

Driverless Taxi: The Future of Thai Public Transportation*

Nutnicha Eagjariyakorn**

บทคัดย่อ

เทคโนโลยีกลายเป็นส่วนหนึ่งของชีวิตมนุษย์เนื่องจากเทคโนโลยีเหล่านั้นช่วยเหลือและอำนวยความสะดวกให้กับเราในรูปแบบต่าง ๆ นับไม่ถ้วน รวมถึงการช่วยให้ผู้ขับขี่ไม่ต้องปฏิบัติหน้าที่ในการขับขี่และช่วยเพิ่มความปลอดภัยในการใช้ถนน รถยนต์ไร้คนขับได้รับความนิยมเพิ่มมากขึ้นในหลายประเทศทั่วโลก ในขณะที่ผู้ขับขี่ในประเทศไทยใช้ระบบช่วยเหลือการขับขี่ซึ่งทำงานร่วมกับปัญญาประดิษฐ์ (AI) เช่น ระบบช่วยรักษาช่องทางเดินรถ ระบบช่วยควบคุมรถให้อยู่ในเลน หรือ ระบบควบคุมความเร็วอัตโนมัติแบบแปรผันช่วยเหลือในการขับขี่มาเป็นระยะเวลาหลายปี และรถยนต์เหล่านี้สามารถจดทะเบียนภายใต้พระราชบัญญัติรถยนต์ พ.ศ. 2522 อย่างไรก็ตามในอนาคตอันใกล้เทคโนโลยีจะถูกพัฒนาอย่างก้าวกระโดด รถยนต์จะกลายเป็นยานยนต์ไร้คนขับ และถูกควบคุมโดยโปรแกรมและผู้ควบคุมซึ่งอยู่ในศูนย์ควบคุม ในต่างประเทศ เช่น สหรัฐอเมริกา เกาหลีใต้ และญี่ปุ่น รัฐบาลได้ออกกฎหมายเพื่อสนับสนุนการดำเนินการของรถยนต์ไร้คนขับและการให้บริการของรถยนต์ไร้คนขับนั้นได้ช่วยเพิ่มความปลอดภัยในการใช้รถใช้ถนน แก้ไขปัญหาสังคมผู้สูงอายุ และอำนวยความสะดวกให้กับผู้สูงอายุในบริเวณที่ที่ระบบขนส่งสาธารณะไม่ทั่วถึง อย่างไรก็ตามรถยนต์ประเภทนี้ยังไม่สามารถจดทะเบียนในประเทศไทยได้เนื่องจากรถยนต์ถูกขับเคลื่อนโดยระบบอัตโนมัติและไม่มีคนขับคอยควบคุมอยู่หลังพวงมาลัย และไม่มีใบอนุญาตให้ประกอบการรถยนต์รับจ้างไร้คนขับ จึงสมควรที่จะมีการแก้ไขเพิ่มเติมพระราชบัญญัติฉบับดังกล่าวให้รถยนต์รับจ้างไร้คนขับสามารถจดทะเบียนตามกฎหมายไทยได้ และให้มีการประกอบธุรกิจรถยนต์รับจ้างไร้คนขับได้ โดยควรดูจากบทบัญญัติของสหรัฐอเมริกา (บางรัฐ) เกาหลีใต้ และญี่ปุ่น และแก้ไขเพิ่มเติมให้มีการจดทะเบียนรถยนต์ประเภทดังกล่าวในประเทศไทยได้ และต้องมีการอนุญาตให้มีการประกอบการดังกล่าว นอกจากนั้นการประกอบการนั้นต้องกำหนดให้ผู้ควบคุมรถยนต์สามารถควบคุมรถยนต์ได้เพียงครั้งละหนึ่งคัน และต้องได้รับใบอนุญาตขนส่งสาธารณะ ในขณะที่บริษัทจะต้องส่งรายงานอุบัติเหตุและแผนการดำเนินงานทุกปี

คำสำคัญ: รถยนต์ ไร้คนขับ พระราชบัญญัติรถยนต์ พ.ศ. 2522

* รถยนต์รับจ้างไร้คนขับ: อนาคตของระบบขนส่งสาธารณะประเทศไทย

The term “taxi” is used here as the English version of “รถยนต์รับจ้าง” under the Vehicle Act, B.E. 2522 (1979) as it is used in the translation provided by Krisdika (the Council of State)

