need-to-know-about-the-apple-car-1292674) meanwhile, are spotted regularly, driving down the road with rigs housing everything that's needed to run a selfdriving experience. While the driverless car industry continues to grow, one unfortunate turn in the journey of self-driving cars is a number of [accidents,](https://www.techradar.com/in/news/uber-suspends-public-self-driving-tests-after-pedestrian-struck-and-killed) some of them fatal, which show the technology that cars use to spot pedestrians and other obstacles and avoid collisions still has a long way to go. With more companies applying for permits to test driverless cars on public roads, and more public scrutiny on the tech than ever before, we thought it best to break down how companies like Apple, Google, Uber, Tesla and others train artificial intelligence to see the road—and which AIs might have a blind spot. We've also gathered the latest details on which countries allow public driverless car testing, which companies are developing the smartest self-driving artificial intelligence (AI) models, and what the future of the driverless car industry could bring in the next few years.

# 4. Business Idea and Value Proposition with Customer Segmentsand Selling Plan:

## 4.1 Unique Business Idea:

Business deals of autonomous vehicle are very vast and large. Because it is very unique idea to deal with. This concept will shake the market and all the investors, revolution in the market. Because once this kind of vehicles will be launched in the market this will make the huge change in the world because this will reduce the human work of driving the vehicles for long time like 8 hours and so on. People don’t use public in large amount because they think they public transport are not safe enough you can trust them for the safety and security. For driving the vehicles for large time human being get bored and body start aching due to which some people are not able to drive for long distance and suffer several problems in the body which may lead to physical problem and internal organ problems. Due to which sometime human organs stop working. And those internal minor damage and problems become take appearance of big problems. For removing this problem people found solution to hire driver for their vehicle so that they don’t have to drive by their own. But the driver they are hiring is also a human so that he also suffers the same problems and sometime you have to ride for days. Which is not possible for single person to drive. Sometime human being made in contact with accident because he/she sleeps during the driving and sometimes they are not much more aware and concentrated. That’s why they come in contact with the accident may lead to lose their lives.

So.Making the solution of this kind of problems which are facing by human being in daily life.

We have an idea of AUTONOMOUS VEHICLES:

Autonomous vehicles are the concept of modern science in which the vehicles drive themselves by their own. They may work on fuel like electricity as well as petroleum products like petrol and gasoline. For these kinds of vehicles, we use technologies like machine learning and artificial intelligence. Which provide the virtual brain to the vehicle so that it can drive itself safely and make you reach at destination in less time by obeying the traffic rules. For this we don’t need any driver. We don’t have to wait for anyone permission to come with us and take us to our destination.

But by using this technology we can go wherever we want to go.

Autonomous vehicles are very efficient and reliable because these vehicles are One-time investment techniques. In this we have to just buy them they run itself in best case efficient provide best mileage save your money from spending driver and save money on fuel so that you can save money and invest on our other autonomous vehicle.

## 4.2 Value preposition and customer segments:

Usually the customer wants the thing which helps him in the way so that he doesn’t have to work hard and all the money which he invested will be safe and secure and fully efficient. so that they can get free from the tension of losing the money he invested. For securing the money which people have invested we have the vehicles which helps in the way you don’t have to drive this vehicle. You have sat in the car and get relaxed. For these requirements there is no other vehicle which can provide you these features in this range. In our autonomous cars the specs are 1999cc engine which works on petrol and 300hp 5000nm torque and fuel efficiency of 17kmpl. The seats of the cars are very comfortable so that you can sleep on the seats without any fears.

## 4.3 Promotions:

* Promoting the vehicles on T.V.

Promoting on T.V. would be the best way of the promotion. Because most of the people used to watch all day. If we promote our product then they come to know about it and may be buy it.

* For T.V. on most viewing channels

For T.V. we have to choose the channels which have max ratio of watching so that the people can easily come to know about the self-driving vehicles which are very useful for them.

* Hiring the most famous and lovable actor by people. So that people follow him and buy our vehicles.

When we hire the most demanding actor for the promotions. At that time people follow that person and do whatever is done by that actor because this the techniques of fan base promotion in this we just have to make the public greedy for the product and increase the salary.

* Promoting using the banners and news, newspaper. So that wherever the people saw they always see our products
* When people come to know about this is unique and different vehicle then they are very happy to buy the vehicle and use it. Once they use use our car then there is no choice for them for choosing the other vehicle over our vehicle.
* Hiring the most famous and lovable actor by people. So that people follow him and buy our vehicles.

When we hire the most demanding actor for the promotions. At that time people follow that person and do whatever is done by that actor because this the techniques of fan base promotion in this we just have to make the public greedy for the product and increase the salary.

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* When people come to know about this is unique and different vehicle then they are very happy to buy the vehicle and use it. Once they use use our car then there is no choice for them for choosing the other vehicle over our vehicle.

## 4.4 Selling Techniques:

There are so many techniques to sell any product.

For selling the products there are some key points are:

* Promotion
* Discount on special occasions
* Provide more facility at less rate (then increase the price according to demand).
* Provide hub, service centre more and more in every city.  Have to make maximum number of showrooms  Show features on internet T.V.
* Creating more and more ads of the vehicle on every site so that more and more people will get aware toward us and buy our products.
* Giving pamphalets.

# 5. Customer Relation Building, Revenue Streams and Resources:

As autonomous vehicle will continue to develop and spread across various industries , it will be important to develop certain criteria’s in CRM(Customer Relationship Management).

## 5.1 Evolution and Change

CX, or Customer Experience, has become a competitive differentiator for many businesses. Not only is importance placed on the speed of responding to customer issues, but also the way in which these issues are resolved. How companies engage with their customers has evolved from providing solutions to customer complaints, to proactively anticipating problems and addressing them beforehand.

Big Data, Data Science and Artificial Intelligence all play a part in Customer Experience. Big Data, which is used to understand patterns and trends, can improve customer experience by shaping experiences to drive repeat business, customer loyalty and profits. Related to Big Data, Data Science, or Data-Driven Science, is the method by which information is extracted from data. Businesses that incorporate these big data principles can be better informed about customers and can help understand customers mainly through the use of statistics. According to the article in [MaritzCX,](https://www.maritzcx.com/blog/%EF%BB%BFbig-data-the-case-for-customer-experience/) Big-Data — The Case for Customer Experience, 64% of organizations see CX as the primary ROI goal for Big Data.

