



Since the turn of the century, we have seen the automotive industry shifting from one that is asset-centric to a service-oriented industry. From e-hailing services to car rental communities, as we inch closer towards the turn of a century, innovation takes another progressive step in the transportation industry and Mobility-as-a-Service — driverless vehicles. Experiments have been conducted on autonomous vehicles (AVs) since the innovation of the Stanford Cart in 1961,¹ but how quickly can regulation catch up to speed with the evolution of mobility today?

SAE Levels of AV

The Society of Automotive Engineers introduced the SAE Levels of Driving Automation² in January 2014 providing the international community with the taxonomy and definitions for AV driving systems. The SAE levels show the range of automation from Level 0 (full manual driving)

to Level 5 (fully automated systems)

Apart from the SAE systems on vehicle readiness for automation, KPMG International published a list of countries that were most ready to adopt AVs called the Autonomous Vehicle Readiness Index (“AVRI”), based on the following four pillars:³

- Pillar 1: Policy and legislation;⁴
- Pillar 2: Technology and innovation;⁵
- Pillar 3: Infrastructure;⁶
- Pillar 4: Consumer acceptance.⁷

Where policy and legislation are concerned, we shall be looking at the AV laws and policies of Singapore and the UK, which are ranked 1st and 2nd, respectively, for Pillar 1.

1 “A Brief History of Autonomous Vehicle Technology” *WIRED Brand Lab* <<https://www.wired.com/brandlab/2016/03/a-brief-history-of-autonomous-vehicle-technology/>> (accessed 23 September 2019).
 2 Society of Automotive Engineers, “Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems” (16 January 2014) <https://www.sae.org/standards/content/j3016_201401/>.
 3 KPMG International, “2019 Autonomous Vehicles Readiness Index” <<https://home.kpmg/xx/en/home/insights/2019/02/2019-autonomous-vehicles-readiness-index.html>> (accessed 22 September 2019).
 4 Countries with high scores in Pillar 1 are supportive of AV and have few restrictions on when, where and how testing of AVs may occur and also include the country’s ability to pass regulations necessary for the development of AVs.
 5 Countries with high scores in Pillar 2 focus on investing in AV-related firms and R&D, industry partnerships and innovation-friendly business environment.
 6 Countries with high scores in Pillar 3 have high performance mobile internet network coverage, speed, the number of servers and network bandwidth, great 4G coverage to enable AVs access to mobile data networks and high-quality roads.
 7 Countries that have high scores in Pillar 4 have consumers that are positive and enthusiastic about the adoption of AVs and have access to the latest technologies, mobile broadband subscriptions, internet access and bandwidth.



SAE J3016™ LEVELS OF DRIVING AUTOMATION

	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are not driving when these automated driving features are engaged – even if you are seated in "the driver's seat"		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
	These are driver support features			These are automated driving features		
What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
Example Features	<ul style="list-style-type: none"> • automatic emergency braking • blind spot warning • lane departure warning 	<ul style="list-style-type: none"> • lane centering OR • adaptive cruise control 	<ul style="list-style-type: none"> • lane centering AND • adaptive cruise control at the same time 	<ul style="list-style-type: none"> • traffic jam chauffeur 	<ul style="list-style-type: none"> • local driverless taxi • pedals/steering wheel may or may not be installed 	<ul style="list-style-type: none"> • same as level 4, but feature can drive everywhere in all conditions

Graphic source: www.sae.org

Both Singapore and the UK have enacted laws to regulate the growth of the AV industry, but we will see that they have different approaches to regulation. Singapore is recognised for its effectiveness of its law-making bodies, and the UK for its open and shared data approach that enables greater collaboration between government and private industry.

The Malaysian government has yet to provide any concrete regulatory framework on the AV industry, but perhaps by looking at the laws and policies of Singapore and the UK, we may get a clearer indication of the standards that we should be adopting in regulating AVs in the country.