**นางสาวณัฐนิชา เอกจริยกร, LLM, University of Cambridge, United Kingdom

วันที่รับบทความ 29 กันยายน 2566; วันแก้ไขบทความ 17 พฤศจิกายน 2566; วันตอบรับบทความ 17 พฤศจิกายน 2566

Abstract

Technologies become part of our life. They assist and facilitate us in countless ways, including freeing drivers from driving duty and enhancing road safety. Autonomous vehicles (Avs) become a trend in many countries around the world. For Thailand, drivers use driving assistance features which are often incorporate with Artificial Intelligence (AI) such as Lane Keeping Assist or Adaptive Cruise Control for several years, and those cars can be registered under the Vehicle Act, B.E. 2522 (1979). As technology advances, there will be no drivers present physically at the wheel, and the vehicles will be control by programs and operators in control center. In other countries such as the USA, Korea and Japan, governments enact laws to legitimize the operation of driverless taxis, and the service can help improve road safety, tackle aging society problem and facilitate people in areas lacking of available public transport. However, this type of cars cannot be registered under the Thai existing law since they are totally controlled by program, and there is no driver behind the wheel. Thus, there should be the amendment of the Vehicle Act, B.E. 2522 (1979), and it is crucial to examine laws and regulations of other countries such as the USA (some states), Korea and Japan where driverless taxi services have proven successful. The amendment should allow the registration of fully-automated vehicles and the operation of Robotaxi company. Autonomous vehicles must be equipped with accessories such as sensors, navigation system, cyber security system and driving assistance. Moreover, it should specify that the operator must oversee only one vehicle per time, and the operator must acquire public license while the company need to report to the Department of Land Transport when there is an accident occur and submit the operation plan every year.

Keywords: vehicle, autonomous vehicle, Vehicle Act, B.E. 2522 (1979)

1. Introduction

It is inevitable that technologies are parts of our life, and they are transforming our way of living. Nowadays, in mobility industry, Artificial Intelligence (“AI”) is used as a part of the self-driving or autonomous cars. There are different levels of AI’s involvement (automation levels) in controlling those vehicles. The Society of Automotive Engineers (“SAE”) International which is a global professional association and standards organization for engineers and experts in the aerospace, automotive, and commercial vehicle industries¹ categorized levels of automotive vehicles into six levels (ranging from 0 to 5) in their J3016 standard as follows²:

Level 0: The features only help warning and momentary assistance;

Level 1 (**Driver Assistance**): The features provide steering, brake or acceleration support. The examples are Lane Keeping Assist (LKA) or an Adaptive Cruise Control (ACC)³;

Level 2 (**Partly Automated Driving**): The features provide steering, brake and acceleration support;

Level 3 (**Highly Automated Driving**): The features run the vehicles under specific conditions and only function when all necessary conditions are completed. It still requires drivers’ driving;

Level 4 (**Fully Automated Driving**): The features run the vehicles under specific conditions and only function when all necessary conditions are completed. Drivers are not required; and

Level 5 (**Fully Automation (no drivers)**): Vehicles can be run under all circumstances.

With a difference in level of AI’s involvement, it reflects on drivers’ liability and regulating those vehicles. This is simply because, for level 0-2, drivers drive the vehicle and constantly supervise the support features⁴ while, for level 3-5, drivers are freed from driving duty and become passengers instead.

In the near future, we are not only using self-driving cars by driving them ourselves, but there are also driverless taxi services that uses those autonomous vehicles for transportation. By using of

¹ ‘SAE International’ <<https://www.sae.org/>> accessed 5 August 2023.

² ‘Autonomous Driving – five steps to the self-driving car’ <<https://www.bmw.com/en/automotive-life/autonomous-driving.html>> accessed 5 August 2023.

³ ‘Autonomous Driving: The Steps to Self-Driving Vehicles’ <https://www.zf.com/mobile/en/technologies/autonomous_driving/stories/6_levels_of_automated_driving.html> accessed 5 August 2023.

⁴ ‘SAE Levels of Driving Automation™ Refined for Clarity and International Audience’ <<https://www.sae.org/blog/sae-j3016-update>> accessed 5 August 2023.

driverless taxi, it improves road safety with a range of advanced sensors detecting objects in the area enabling precise perception of the environment and detecting potential risks, and this is an up-coming trend in many countries around the world such as the USA, Korea and Japan. As this evolving trend continues to gain momentum, if Thai laws allow for such operations, its benefits will become evident.