According to [Gartner,](http://www.gartner.com/imagesrv/summits/docs/na/customer-360/C360_2011_brochure_FINAL.pdf) by 2020 85% of business relationships will not be managed by humans. AI platforms can aid businesses’ Customer Experience by analysing buying patterns and recognizing individual customers. This helps to improve relevancy and deliver a better customer experience. This more personalized experience improves customer satisfaction and increases customer loyalty.

Predictive Service allows businesses to detect and analyze data patterns in order to forecast future behavior based on past behavior. This is essential to businesses as it enables them to predict consumer behavior. Predictive services can recommend products to consumers from data. By helping customers easily find what they’re looking for and tailoring experiences to consumer’s needs based on data, customer experience can be greatly improved.

The Car as a Consumer Service Platform has changed the face of the automobile industry. Today, car manufacturers have to consider the fact that consumers want a seamless customer experience. Cars have to do more than get a driver from point A to point B. Consumers are more connected than ever and want cars that provide them with the technologies and services they need. Vehicles have evolved from being able to plug in an mp3 player to play music to being connected with Internet access and features that alert the driver of arrival and departure times.

The Need of CRM to Evolve in the Automotive Industry:

CRM must evolve to be meet the needs of the customer in the near future. The current Customer Relationship Management (CRM) platforms help Auto OEMs deliver customer experiences for all customer-facing operations. Although it is able to tailor its CRM solutions to each industry with prebuilt integrations and role-based customer intelligence as well as being available in different platforms including mobile and in store, it needs to evolve due to a number of pitfalls.

How CRM Needs to Evolve for Automotive OEMs

CRM Platforms & Solutions need to be future ready by integrating the six key elements as below:

Open Interfaces

There is a need for industry-standard interfaces to connect to multiple solutions and services. For example — REST based APIs are the key to successful collaboration by allowing systems to easily communicate with one another securely and privately. This open communication results in good decisions. Open interfaces help because they are light weight, deal only with messages and require less configuration., Easy to access, Interoperable, Stateless, Scalable and can be used across domains. Since these are web-based services the systems are loosely coupled and hence easy to use.

Single Sign On (SSO) and Authentication are important as well as it saves time by allowing users to sign in once instead of multiple times to gain access to applications for which they have permissions. They also prove as a protection against hacking, which is another important need of the hour. In addition to fewer logins, other benefits include reduced calls to customer service, ease of change for user restrictions and increased security.

Hybrid Cloud as a Service:

For a great user experience, integration between various business applications

(backend, frontend systems), real time communication systems and collaboration

tools are necessary. With customer support processes and workflows along with multichannel experiences becoming the norm, the systems need to focus on realtime capabilities to streamline operations, boost productivity, improve interactions and enhance customer experience. This will need the OEMs to integrate their digital experience platforms and systems across CRM, contact centers and communication systems to be deeply integrated to share data and context and insights in real time to provide a seamless customer experience.

Real-time processing provides better response times based on up-to-the-minute data and does not rely upon someone to run a batch process at a later time — or sometimes never. Additionally, smaller, real-time queries mean faster response times. Allowing multiple systems to “talk” to each other, like weather systems communicating with traffic systems to connect with CRM, allows for a better, more informed, customer experience. For CRM in the auto industry, this translates to integrating systems that enable communication with each other in the case of dealers with multiple franchises, for example, to better manage customers.

Moreover, mixing private and public cloud services, or Cloud to Cloud Connectivity, businesses become more flexible and have access to more options with how they use data. Likewise, CRM needs to evolve to include Always on Connectivity, or real-time connectivity, which allows for access to information any time and from anywhere on any device.

Smart Data Solutions:

Big Data is important, but smart crunching of the data is important to make it Smart Data. Smart Data is, small pieces of Big Data evaluated for decision making across multiple servers/solutions.

Big Data is a trove of data that can be totally meaningless if it doesn’t provide actionable insights for the business. For example, sales data which is over two years old may be irrelevant to predicting sales today. However, service data might help in providing faster support services to the consumers.

Proactive Services:

Proactive Support Services is the Next Generation Customer Experience. It is important as customers become more connected and organizations keep up with the evolving needs of the customer. Proactive services can help reduce costs, increase productivity, generate more revenue and increase customer loyalty. Also, secure, quality monitoring allows for immediate customer feedback, early detection of problems, the ability to measure customer experience, and a clearer understanding of user activity.

Pre-emptive Diagnosis through Knowledge Mining:

Data Mining and Artificial Intelligence recognizes patterns in large data. Well mined data can help extract knowledge that when placed in the context of a CRM system that is geared towards generating knowledge from multiple entry points becomes extremely valuable to the customer experience.

For example, collection of symptoms remediated through actions of independent support technicians spread across a network may point at the diagnosis of an underlying problem that may only become visible after a large set of data is crunched in connection with the knowledge generated around it.

Reconciling the narratives for each case and distilling the knowledge captured in each instance is the province of Artificial Intelligence. Getting organizations ready for knowledge mining involves:

· Implementing a knowledge management system that leverages every technician’s skills and experience into generating knowledge

· A process that connects the collective knowledge generated by this type of method with the engineers and designers dedicated to creating, improving, and maintaining the product.

Data should be processed and will become more effective while collating what is known into assumptions about what the issue is — aka knowledge. The knowledge generated can be plugged back into support to provide better troubleshooting guidance.

CRM as a Services Platform:

As newer services and technology platforms like Android Auto & Apple Car are integrated into cars for navigation, streaming content, communications and innovative services through the vehicle’s dashboard — the CRM needs to evolve as a services platform. By doing so, the CRM platform can provide interfaces for core services like (1) Billing Services that control billing and invoicing; (2) Single Sign on (3) Subscription Management and(4)On Demand Solutions for seamless, real-time integration — etc.

