

# Driverless car, can the new technology find its way in Thailand

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Traditional industries are disrupted inevitably by innovation from breakthrough technology to improve our society and welfare. Automotive industry is one of them which is embracing new technology especially in hardware and software development unprecedentedly. Innovation rather than mechanical engineering is gaining momentum and becoming a key selling point of car manufacturers. Apart from the quest to find other sources of energy to propel the car, driverless/self-driving car/autonomous car technology made several headlines and gain significant momentum in the development arena. Even with diverse names, the technology is heading to the single goal that cars do not need human's control anymore.

A driverless car is broadly defined as a car that drives itself without or with the least possible help of human by replacing recognition availability of human eyes to sensors, e.g. Sonar, Radar, and Lidar depending on technology, and delegating decision making of human brain to machines. Development of the technology arises from the fact that 94% of car accidents are caused by human error according to National Highway Traffic Safety Administration (NHTSA). Literally, if a machine can replace human, many lives will be safe. NHTSA classifies driverless car into 4 levels as described in the table below

| Vehicle Automation Level                 | Definition  |
|--|---|
| Level 1: Function-specific Automation    | Automation at this level involves one or more specific control functions. For example, brake assist.  |
| Level 2: Combined Function Automation    | This level involves automation of at least two primary control functions designed to work in unison to relieve the driver of control of those functions. For example, adaptive cruise control with lane centering.  |
| Level 3: Limited Self-Driving Automation | Vehicles at this level of automation enable the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver control. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time. |
| Level 4: Full Self-Driving Automation    | The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip.   |

Source: National Highway Traffic Safety Administration (NHTSA).

The technology incorporate both hardware and software development to allow Artificial Intelligence (AI) to understand road network and recognize objects to navigate cars by itself. Computers inside driverless cars need to act at least as good as human. According to Google Self-driving Car Project, 4 key information that driverless car needs to answer in order to control and navigate autonomously and safely are

- 1) Location: from coordination to name of street to the lane it is in
- 2) Surrounding objects recognition: size, shape, pedestrian, and their movement pattern.
- 3) Prediction: to know what will happen next from the first 2 points
- 4) Action: from all analysis, what it should react?

To answer these factors, developers need countless amount of time to develop hardware and software that can think like a human. Before launching, developers of technology need to extensively test drive the system to collect big data and use analytics software to analyze pattern and teach computers on what to look for and what to do. For the reference, google has been testing its driverless car on public roads since 2012 for over 1.5 million miles, over 60 rounds around the globe. The average American adult drives around 12,000 miles a year, which means that Google's driverless car has travelled the equivalent of 125 years of average American adult driving.

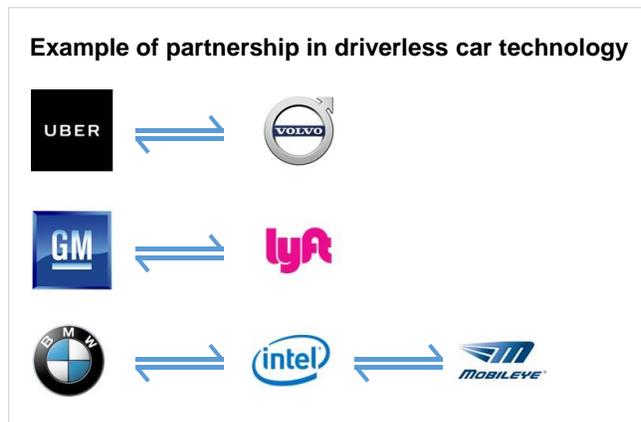


Google Self-driving Car Project  
Source: Google

On safety issue, Virginia Tech Transportation Institute, with Google's support, found that crash rate of driverless car was 3.2 crashes per million miles, compared to the US national average of 4.2 crashes per million miles.

To develop driverless car, two main parties need to interact: car development and software development or automotive part manufacturing for AI. In the past, mainstream car makers e.g. Toyota, Volkswagen, did not pay much attention to the technology and still rely on their traditional robust business; upgrade performance in term of fuel consumption, put more horse power in car engine, and improve aesthetic looking. On the other side, software companies and automotive part manufacturers who try to develop the technology do not gain much access to testing due to their limited budget and available testing sample. In other words, they found it really hard to absorb costs of testing because they do not own car fleets. The example of software companies and automotive part manufacturers who engage in the technology include Google, Delphi, and Baidu. As mentioned earlier, product testing is extremely important due to the safety concern of the technology. From the two points, driverless car development was slow until recently that the technology gained traction.