2. Thai Existing Laws

Driverless taxis may become a reality in the not-so-distant future. It would benefit customers since it is more convenient and prevent road accidents occurring from human errors in case of drunk or fatigued drivers. The driving system is completely controlled by AI, which thus ensures that its service is monitored and regulated to comply with traffic laws. Moreover, the elimination of human drivers can improve safety and security of passengers. There were several cases that taxi drivers misconducted, harassed, (sexually) assaulted or robbed passengers leading to a sense of fear (especially in women) and avoidance of using public transportation. The absence of drivers provides passengers more comfortable feeling with greater privacy and security. Another point is that the system might be programmed to set a safer pick-up and drop-off locations, and that reduces risk of crime occurred before and after using the service, fostering a safer environment. Thus, it is crucial to take into account the existing laws and regulations enforcing in Thailand whether they are in response to this notable trend.

2.1 The registration of autopilot cars in Thai existing laws

As of today, all autonomous cars in Thailand are still below Level 3 of JS016 Standard (Highly Automated Driving), meaning that there are still drivers sitting in the drivers' seats. Vehicles are not fully autopilot, which the cars can be driven without human's involvement. Thus, their operation closely resembles that of traditional vehicles, but they are equipped with functions which provide assistance to the drivers. Drivers are still fully responsible for the overall operation of the cars.

In term of registration, Section 42 of the Vehicle Act, B.E. 2522 (1979) stated that "a driver shall be licensed and shall, while driving, possess driving license..." To illustrate, even though it does not explicitly state that vehicles must be only operated by human being, it can be inferred that the requirement for a driver's license implies the operation by a qualified human driver. This means semi-autopilot cars are still able to be registered under the Act mainly because they are not much different from traditional cars: they are operated by drivers who hold driver's license under the same Act.

While traditional cars are driven by drivers who hold drivers' licenses, driverless taxis operate without human drivers, autonomous taxis are completely operated by environment perception, car navigation, path planning and car control⁵ which are not human being. Consequently, the fully-automotive cars which are fully operated by AI cannot be registered under the existing system.

2.2 The registration of cars under online ride-hailing system

Without having drivers behind the wheel, driverless cars should be only summoned through online platforms with two main reasons. First, autonomous cars are programmed to operate in a predefined route and be unlocked through phone application, so its nature is not suitable to be hailed by raising the hand on the street. Second, it makes traditional taxis face the reduced demand in their services and job security with its cost efficiency and consistency. Hence, all automotive taxis should be hailed only via an electronic system.

In the future, fully-automation vehicles can be both personal cars or public cars. Under the current laws and regulations, both types of cars can be summoned via online application under the Ministerial Regulation Re: Ride-Hailing Vehicle via an Electronic System B.E. 2564 (2021) and Department of Land Transport Notification Re: Specifications for Qualifications and Operations of electronic system, and Criteria, Procedures, and Conditions for Verifying Electronic System and Operator of Ride-Hailing Vehicle via Electronic System B.E. 2564 (2021).

In summary, under existing law, hailing cars through online application is legal permissible. However, the autonomous cars cannot be registered under the existing provisions. Consequently, it is essential to learn from laws and policies of other countries which are world pro-autonomous supporters.

3. Foreign Law and Practice

Since Thai laws and regulations are inadequate to govern the emerging sophisticated technology effectively. This comes into a question regarding who should hold the driving license because, in a traditional world, it is issued to those who are capable of driving cars safely and adhere to traffic laws. Now, the focus here is shifted from an ability to drive the car to being able to oversee computer system to comply with traffic laws and regulations as well as safety standards. Hence, the

⁵ Jianfeng Zhao, Bodong Liang and Qiuxia Chen, 'The Key Technology Toward the Self-Driving Car' (2018) 6 International Journal of Intelligent Unmanned Systems 4 <<https://www.emerald.com/insight/publication/issn/2049-6427/vol/6/iss/1>> accessed 9 August 2023.

established laws and regulations of USA, Korea and Japan, where the developments of driverless have embraced and laws have tackled those issues, should be taken into account as a potential model for Thai laws.