Our Take:

The Auto Industry is becoming increasingly global and competitive, and OEMs understand the need for CRM to satisfy customers and drive consumer decisions. A good customer experience begins when companies connect with customers even before a purchase is made — and it all starts with data. With the auto industry evolving at lightning speed, automotive OEMs need to get the most out of CRM to deal with customers’ demand for excellent and real-time customer service. As OEMs deal with more informed users, they need to improve customer service to manage and build relationships with not only existing but potential customers as well. An improved futuristic CRM platform with the above six features will simplify the process of connecting with customers throughout the customer lifecycle. Staying focused on customers is an integral part of the automotive industry’s ability to survive, especially because strong competition exists in the auto industry today. Effectively managing customers, improving the quality of products and services, and streamlining business operations can all be achieved through these six core pillars of CRM technology of the future.

With the newer incumbent players in the Auto OEM Industry like Tesla and the likes, their CRMs are equipped with some of the six that we have mentioned above. That has helped them leap frog and become successful in the industry.

## 5.2 Make Money Concept:

Ways We Make Money from Cars:The most obvious ways that everyone imagines that there is profit to be had will be these traditional kinds of modes:

* Selling autonomous cars
* Renting out autonomous cars
* Delivering via autonomous cars
* Ridesharing out autonomous cars

If you ponder those key modes, it really doesn’t seem to be much different than today’s world and contemporary conventional cars. You can make a profit by selling conventional cars.

You can make a profit by renting out conventional cars, though admittedly the car rental agencies are a bit queasy about a future of driverless cars and how that will mess with the renting of cars.

There’s also the use of cars to do deliveries, such as the current craze of getting a taco and burrito delivered to your door at midnight, which many are already experimenting with via using autonomous vehicles [lesser than full-on cars](https://www.aitrends.com/selfdrivingcars/in-car-deliveries-with-ai-self-driving-cars/) to do this kind of simpler and more bounded act.

You can maybe make money [by ridesharing](https://www.aitrends.com/selfdrivingcars/ridesharing-services-and-ai-self-driving-cars-notably-uber-in-or-uber-out/) out conventional cars, but the record so far of Uber and Lyft doesn’t give you any warm and fuzzies that a real profit is to be readily had (they are losing money hand-over-fist, though some say this is just the early part of the service life cycle when trying to grab market share and gain a loyal base, so you need to expect that sometimes you have to spend money to ultimately later on make money).

For ridesharing of conventional cars, the difficulty of trying to eke out a profit involves all of the costs associated with the ridesharing arrangements. Pundits are expecting that once the human driver of the ridesharing car is excised from the deal, which presumably will take place once autonomous cars are safe and available, the most significant cost that has been a presumed major impediment toward profitability will be off-the-table (i.e., human driver labour).

Smooth sailing afterward, they assume. The thing is that we don’t really know yet what the financial numbers will really look like. What will be the cost of the AI system and its ongoing [updates and maintenance](https://www.aitrends.com/selfdrivingcars/auto-recalls/)? Will there need to be special kind of insurance for driverless cars and how costly will it be? And so on. Let’s though put aside the usual modes of making money from a car, whether it be autonomous or not, and use our thinking caps to find other ways to make money from a car.

Other Ways to Make Money from Cars:

I’ll give you a clue about another likely significant way to make money via a car, especially down-the-road in an era of driverless cars (that’s a teaser, a spoiler alert of what I’m about to reveal!).

Recently, ridesharing drivers have been selling their eyeballs, well, the use of their eyeballs, by contracting with real estate firms that are trying to [find houses to flip.](https://www.wsj.com/articles/uber-drivers-seek-extra-cash-working-for-house-flippers-11559035802)

If you are an Uber or Lyft driver, you are presumably roving around for hours on end, hopefully with paying passengers on-board, most of the time, and have not much else to do other than drive the car. I realize that human drivers are [supposed to be fully attentive](https://www.aitrends.com/selfdrivingcars/not-fast-enough-human-factors-ai-self-driving-cars-control-transitions/) to the roadway and traffic, but I think we all know that humans aren’t nearly that [singularly focused](https://www.aitrends.com/selfdrivingcars/human-back-up-drivers-for-ai-self-driving-cars/) when behind the wheel.

So, a ridesharing driver can easily keep their eyes peeled for any houses that seem to be viable house flippers.

Usually, tell-tale signs are when a house looks like it is pretty much semiabandoned, including that the front lawn is dishevelled, there might be posted signs warning that the property is in violation of homeowner’s ordinances, and so on. It’s pretty easy for a ridesharing driver to be watchful for such houses. Once they spot a potential house flipping candidate, they either write down what they spotted, or enter it into a mobile app, and they’ve just completed a tidy extra task. Along with the tidy extra task comes the potential for getting a tidy fee from the real estate firm seeking houses to be flipped.

In short, another way to make money and possibly profit from a car would be to use the car as a handy platform from which to traverse an area and find or detect something that others would be willing to pay to know about.

Fortunately, autonomous cars are going to be able to do this in spades, escalating exponentially the capability to rove and scan, it’s in their bloodline, one might say.

Driverless Cars as Roving Golden Eyeballs:

Imagine that there are autonomous cars undertaking ridesharing.

Some assert that this is going to be a springboard towards ridesharing on a volume and scale that we can [hardly conceive of.](https://www.aitrends.com/selfdrivingcars/top-10-ai-trends-insider-predictions-about-ai-and-ai-self-driving-cars-for-2019/) If that’s the case, there are going to be driverless cars roaming and roving all over the place, taking human passengers to their destinations, picking up human passengers that need a ride, and otherwise trying to be in the right places at the right times.

For purposes of being a driverless car, the vehicle is jam-packed with sensors. The [sensors include](https://www.aitrends.com/selfdrivingcars/multi-sensor-data-fusion-msdf-and-ai-the-case-of-ai-self-driving-cars/) multiple cameras, collecting visual video and images that are being interpreted by the AI to figure out where the road is, where to turn, whether pedestrians are nearby, etc. Plus, there are other sensors including likely radar, ultrasonic units, [Lidar,](https://www.forbes.com/sites/lanceeliot/2019/04/16/lidar-game-of-thrones-for-driverless-cars-there-will-be-winners-and-there-will-be-losers) thermal devices, audio listening devices, and a cornucopia of similar sensors.