As both car manufacturers and software companies have gap to be filled by the other party, the new trend of development comes from partnership model, between a party that has technology with a party that has fleet of cars available for testing. Announced earlier, partnership of Uber with Volvo and Lyft with GM. Not limited to the model mentioned earlier, several traditional car companies also plan to launch driverless car in the future through acquisition and partnership with software and hardware companies. BMW formed a partnership with Intel Corp, a chip maker, and Mobileye NV, a camera-software company, to develop driverless car technology. The German car company plans to offer driverless car in 2021. Ford also plans to introduce driverless car in the same years as BMW does. The American automaker purchased Velodyne Inc., a laser-sensor maker, to develop the driverless cars, the company believes that driverless car will make big impact to society in the same level as Ford mass assembly line made over a century ago. Deemed to be wrong if not mentioning Tesla, the startup company founded by Elon Musk, a Pay-pal's co-founder, is one of the most prominent players of the technology. Tesla began rolling-out its semi-autonomous technology in 2014 and calls it Autopilot. The features of its electric car producer made its way to become headlines as it is regarded as the first commercialized technology that ordinary people can access. However, ordinary may limit to only rich people who can afford luxury Model S or Model X. Also, Elon Musk still insists that the electric car still requires human attention.



Tesla Model S  
Source: Tesla

As the technology is driving around the globe, the main question remains for Thailand that will it ever come to the country anytime soon. In my perspective, chance is low. It is unlikely for leading global companies to introduce driverless car technology in Thailand in the foreseeable future due to three main factors.

1. Regulation still not allow fully driverless cars on the road.

Thai law defines that a legal driver of a car must be over 18 year-old. That is definitely a human with no question and the car cannot drive itself. Comparing with the US, the forerunner country of driverless technology legalize testing on public highway. This enabler launching of driverless car in real world. As the result, if car companies were to launch the technology somewhere, the US would stay second to none in term of readiness. For now, Florida is the only state in the US that

legalizes fully driverless car on public. And in this case, driverless means no driver. Many believe that other states will follow guidance of Florida.

## 2. Maps and signs are not clear

Thai maps is notoriously known for poor ability of navigation. Not to blame map makers, roads and Sois in Thailand are comparatively complex due to poor urban planning. Implementation of the plan is also an issue as roads are not laid out according to a proper plan due to low enforceability of the plan. Also, there are several changes of road infrastructure that is not reported to central controlling unit. As the result, Google Maps often leads users through private road or unusable roads. Moreover, traffic light and road signs, e.g. speed limit sign, are not well built and often misleading. To control driverless car, the system must be able to read and interpret signal and information unambiguously to react properly

## 3. Market is not large enough:

With only about 70 million population, Thai market is relatively small comparing with Japan, India, China, Indonesia, and even Vietnam. Not implying that Thai market size is small in absolute term. The market size still far exceeds Malaysian, Singaporean, and other several developing countries'. Car companies have two main choices to deploy new technology into new markets: choose small and well-developed countries like Singapore or bet in big market like China and Indonesia. Thailand stands in the middle with little chance to see early deployment or development of new technology, unless it comes from local. As of now, driverless car technology still comes from foreign countries especially Americans and Europeans. The rise of Thai developers is still unfounded

The three main factors that are likely to delay the launch of driverless car in Thailand are solely internal factors. External factors which cannot be controlled from local authorities or companies still avert the commercial-scale launching in anywhere in the world. Even the trend is rising, driverless car technology still see obstacle in several ways. The major two hurdles include readiness of technology and trust of consumers. For the former point, currently available driverless cars are not truly driverless. They are only listed as level 2 in Vehicle Automation Levels which mean that cars is not driverless. Also, uncertainty about safety and reliability of driverless car remain large for mainstream car owners. 3 in 4 American drivers do not feel safe in driverless car according to AAA survey. Tesla fatal car crash and security vulnerability that allow Chinese researchers to remotely hack a Tesla car gave birth to public argument to allow authorities to regulate the technology formally which certainly drag the pace of development due to complexity of legal compliance.

Driverless technology is still far away from being adopted in Thailand, or even in global arena. Specifically for Thailand, three main hurdles which are unfavorable regulations, incomplete maps and road signs, and too small market size delay introduction of the technology to the country. The technology may find its long way into Thailand unless there

is a special government support and legalization of driverless technology to be tested in Thailand before official launch. If that happens, the latter two hurdle will seem small and can be overcome by enthusiastic companies, even it will likely to take tremendous time and effort.