3.1 Arizona, USA

Arizona's Executive Order 2015-09 (Self-Driving Vehicle Testing and Piloting in the State of Arizona; Self-Driving Vehicle Oversight Committee) laid down a brief framework that the state will support the testing and operation.⁶ The testing and operation must follow the following rules. First, vehicles must be run only by persons designated or authorized by organization which is developing the technology. Second, in terms of operation, the vehicle must be overseen and operator must be able to control if necessary. Third, the person operating the vehicle must acquire a driver's license to operate motor vehicle. Last, the vehicle owner must submit the evidence of financial responsibility.⁷

In 2018, the state recognized how driverless cars help reducing road accidents, so it promulgated State of Arizona Executive Order 2018-04 Advancing Autonomous Vehicle Testing and Operating; Prioritizing Public Safety. Subsequently, the Arizona Department of Public Safety (DPS) to develop a Law Enforcement Interaction Protocol ruling about conditions that companies are required to meet as well as the law enforcement in incidents such as accidents, violation of Arizona traffic regulations and crimes in relation to the vehicle.⁸

3.2 California, USA

California is one of the pioneering states in allowing autonomous vehicle testing and public use, and this initial action was leading to a significant uplifting across the industry. Under the California Autonomous Vehicle Testing Regulations, the company must adhere to seven main requirements. Firstly, it must provide insurance or bond.⁹ Secondly, it must verify that the cars can operate without human drivers, meet federal Motor Vehicle Safety Standards or be exempted from the National

⁶ Executive Order 2015-09 (Self-Driving Vehicle Testing and Piloting in the State of Arizona; Self-Driving Vehicle Oversight Committee).

⁷ Ibid.

⁸ Law Enforcement Protocol for Fully Autonomous Vehicles.

⁹ 'DMV Authorizes Cruise to Test Driverless Vehicles in San Francisco' <<https://www.dmv.ca.gov/portal/news-and-media/dmv-authorizes-cruise-to-test-driverless-vehicles-in-san-francisco/>> accessed 10 August 2023.

Highway Traffic Safety Administration, and are SAE Levels 4 or 5 vehicles.¹⁰ Thirdly, the vehicle must be tested under the controlled settings, resembling the expected area of operation. Fourthly, the company must notify the local authorities about the testing field. Fifthly, it must create a Law Enforcement Interaction Plan outlining the law enforcement and how first responders interact with the vehicles.¹¹ Sixthly, it must oversee the condition and performance of the vehicles.¹² Seventhly, it needs to held trainings for remote operators regarding the technology. Lastly, it must submit an annual report and a within 10 days if there is any crashes report to the Department of Motor Vehicles.¹³

Furthermore, in the initial stage, autonomous taxis were only allowed to operate during 10 P.M. to 6 A.M. without human drivers with a capped speed at 30 miles per hour on selected areas in San Francisco¹⁴ and, with drivers, the operation can be done in full throughout the state. However, it needs to provide a service throughout the state for free if they operate without the presence of human drivers.¹⁵

On August 10, 2023, the California Public Utilities Commission had just allowed a commercial service of driverless taxis with a 24-hour operation in all part of the state.¹⁶ Nonetheless, it limits the speed and restrict some companies from using use highways or operating at times of heavy fog, precipitation or smoke in order to avoid hazardous conditions and ensure safe operation.¹⁷

3.3 South Korea

South Korean started from passing the Act on the Promotion and Support of Autonomous Vehicle Commercialization of Autonomous Vehicles in 2019. After that, it produced strategies for the

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

¹⁴ ‘Cruise can finally charge for driverless robotaxi rides in San Francisco’ <<https://techcrunch.com/2022/06/02/cruise-can-finally-charge-for-driverless-robotaxi-rides-in-san-francisco/>> accessed 11 August 2023.

¹⁵ ‘Driverless cars set to soon operate in San Francisco’ <<https://traveltomorrow.com/driverless-cars-set-to-soon-operate-in-san-francisco/>> accessed 11 August 2023.

¹⁶ ‘Cruise robotaxis now run all day in San Francisco, with public access after 10 p.m.’ <<https://www.cnbc.com/2023/04/25/cruise-robotaxis-now-run-24-7-in-san-francisco-public-access-at-night.html>> accessed 11 August 2023.