The mainstay at first will be that those sensors are there for the [purpose of driving the car.](https://www.aitrends.com/selfdrivingcars/cognitive-timing-for-ai-self-driving-cars/) Don’t mess with the sensors or the onboard computer processors for anything besides making sure the autonomous car can safely get from point A to point B. I’m betting that there will be some [extra computational cycles](https://www.aitrends.com/selfdrivingcars/micro-movements-in-driving-behaviors-crucial-for-ai-self-driving-cars/) available, perhaps normally kept in reserve for situations of a tight or tough driving situation, and yet otherwise could be used for other aspects if needed, when viable to leverage.

Why not have the AI look for houses to be flipped?

It would be relatively easy to do.

The data pouring in from the cameras is already going to be undergoing analyses. You could either have the [vision processing system](https://www.aitrends.com/selfdrivingcars/compressive-sensing-ai-self-driving-cars/) tag the images of houses and in real-time be marking ones that could be house flippers, or, you could set aside for the moment the house flipper search and have that undertaken in more idle moments.

For driverless cars, there will be idle moments for example when sitting at a red light. You and I likely daydream when at a red light, but the computer processers on-board can be doing some real work, like rescanning images to find those house flippers. Or, maybe when the driverless car is getting charged-up at an EV charging station (most self-driving cars are [likely to be EV’s)](https://www.aitrends.com/selfdrivingcars/power-consumption-vital-for-ai-self-driving-cars/), during that idle time the processors can be doing constructive acts such as filtering the collected data for houses meeting the house flipping criteria.

Let’s kick this up a notch.

Fleets of driverless cars will be likely uploading their individually collected data to the [cloud database of the automaker](https://www.aitrends.com/selfdrivingcars/air-ota-updating-ai-self-driving-cars/) or tech firm (or other). The uploaded data might already have been examined for houses to be flipped, or this might be a task undertaken once the data has been [pushed up into the cloud](https://www.forbes.com/sites/lanceeliot/2019/05/09/driverless-car-myth-1-well-fix-it-over-the-air) (sparing the onboard AI systems this task).

The collective “wisdom” of hundreds or say thousands of driverless cars that have been whisking around towns and cities, well, it’s a treasure trove of handy data.

What Will the Eyed Data Be Used For?

Think about the possibilities.

You are a local house painter and you are trying to find out which homes in the county need a paint job.

Easy, just consult a database of houses that have been “seen” by a fleet of driverless cars.

You can search the database by where the house is, when it was most recently seen, and pull-up an image or two (or a video) that shows what it looks like. The AI can already pre-assess which homes have faded or peeling paint, so you don’t need to cull the list.

This can be tied to another database of homeowner records, and with the touch of a button you can be on the phone to the homeowner, explaining how wonderful their house would look if painted in green. You can even text them a photoshopped version of their house with the colour changed.

Right now, we often take a look at a large database such as the one maintained by Google, trying to see what a house looks like. Those images are often dated, and there are only so many times that they are able to send out their handful of phototaking cars to capture an area. With driverless cars, assuming they are already on a ridesharing quest, this photo-taking or video-taking is part-and-parcel of what they are already doing. No added cost, in a manner of speaking.

It is conceivable that via various ways to make money from the driverless car collected data, [it might motivate](https://www.aitrends.com/selfdrivingcars/affordability-of-ai-self-driving-cars/) the autonomous car owner to keep their [selfdriving car on-the-go,](https://www.aitrends.com/selfdrivingcars/non-stop-ai-self-driving-cars-truths-and-consequences/) even when there aren’t any paying passengers needing a ride.

If the money is good enough, it might be better to actually avoid taking rides, since those passengers expect to get to their desired destination, which might not be where your driverless car needs to go to collect money-making data.

Downsides of the Madcap Data Collecting:

The world is never accommodating to having only benefits and no costs, or so it seems.

In the case of the driverless car data collection, once a particular neighbourhood has been scanned, the question arises about what good does it do to potentially scan it again a few hours later. In essence, it could be that the data won’t have quite the payoff at all times as might be hoped for.

Plus, if one fleet has already done that neighbourhood, and a different fleet does so, this will rachet up competition in terms of these collected databases, meaning that there might not be as much profit as one would have if only one fleet had the golden goose and no others did.

The [privacy implications](https://www.aitrends.com/selfdrivingcars/privacy-ai-self-driving-cars/) of this kind of vast and unending data collection can be quite staggering when you sit down and think about it. I’ve only mentioned the notion of scanning to find houses, but it is perhaps obvious that the scanning of the images can look for many more objects, including human beings in the images.

Want to know where your significant other was yesterday? Log into a cloud database of a fleet of driverless cars, give it a picture of your partner, and let it find them, reporting to you that the person was seen in front of the pancake restaurant, then later on seen at the local park, then at the door of an apartment in downtown, and so on.

**5.3 Resource required:**

Resources for development:

For most people, the vision for self-driving cars centers on their use as personal vehicles. While this vision may come to pass, many consumers’ first experience with self-driving technologies will likely happen through shared car services. In May 2015, ride-haling service Uber announced plans for an [Uber Advanced Technologies Center](https://www.uber.com/info/atg/) in Pittsburgh, fueled by its acquisition of Otto, a start-up focused on autonomous trucks – the service began piloting self-driving cars for invited Uber users in Pittsburgh in 2016. Uber later expanded its self-driving service to Tempe, Arizona, but suspended the program after one of its autonomous vehicles was involved in a high-impact crash when another car failed to yield for the Uber car. In 2018, an autonomous car operated by Uber struck and killed a woman on a street in Tempe – the company suspended operations for nine months and returned with commitments to operate at drastically reduced speeds and in less challenging environments than before.

In 2017, ride-hailing service Lyft began piloting self-driving cars in Boston (with self-driving firm [nuTonomy)](https://www.nutonomy.com/) and San Francisco (with self-driving firm [Drive.ai)](https://www.drive.ai/) before launching a service in Las Vegas for attendees of the 2018 Consumer Electronics Show (CES) – the company [expanded that Las Vegas pilot](https://ir.aptiv.com/investors/press-releases/press-release-details/2018/Aptiv-Launches-Fleet-of-Autonomous-Vehicles-on-the-Lyft-Network/default.aspx) in May 2018 with the addition of 30 self-driving cars available to members of the public who agree to participate in the self-driving technology.

