

Autonomous Vehicles 2020



WAYMO

Waymo is an American autonomous vehicle development company. It is a subsidiary of Alphabet Inc, a Parent company. It is currently the only self-driving car service to operate fully autonomously.

Why is Waymo the leader in Autonomous driving technology?

The idea of autonomous vehicles becoming a part of everyday civilian life has been coming for over a decade now. However, Waymo has come closer than anyone else to making this a reality.

Waymo timeline

- 2009-Found as the Google self-driving car project
- 2015-Firefly vehicles are developed. These cars had custom sensors, computers, steering, and braking, with no steering wheel or pedals
- 2016-The google self-driving car project becomes Waymo
- 2017-Self driving minivans are developed
- 2018-Trials of commercial self-driving taxis, titled Waymo One, begin in Phoenix, Arizona

In October 2020, made its self-driving available to the general public. The service is only available in a limited area around greater Phoenix, Arizona for now. This is because the cars require a 3D roadmap to tell them about the road environment. The self-driving vehicles currently being used had been tested for several years and the service was initially due to launch in April but was halted due to the COVID-19 pandemic.

Waymo One, Waymo's self-driving taxi service had been operating since 2018. However, they still required a human to be in the driver's seat to override the actions of the self-driving car if necessary. Now, there are several vehicles where there is no requirement for a human to be present in the vehicle while operating.

Autonomous vehicles can be broken down into 5 categories.

Level 0: Fully Manual Vehicles. Accounts for most vehicles on the road today, fully controlled by humans

Level 1: Single autonomy. The vehicle has one feature that is automated, such as braking or steering

Level 2: Automated steering and acceleration capabilities. The automated system takes full control of the vehicle, automating tasks such as steering, accelerating and braking. The driver must still monitor the vehicle and still be prepared to respond at any time if the automated system fails to respond properly

Level 3: Environment detection. Still require human input, but these cars are able to automatically detect the environment around them. These vehicles can decide whether to overtake a slow-moving vehicle. Waymo have made these available to the public as a taxi service since 2018

Level 4: No human interaction required

These vehicles are what Waymo recently made available to the public as a taxi service.

These vehicles are able to intervene themselves if things go wrong or there is a system failure. In this sense, these cars are left completely to their own devices without any human intervention in the vast majority of situations.

Level 5: These vehicles are currently not in commercial operation but are being developed. The key attribute that Level 5 has is its ability to handle difficult terrain such as off-road driving that Level 4 cars may not comprehend. Their environment detection system is very advanced. In addition, Level 5 self-driving cars would be the

only cars not to have typical human driving controls such as steering wheels, brake pedals. Human input would be eliminated completely

Here is an example of a Level 4 self-driving minivan in action

https://www.youtube.com/watch?v=tBJ0GvsQeak&feature=emb_title

The passenger is in the back seat, not interacting at all with the vehicle.

Impact of self-driving cars

Autonomous vehicles are sure to have a significant impact on the economy. A study by research group BCG predicts by 2035, 12 million fully autonomous vehicles and 18 million partially autonomous vehicles will be sold globally each year. In this same timeframe, vehicles with autonomous features will hold 25 percent of the car market.

Waymo One driverless taxi service

As shown before, Waymo is currently operating a driverless taxi service in Phoenix, Arizona with Level 3 and Level 4 autonomous vehicles. Jobs held by humans, such as taxi drivers or chauffeurs could be replaced by this. Autonomous public transport such as buses or trains are also a possibility.

Industrial

Mining and farming industries have adopted autonomous vehicles as the technology becomes more affordable. The vehicles used in these industries do not need to have a

high level of autonomy to be independent from humans as the risk of accidents on private roads is minimal.

Waymo have plans to expand beyond Phoenix, Arizona and operate their service throughout the United States. There are 3 steps needed to take in order to expand into a new area;

1. Building detailed maps for a new area
2. The cars would need to be drive-tested with humans behind the wheel to check for software errors
3. If the car is determined to be able to safely operate autonomously, then Waymo will be able to commence operations in the new area.

Giving self-driving cars the ability to operate autonomously in a new area does take quite some time. For the town of Chandler, on the outskirts of Phoenix, Arizona, Waymo took 3 years to design sophisticated maps that the car's computer could comprehend.. If Waymo wants to expand this service nationally, it probably has to dramatically speed up this process.

Impact on productivity

The average person spends 1 hour, 41 minutes per day driving, with a large amount of that time commuting to and from work. If flexible working could be arranged, working while commuting could mean less time in the office and more time out and about.

Cheap

Driverless taxis may also eradicate the need for car ownership, especially if they are affordable. The Waymo One taxis are slated to be a small \$0.15/mile. Costs associated with car ownership such as fuel and maintenance and even learning how to drive would be eradicated. Currently, using taxis are a drain on someone's bank account but a taxi ride without having to pay the driver's salary could bring the price of a driverless taxi down to the level of public transport. This would definitely help the local economy of an area that has autonomous taxis.

Safer Streets

- If the vehicles were Level 5 autonomy, all road rules would be automatically adhered to and the streets would be safe.
- Less danger of intoxicated individuals being behind the wheel

Personal Impact

Written by Glenn

I would strongly benefit from driverless technology being available in my area. I don't currently have my license so driverless cars would afford me significantly greater mobility.

Disclaimer: These are written as if there no travel restrictions due to COVID-19

- Church. Currently, it takes me 90 minutes to get to church by bus and train. This could be reduced to as little as 30 with a driverless car. I wouldn't have to worry about getting up at a specific time to ensure I didn't miss the train. Sunday mornings would be a little less stressful getting up an hour early
- Less reliance on family. Currently, I tutor a student once a week in a town 20km away. There is no reliable public transport to this area so I have to rely on family to drive me there. Driverless technology would reduce the need of family and friends to drive me everywhere

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