¹⁷ ‘San Francisco moves to center of robotaxi universe after California agency vote’ <<https://www.reuters.com/business/autos-transportation/california-agency-vote-san-francisco-robotaxi-expansion-amid-heavy-opposition-2023-08-10/>> accessed 11 August 2023.

rapid growth of the industry, created the Level 3 driverless car safety standards (which is the world's first standards) in accordance with the World Forum for Harmonization of Vehicle Regulations (WP.29) as well as established the testing zone for cars which fail to meet safety standard and safety zone for robotic vehicles on public roads.¹⁸

Regarding its action towards fully automated driving, there was an amendment of the Act on Guarantee of Automobile Accident Compensation in order to protect the victims of road accidents occurring from autonomous vehicles.¹⁹ It introduces a rule that all driverless vehicles must have a recording equipment allowing the accurate investigation into the causes of accidents and the record must be kept for one year.²⁰ Moreover, it allows the launch of Level 4 driverless taxi in a district in Seoul. However, the ministry required the presence of a human driver in case of emergency, regardless of the fact technologies can operate the car completely,²¹ and it can run only on weekdays 10 A.M. to 4 P.M.²²

3.4 Japan

Japan government amended the Road Traffic Act 1960 in order to allow Level 4 vehicles. The robotic taxis can offer services under remote supervision and on specific roads in depopulated zones, and the company is required to submitted the operation plans to the Public Safety Commissions of Prefectural Police.²³ Moreover, the remote monitoring system must contain equipment that be able to ensure situations within and outside through visual and auditory means while the cars must have a visible mark indicating that they are overseen remotely and equipped

¹⁸ 'Recent trends in regulations on autonomous vehicles in Korea' <<https://www.ibanet.org/article/19FCDD11-A0B1-41F1-97AB-F32E144311F8>> accessed 14 August 2023.

¹⁹ Ibid.

²⁰ Ibid.

²¹ 'Hyundai RoboRide - driverless taxi service goes live in Seoul' <https://www.arenaev.com/hyundai_rob Ride__driverless_taxi_service_goes_live_in_seul-news-360.php> accessed 14 August 2023.

²² 'Hyundai IONIQ 5 RoboRide Driverless Taxi Pilot Begins in Gangnam District' <<https://www.dsf.my/2022/06/hyundai-ioniq-5-rob Ride-begins/>> accessed 14 August 2023.

²³ 'Fully automated driving under certain conditions allowed in Japan' <<https://www.japantimes.co.jp/news/2023/04/02/national/level-4-fully-automated-driving-allowed-japan/>> accessed 14 August 2023.

with an emergency button, and staffs must be prompt to go to the scene in case of accident or emergency.²⁴

Under the current operation, Japan allows the operator to manage the vehicles remotely and be able to oversee up to three vehicles at the simultaneously²⁵ with a purpose to offer a mode of transport of elderly people in places where public transportation services are reduced since depopulation.²⁶

4. Suggestion

Technology improves our living significantly in several ways. It provides people with greater comfort and enhance safety, especially when Thai society is becoming an aging society. The proportion of senior citizens is growing while birth rates decline causing manpower shortage. Autonomous taxi will become an upcoming trend in Thailand, but it is relatively new for Thai people, and it takes some time for Thai people to adjust our lifestyle in order to fully integrate this technology into our daily lives. Thus, I suggest that the Ministry of Transport and Department of Land Transport should initiate a project as well as enacting law and regulations supporting the research, innovate or test driverless car. This shall begin with the coordination between the Department of Land Transport, the Department of Highways and the Department of Rural Roads in ensuring road safety i.e. the quality of roads and traffic patterns of each local community. At the same time, fully automated vehicles and their service must be allowed to be registered under Thai law. Thus, there must be an amendment of the Vehicle Act, B.E. 2522 (1979) together with the enactment of Ministerial Regulation specifying details of autopilot vehicles which will be allowed to operate on Thai roads and Department of Land Transport Rules regarding the car registration and the mandatory vehicle tax.

Having reviewed the laws and regulations of other countries, I hereby propose the following amendments to Thai law.

²⁴ 'Japan to create legal framework for level 4 self-driving cars' <<https://asia.nikkei.com/Business/Automobiles/Japan-to-create-legal-framework-for-level-4-self-driving-cars>> accessed 14 August 2023.

²⁵ 'Fukui launches Japan's first transport service using 'level 4' autonomous driving' <<https://www.japantimes.co.jp/news/2023/05/29/business/economy-business/fukui-level-4-autonomous-driving/>> accessed 14 August 2023.

²⁶ *ibid.*

1) Vehicle

The writer agrees with California's system that divide the launch of driverless taxi services into two phrases. There should be short-term plan and long-term plan for the operation. In the first period, similar to those of Korean, all newly produced autopilot cars must be tested in a sandbox or testing area before running roads which area are limited. A presence of drivers must be required to serve as a safeguard and observe situation as well as prevent potential accidents. For the long-term plan, human drivers might not be required on the drivers' seats but still in the control centers.