In November 2018, Google’s [Waymo](https://waymo.com/) subsidiary announced plans to launch a commercial driverless car service, starting small with dozens or hundreds of authorized riders pulled from its [Early Riders](https://waymo.com/apply/) program in the suburbs around Phoenix. The potential reach of Waymo’s service is evidenced by its purchase of thousands of Pacifica hybrid minivans from Fiat Chrysler and orders for more than 20,000 electric self-driving vehicles from Jaguar – Waymo estimates that the Jaguar fleet alone will be capable of doing a million trips each day in 2020.

Still other, smaller providers are exploring shared uses for self-driving cars. The self-driving taxi fleet Voyage [piloted a service](https://news.voyage.auto/voyages-first-self-driving-car-deployment-29c7688c6a1) that provided two self-driving Ford Fusions in a retirement community of 4,000 residents in California – the cars learned to navigate the 15 miles of roads within the gated community. And in Michigan, students at the University of Michigan can cross campus in self-driving shuttles as part of the University’s [MCity](https://mcity.umich.edu/) self-driving development hub, which includes a two-mile route between the University’s Lurie Engineering Center and its North Campus Research Complex.

While many firms focus on transporting people, self-driving technology could become especially useful for the transport and delivery of goods and services. In 2018, Uber and Waymo launched self-driving long-haul transportation services in Arizona and Atlanta, respectively Both services still rely on human drivers to serve in an advisory capacity or to complete the “last mile” driving once the trucks enter more complicated inner-city driving.

Within cities and communities, self-driving vehicles are increasingly being used to deliver goods directly to consumers. Grocery store chain Kroger has experimented with self-driving car partner [Nuro](https://nuro.ai/) to launch grocery delivery services using both self-driving Toyota Priuses with safety drivers on board and with [Nuro's R1 vehicle,](https://nuro.ai/product/) a smaller vehicle designed exclusively for the transportation of goods without space for a driver or passenger.Retailer Walmart has engaged with several partners, including Ford and [Udelv,](https://www.udelv.com/) to explore the delivery of groceries and other goods. Walmart’s [partnership](https://news.walmart.com/2019/01/08/custom-autonomous-cargo-vans-to-deliver-groceries-in-walmarts-pilot-with-udelv) with Udelv promised to leverage autonomous delivery trucks and vans to make deliveries to multiple customers in a single trip. And, of course, Amazon has explored selfdriving technology, tasking a team of employees to explore uses for autonomous vehicle technology to deliver packages more quickly, even if the company does not plan on building its own self-driving vehicles. Automakers like Ford are using this focus on delivery as an opportunity to develop parallel business tracks for self-driving cars – one business track focused on vehicles owned by consumers and a second business-to-business track that improves delivery efficiency, testing fleets of self-driving cars as [delivery vehicles for Domino's, Postmates, and Walmart.](https://medium.com/@ford/e627a2c398ea)

While self-driving technologies could enhance quality of life for some people and improve safety in communities, there are very real concerns for the effects the technology could have on jobs and the workforce. In 2018, advocacy group Securing America’s Future Energy commissioned a [wide-ranging study](https://avworkforce.secureenergy.org/) to consider the economic and labor impacts of self-driving technologies. The study concluded that some of the most disruptive technologies, like self-driving trucks, would not arrive until the mid-2030s, providing workers with some time to train in new areas or adapt for new roles in the industry – and self-driving technologies could provide less expected economic benefits, like simplified commutes that might encourage workers to explore new opportunities in other sectors or communities.

Even as industry leaders attract attention for announcements and new pilot programs, many artificial intelligence experts note that it may be years, or even decades, before self-driving systems can reliably avoid accidents. Self-driving systems require massive amounts of data to work properly, and while they may be able to identify familiar objects and follow rules, the vehicles could be challenged in more accident-prone scenarios where many variables contribute to safe performance.

Self-driving cars could solve one of the biggest problems in urban design – parking. If self-driving cars improve transportation efficiency to the point that residents choose not to own automobiles, the amounts of parking needed in cities and communities could drop significantly. This could be an especially important change for libraries’ physical locations, where considerations for parking availability can challenge facilities planning, affect patrons’ visits, or even raise concerns for safety.

The design and function of self-driving cars’ interiors could radically change users’ experiences. Freed from the requirements of driving, passengers may shift their drive-time focus to entertainment, productivity, or even education. Similarly, public and shared transportation services could become spaces for community dialog, programming, or other forms of engagement.

Libraries could become interested in self-driving technology as a means of improving materials delivery, outreach services, or transportation between locations.

Like other advances in artificial intelligence, self-driving technologies could have a significant impact on labor and the workforce. There is reasonable concern that this could be especially harmful to individuals who used ride-hailing and other on-demand services to supplement or as their only form of employment. Libraries may once again play a role in workforce training.

If developed in a certain direction (self-driving shared shuttles) or for a certain benefit (ease of transportation), self-driving cars could help increase socialization in communities – allowing people to encounter each other in convenient and efficient shared shuttles or making it easier and more compelling to venture out of their homes into public spaces. But just as likely might be the further isolation of communities – residents becoming accustomed to private self-driving rides to and from their destinations or the convenience of cheap delivery directly to their homes.

## 5.4 Assets of business model:

Operating system: Apple, Google and Microsoft — iOS, Android and Windows. The three biggest companies in the world today all control (or have de facto control of) their own operating systems. Why? Because controlling an operating system is an incredibly important place in a value chain. Operating system providers provide an abstraction layer over hardware (commoditizing hardware providers) and own a direct channel to end users (allowing them to tax anyone else who wants to access those end users).

In the world of servers, desktops, laptops, smartphones and tablets, Apple, Google and Microsoft each have a unique strategy to capture value from their operating system. Apple uses its operating system to extract higher margins on its hardware business, Google uses its operating system to earn more revenue from its ad business and Microsoft charges directly for its operating system and the key applications that run on top of it.

Now, automakers and technology companies are all in a race to build the software that will drive autonomous vehicles, but it’s unclear how those companies will monetize their software. Tesla is pursuing an Apple-like approach, where they will build an integrated hardware-software stack; companies like Baidu and Udacity are building “open-source” self-driving car tech that will help them sell complementary products; and companies like Mobileye and Uber seem to be forging partnerships where they will become software providers to automobile manufacturers.

It is likely that several models will emerge for monetizing the operating system layer for vehicles, and these models will deeply impact how different companies invest in R&D, marketing, lobbying and operations. If the Tesla vertical integration model wins out, expect to continue seeing flashy marketing and sleekly styled vehicles, because high-priced, high-margin “hardware”/vehicle sales will be the main driver of business. If the Baidu “open source” model wins out, expect to see many low-cost automobiles from different manufacturers and Baidu monetizing their open-source software by selling other services.

Some of these consequences are obvious, but there are also some less obvious effects. For example, companies that operate a “closed” hardware/software ecosystem may be less likely to share their data with others, and this could lead to difficulties in developing a national system of legislation for autonomous vehicles because of public concerns around safety and equity. Additionally, if one company ends up taking an early lead but is reticent to share their data or algorithms, they may be able to shape regulation in a way that makes it difficult for others to build competing systems.

How will users pay for transportation? As a service or own cars?

Today, companies like BMW are making a series of bets on what the future will look like for transportation consumption. BMW is continuing to sell cars directly to consumers; however, they are also selling “transportation as a service” where consumers can rent free-floating cars, hail a car with a driver or, in the future, order a car without a driver. Their belief is that people will want to consume transportation differently at different times and in different places, and they want to offer all options through a single app.

On the other hand, companies like Mazda believe that consumers will always want to drive, and they are building/selling vehicles to a “core customer who loves driving.”

These two views are not necessarily at odds with one another, and different segments of the market will want different things. However, the relative sizes of the transportation-as-a-service and the “own a car” markets will change in the future, and it is likely that more people will choose to pay for transportation on demand rather than own a car, which is often an under-utilized asset.

The more we veer toward the transportation-as-a-service world, the more differently car companies will operate in the future. Automobile manufacturers are today the biggest spenders in the entire advertising industry. If consumers no longer purchase cars and only purchase Uber rides and Zipcar rentals, that will drastically change the billions of dollars spent on automobile advertising. It also will change the set of profit pools across the entire automotive industry.

If ridesharing companies can “commoditize” automobiles such that consumers no longer care what type of car they are in to get from place A to place B, they will be able to capture a significant portion of the profits in the transportation industry and reinvest those profits in their technology platforms and marketplaces.

What does it mean if ridesharing companies take more and more revenue and profits away from car and truck manufacturers? One major impact will be that ridesharing companies will be more likely to invest in automation to cut costs rather than focus on ways to employ drivers (who will buy cars), and this could rapidly accelerate the loss of driving jobs. Another major impact would be that car dealerships become less relevant as a distribution channel for cars as ridesharing companies would likely prefer to buy in bulk from automakers to lower costs.

Who generates the data? Who processes the data? And who owns the data?

Autonomous vehicles will both ingest and generate vast amounts of data. Vehicles need driving data to train their neural networks, mapping data to navigate roads and avoid obstacles, regulatory data to understand speed limits and parking regulations and passenger data to create personalized trip experiences suited to each rider. At the same time, autonomous vehicles will be generating terabytes of data each day from cameras, radar, lidar, sonar, GPS and other sensors that can be used to further improve the cars’ driving models, a city’s traffic planning or a ridesharing company’s route optimization algorithms.

This data intake and data exhaust will not only require new infrastructure and software, it also will require new business models around the processing, sharing and usage of data. Already we have seen a number of companies form partnerships to either gain access to or build new sets of data around high-definition maps in order to ensure they have access to a key input to operating autonomous vehicles. Another critical piece of the data puzzle is companies that use human intelligence to produce training data for machines. For the foreseeable future, these “human in the loop” systems will be key to generate high-quality training data and feedback loops.

The issues of who owns data, who can access data and who will process the data will be a critical question for companies and regulators over the next several years. As vehicles generate and consume more and more data, it will be critical to watch who controls the data and how they decide to monetize the data. There likely will be a number of large companies that are built solely around the collection and cleaning of data, and how these companies work with other players in the automotive space is currently being explored.

What portion of the value chain will capture the most value?

In the traditional world of desktop and mobile operating systems, operating systems are able to capture value by commoditizing hardware suppliers and aggregating consumers, so that other application developers have easy access to a development platform with easy-to-use tools and a distribution channel with a large audience of buyers.

In the world of automobiles, this seems to suggest that companies like Uber and Lyft have the best shot at becoming the central point for demand-side aggregation and supply-side commoditization. Ridesharing customers don’t care too much about the actual vehicle they are riding in, and they provide an aggregation point for consumers who wish to access a pool of transportation options. Lyft’s recent announcement to build a new self-driving division and self-driving system for car manufacturers suggests they are looking at this as an important opportunity.

However, this industry is still young, and everyone — from automotive suppliers like Delphi to pure technology companies like Alphabet — want to make sure they can capture a piece of the transportation value chain. This could happen in many different ways. Perhaps Tesla will be able to develop an integrated supply chain from parts to rides that creates the best possible user experience, or maybe Ford will find a way to bring the most efficient driving software to market that every other manufacturer needs to license.

Companies that are providing higher-level services to consumers and businesses that are in the best position to bring supply and demand together are likely to create the most value and profit pools.

In any case, whoever wins this race to capture profits will be in a position to invest more in research, invest more in marketing and continue to innovate faster than competitors. This will lead to the winners helping to craft the public messages on autonomous vehicles, leading the industry on recommendations for tax policies and working closely with local, state and national officials to reshape cities and society.

What is the impact and role of regulators in the development of autonomous vehicles?

Technology companies have not had a strong history of working with regulators (or with automobile companies), and while companies like Airbnb and Uber have struggled to figure this out, automobile manufacturers, more than anyone else, have a reputation for working closely with the government to understand (and potentially shape) regulations and compliance.