The subordinate law must specify the required components that all autonomous vehicles must have in details. The examples are from Japanese law which stipulates that all autonomous vehicles must have sensors, navigation system, cyber security system and driving assistance features such as Lane Keeping Assist or Adaptive Cruise Control. More Importantly, all vehicles must be equipped with emergency button as well as camera and microphone which allow the operators sitting in the control center know the real-time situation. There must be a mark which is visible to the public signifying they are robotaxis.

2) Operator

Operator is the one who is taking control of the autonomous vehicle remotely in the control center. He plays a vital role in the safety and security of not only passengers but also road users and pedestrians. Consequently, this person must pay high level of attention to all circumstances occurred in and outside the car and react promptly in case there is unexpected incident happens. Even though some countries, Japan for instance, allows one operator to oversee three driverless vehicles simultaneously, the writer opines that, as for a matter of safety, he or she should be responsible to take control of only one vehicle at a time, similar to driving traditional car which one driver can drive only one car at once.

All operators must acquire public license which requires more comprehensive qualification compared to private license. The qualifications are such as acquiring other types of driving license for more than one year, not being disable person and having no criminal background. This is similar to the system of upcoming governing law of rail transport which drivers are not in the train but the control centers, and people those who are overseeing the train or the vehicles must acquire public license.²⁷

²⁷ Draft Rail Transport Act B.E. (Department of Rail Transport) under the consideration of the Council of State (29 December 2020).

Furthermore, operators should be trained on various areas; for example, how each part of cars and autopilot features work, emergency protocols, taking control of equipment such as accelerate and brake, communication with passengers and pedestrians, and traffic laws and rules. The aspects of training can be taken from foreign countries' (such as California) courses as examples. After completing training, they must take an exam and undergo testing simulations in order to build deep understanding in the system and practice handling situations that they might encounter while taking control of vehicles.

3) Robotaxi company

The company must establish a system which allows human to give supervision to advanced technology remotely and seamlessly. Global Positioning System (GPS), speedometer, and object tracking are for example. Furthermore, this software must be updated to ensure the accurate navigation as the AI requires precise information in order to make decision in taking control of the vehicles. The update help prevent cyberattacks from hackers and unauthorized access to gain customers' information which might lead to unexpected circumstances causing damage to life of passengers and road users. It must have emergency response team consisting of skilled technicians and trained operators who are able to reach the vehicles' location and solve problems in case of emergency.

Korean's reporting scheme should be taken as a pattern to follow. Company must submit reports if malfunction or accident occurs. The reports must provide information about the investigation of cause, company's response as well as the prevention of future incidents. The company must submit its annual operation plan to the Department of Land Transport specifying details about company's safety and security policy (including cars inspection and cybersecurity) as well as collecting personal data, internal control and trainings.

Moreover, in order to ensure protection to life and body of passengers, the Department of Land Transport must require the company to put bank guarantee in an amount higher than conventional taxi operating companies or acquire insurance protection from at least two insurance companies since vehicles run remotely might cause more serious damages.

By nature of the autonomous taxi, it must offer service through online system or smartphone application only. The registration of cars must also comply with the Ministerial Regulation Re: Ride-Hailing Vehicle via an Electronic System B.E. 2564 (2021) while the companies shall ensure that their system meet criteria specified by the Department of Land Transport Notification Re: Specifications

for Qualifications and Operations of electronic system, and Criteria, Procedures, and Conditions for Verifying Electronic System and Operator of Ride-Hailing Vehicle via Electronic System B.E. 2564 (2021). The criteria are for example the system must be able to calculate route, distance, travel time and fare after passenger specify pick-up and drop-off locations, the system must allow the driver to accept the change of destination during the trip, and the system must show vehicle's plate number, car model and color.

5. Conclusion

Robotaxi is an emerging trend in counties around the world such as in the USA, Korea, and Japan where the development and deployment of robotaxis are growing rapidly. However, Thai's the Vehicle Act, B.E. 2522 (1979) allows only the registration of the cars which are operated by drivers holding the driving license. The fully-automated vehicles cannot be registered under Thai law yet. Thus, there must be the amendment of the Vehicle Act, B.E. 2522 (1979). While the laws and regulations must provide broadly for the flexibility of development, the safety and security of passengers, pedestrians, and road users must be ensured. As can be seen from the regulations of the Arizona, California, Korea and Japan, one operator must have public license and oversee one vehicle per time. Moreover, the company need to report to the Department of Land Transport when there is an accident occur and submit the operation plan annually.