Regulators should and need to be a critical part of the development and introduction of autonomous vehicles. It will be difficult to strike a balance between letting the industry guide regulation and letting regulation dictate what the industry decides to build, but if they can get this right, it will lead to major benefits in terms of reduced traffic deaths, lower emissions and better transportation for everyone. The world isn’t going to flip a switch one day to go from humans driving automobiles to autonomous vehicles. For a long time to come, human-driven vehicles and autonomous vehicles will co-exist, and this is something that regulators need to keep in mind.

If there is one thing for the general public and regulators to pay attention to in the next 3-5 years, it is how companies plan to make money on autonomous vehicles. The business models will drive decision making, and these decisions will have very important consequences for the future of transportation.

# 6. Partners, Activities and Costs

## 6.1 Knowing the Partnership:

From Google and Amazon to Apple and Microsoft, every major tech company is dedicating resources to [breakthroughs in artificial intelligence.](https://builtin.com/artificial-intelligence) Personal assistants like Siri and Alexa have made AI a part of our daily lives. Meanwhile, revolutionary breakthroughs [like self-driving cars](https://builtin.com/artificial-intelligence/artificial-intelligence-automotive-industry) may not be the norm, but are certainly within reach.

AI COMPANIES WITH $100M+ FUNDING

* Tempus
* DataRobot
* Freenome
* CloudMinds
* H20.ai
* Nauto
* Open AI
* Sift Science
* Sound Hound
* Vicarious
* Zoox
* Zymergen

As the big guys scramble to infuse their products with artificial intelligence, other companies are hard at work developing their own intelligent technology and services. Here are 32 artificial intelligence companies and AI startups you may not know today, but you will tomorrow.

DATAROBOT

Industry: Big Data, Software

Location**:** Boston, Massachusetts

What it does: DataRobot provides data scientists with a platform for building and deploying machine learning models. The software helps companies solve challenges by finding the best predictive model for their data. DataRobot's tech is used in healthcare, fintech, insurance, manufacturing and even sports analytics.

CLARIFAI

Industry: Software

Location: New York, New York

What it does: Clarifai is an image recognition platform that helps users organize, curate, filter and search their media. Within the platform, images and videos are tagged, teaching the intelligent technology to learn which objects are displayed in a piece of media.

NUTONOMY

Industry: Automotive, Transportation

Location: Boston, Massachusetts

Whatit does: With a mission to provide safe efficient driverless vehicles, [nuTonomy](https://www.aptiv.com/autonomous-mobility) is developing software that powers autonomous vehicles in cities around the world. The company uses AI to combine mapping, perception, motion planning, control and decision making into software designed to eliminate driver-error accidents.

NVIDIA CORPORATION

Industry: Hardware, Software

Location: Santa Clara, California

What it does: [Nvidia Corporation](https://www.nvidia.com/en-us/) builds graphics processing units and hardware to power various types of AI-enabled devices. The company's technology is used for everything from robots and self-driving vehicles to intelligent video analytics and smart factories.

## 6.2 Knowing the suppliers:

In autonomous vehicle there is a need of various technological components such AI logic units, data sensors, arithmetic 3d processors etc.

These can be provided by the following tech industrialists:

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## 6.3 Important activities:

Legal status in the United States

In the United States, a non-signatory country to the Vienna Convention, state vehicle codes generally do not envisage—but do not necessarily prohibit—highly automated vehicles. To clarify the legal status of and otherwise regulate such vehicles, several states have enacted or are considering specific laws. In 2016, 7 states (Nevada, California, Florida, Michigan, Hawaii, Washington, and Tennessee), along with the [District of Columbia,](https://en.wikipedia.org/wiki/District_of_Columbia) have enacted laws for automated vehicles. Incidents such as the first fatal accident by Tesla's Autopilot system have led to discussion about revising laws and standards for automated cars.

In September 2016, the US [National Economic Council](https://en.wikipedia.org/wiki/United_States_Department_of_Transportation) and [Department of Transportation](https://en.wikipedia.org/wiki/Department_of_Transportation) released federal standards that describe how automated vehicles should react if their technology fails, how to protect passenger privacy, and how riders should be protected in the event of an accident. The new federal guidelines are meant to avoid a patchwork of state laws, while avoiding being so overbearing as to stifle innovation.

In June 2011, the [Nevada Legislature](https://en.wikipedia.org/wiki/Nevada_Legislature) passed a law to authorize the use of automated cars. Nevada thus became the first jurisdiction in the world where automated vehicles might be legally operated on public roads. According to the law, the [Nevada Department of Motor Vehicles](https://en.wikipedia.org/wiki/Nevada_Department_of_Motor_Vehicles) (NDMV) is responsible for setting safety and performance standards and the agency is responsible for designating areas where automated cars may be tested. This legislation was supported by [Google](https://en.wikipedia.org/wiki/Google) in an effort to legally conduct further testing of its [Google driverless car.](https://en.wikipedia.org/wiki/Google_driverless_car) The Nevada law defines an automated vehicle to be "a motor vehicle that usesartificial intelligenc[e,](https://en.wikipedia.org/wiki/Artificial_intelligence) sensors andglobal positioning [system](https://en.wikipedia.org/wiki/Global_positioning_system) coordinates to drive itself without the active intervention of a human operator". The law also acknowledges that the operator will not need to pay attention while the car is operating itself. Google had further lobbied for an exemption from a ban on distracted driving to permit occupants to send [text messages](https://en.wikipedia.org/wiki/Text_message) while sitting behind the wheel, but this did not become law.Furthermore, Nevada's regulations require a person behind the wheel and one in the passenger's seat during tests.

In April 2012, Florida became the second state to allow the testing of automated cars on public roads,and California became the third when Governor [Jerry Brown](https://en.wikipedia.org/wiki/Jerry_Brown) signed the bill into law at Google Headquarters in [Mountain View.](https://en.wikipedia.org/wiki/Mountain_View,_California) In

December 2013, Michigan became the fourth state to allow testing of driverless cars on public roads.In July 2014, the city of [Coeur d'Alene, Idaho](https://en.wikipedia.org/wiki/Coeur_d%27Alene,_Idaho) adopted a robotics ordinance that includes provisions to allow for self-driving cars. On 19 February 2016, [Assembly Bill](https://en.wikipedia.org/wiki/Bill_(law)) No. 2866 was introduced in California that would allow automated vehicles to operate on the road, including those without a driver, steering wheel, accelerator pedal, or brake pedal. The Bill states the [Department of Motor Vehicles](https://en.wikipedia.org/wiki/Department_of_Motor_Vehicles) would need to comply with these regulations by 1 July 2018 for these rules to take effect. This bill has yet to pass the house of origin.

In September 2016, the U.S. Department of Transportation released its Federal Automated Vehicles Policy, and California published discussions on the subject in October 2016.

In December 2016, the [California Department of Motor Vehicles](https://en.wikipedia.org/wiki/California_Department_of_Motor_Vehicles) ordered [Uber](https://en.wikipedia.org/wiki/Uber) to remove its self-driving vehicles from the road in response to two red-light violations. Uber immediately blamed the violations on "human-error", and has suspended the drivers.

Legislation in Europe

In 2013, the [government of the United Kingdom](https://en.wikipedia.org/wiki/Government_of_the_United_Kingdom) permitted the testing of automated cars on public roadsBeforethis, all testing of robotic vehicles in the UK had been conducted on private property.

In 2014, the [Government of France](https://en.wikipedia.org/wiki/Government_of_France) announced that testing of automated cars on public roads would be allowed in 2015. 2000 km of road would be opened through the national territory, especially in Bordeaux, in Isère, Île-de-France and Strasbourg. At the 2015 ITS World Congress, a conference dedicated to intelligent transport systems, the very first demonstration of automated vehicles on open road in France was carried out in Bordeaux in early October 2015.In 2015, a preemptive lawsuit against various automobile companies such as GM, Ford, and Toyota accused them of "Hawking vehicles that are vulnerable to hackers who could hypothetically wrest control of essential functions such as brakes and steering.

In spring of 2015, the Federal Department of Environment, Transport, Energy and Communications in Switzerland (UVEK) allowed [Swisscom](https://en.wikipedia.org/wiki/Swisscom) to test a driverless [Volkswagen Passat](https://en.wikipedia.org/wiki/Volkswagen_Passat) on the streets of [Zurich.](https://en.wikipedia.org/wiki/Zurich)

As of April 2017, it is possible to conduct public road tests for development vehicles in [Hungary,](https://en.wikipedia.org/wiki/Hungary) furthermore the construction of a closed test track, the ZalaZone test track,suitable for testing highly automated functions is also under way near the city of [Zalaegerszeg.](https://en.wikipedia.org/wiki/Zalaegerszeg)

Legislation in Asia

In 2016, the Singapore Land Transit Authority in partnership with UK automotive supplier Delphi Automotive Plc will launch preparations for a test run of a fleet of [automated taxis](https://en.wikipedia.org/wiki/Automated_taxi) for an on-demand automated cab service to take effect in 2017.

Liability

Self-driving car liability is a developing area of law and policy that will determine who is liable when an automated car causes physical damage to persons, or breaks road rules When automated cars shift the control of driving from humans to automated car technology, there may be a need for existing liability laws to evolve in order to fairly identify the parties responsible for damage and injury, and to address the potential for conflicts of interest between human occupants, system operator, insurers, and the public purse.[[113]](https://en.wikipedia.org/wiki/Self-driving_car#cite_note-RAND-113) Increases in the use of automated car technologies (e.g. [advanced driver-assistance systems)](https://en.wikipedia.org/wiki/Advanced_driver-assistance_systems) may prompt incremental shifts in this responsibility for driving. It is claimed by proponents to have potential to affect the frequency of road accidents, although it is difficult to assess this claim in the absence of data from substantial actual use. If there was a dramatic improvement in safety, the operators may seek to project their liability for the remaining accidents onto others as part of their reward for the improvement. However, there is no obvious reason why they should escape liability if any such effects were found to be modest or nonexistent, since part of the purpose of such liability is to give an incentive to the party controlling something to do whatever is necessary to avoid it causing harm. Potential users may be reluctant to trust an operator if it seeks to pass its normal liability on to others.

In any case, a well-advised person who is not controlling a car at all (Level 5) would be understandably reluctant to accept liability for something out of their control. And when there is some degree of sharing control possible (Level 3 or 4), a well-advised person would be concerned that the vehicle might try to pass back control at the last seconds before an accident, to pass responsibility and liability back too, but in circumstances where the potential driver has no better prospects of avoiding the crash than the vehicle, since they have not necessarily been paying close attention, and if it is too hard for the very smart car it might be too hard for a human. Since operators, especially those familiar with trying to ignore existing legal obligations (under a motto like 'seek forgiveness, not permission'), such as Waymo or Uber, could be normally expected to try to avoid responsibility to the maximum degree possible, there is potential for attempt to let the operators evade being held liable for accidents while they are in control.

As higher levels of automation are commercially introduced (level 3 and 4), the insurance industry may see a greater proportion of commercial and product liability lines while personal automobile insurance shrink.

 **Conclusion:**

The main theme of this discussion was to consider ways to make money from autonomous cars, beyond the obvious means that we do today with conventional cars. A key difference of conventional cars and driverless cars is that you’ll have a full suite of sensors, collecting data wherever the self-driving car goes, and the data can be kept and analyzed on-board the driverless car or placed into the cloud and used there.

This can be done in a scale and in a manner not feasible for what human drivers could do. There are likely money-making ways to leverage this that no one [has yet envisioned](https://www.aitrends.com/selfdrivingcars/how-to-best-pitch-your-startup/) and will emerge once self-driving cars become prevalent. Try to figure that out, before everyone else does.

In spring of 2015, the Federal Department of Environment, Transport, Energy and Communications in Switzerland (UVEK) allowed [Swisscom](https://en.wikipedia.org/wiki/Swisscom) to test a driverless [Volkswagen Passat](https://en.wikipedia.org/wiki/Volkswagen_Passat) on the streets of [Zurich.](https://en.wikipedia.org/wiki/Zurich)

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