Singapore

'Specified Person' to seek authorisation

In 2017, Singapore introduced for the first time legislative amendments to the Road Traffic Act to regulate the use of AVs. The Minister of Transport then issued the AV Rules,⁸ with the intention of creating a testing ground for the AV industry.

The Rules that came into operation on the roads of Singapore purport to regulate the early testing stages of AVs before conducting

any trial of AV technology on public roads. Whenever a Specified Person (e.g. technology developer) undertakes the trial of conducting the AV technology or the usage of the AV on the road (e.g. any person using an AV on the road), he must first obtain authorisation from the Land Transport Authority of Singapore (**Authority**), which may prescribe the following conditions:⁹

- stating the geographical area that the approved trial or use may be carried out;
- requiring a driver to be seated in the AV to monitor the AV and to take over operation of the AV if necessary;

⁸ Road Traffic (Autonomous Motor Vehicles) Rules 2017 <<https://sso.agc.gov.sg/SL/RTA1961-S464-2017?DocDate=20170823>>

⁹ Rule 10 of the AV Rules also provide for the Authority to have the power to modify these conditions with written notice and a chance of not less than 14 days for the Specified Person to make representations on whether the proposed modification is justified.

Pillar 1: (Policy and legislation) normalized indicator values by country

Country	AV regulations	AV department within government transportation dept.	KPMG Change Readiness Government Capability pillar	WEF – Effectiveness of lawmaking bodies	WEF – Efficiency of the legal system in challenging regulations	Number of government-funded AV pilots	Assessment of the data-sharing environment
Singapore	1.000	1.000	1.000	1.000	0.697	1.000	0.411
United Kingdom	0.917	0.857	0.673	0.847	0.781	0.833	1.000
New Zealand	0.917	0.929	0.845	0.882	0.874	0.667	0.743
Finland	1.000	0.714	0.892	0.786	1.000	0.833	0.451
The Netherlands	1.000	0.714	0.766	0.732	0.837	0.917	0.688
Germany	0.750	0.857	0.778	0.679	0.867	0.833	0.621
Norway	0.917	0.843	0.856	0.792	0.654	0.833	0.674
Canada	0.750	0.714	0.622	0.732	0.617	1.000	0.870
United States	0.833	0.714	0.527	0.422	0.986	0.917	0.771
Sweden	0.667	0.714	0.968	0.785	0.730	0.667	0.625
United Arab Emirates	0.833	0.929	0.990	0.748	0.739	0.667	0.081
Australia	1.000	0.714	0.663	0.622	0.592	0.500	0.765
Austria	0.833	0.929	0.648	0.456	0.518	0.833	0.629
France	0.750	0.714	0.480	0.624	0.545	0.833	0.815
Japan	0.333	0.571	0.537	0.780	0.720	0.833	0.691
South Korea	0.833	0.857	0.380	0.216	0.391	1.000	0.766
Czech Republic	0.833	0.714	0.484	0.231	0.225	1.000	0.309
Israel	0.667	0.643	0.435	0.364	0.572	0.750	0.331
Spain	0.833	0.714	0.341	0.425	0.245	0.500	0.668
China	0.500	0.643	0.367	0.460	0.564	0.917	0.000
Hungary	0.583	1.000	0.232	0.330	0.000	0.833	0.046
Russia	0.500	0.857	0.133	0.304	0.302	0.167	0.360
India	0.167	0.000	0.221	0.417	0.682	0.167	0.288
Mexico	0.000	0.143	0.093	0.200	0.225	0.000	0.670
Brazil	0.167	0.143	0.000	0.000	0.157	0.000	0.488

Source: KPMG International, 2019

- (c) prohibiting any AV from carrying passengers;
- (d) prohibiting any autonomous motor vehicle from being used for hire or reward;
- (e) stating the persons who may participate in the approved trial or approved special use; and
- (f) any other conditions regarding the technical specifications of the AV.

The Authority may withdraw the authorisation if it thinks that the AV is no longer in the public interest to continue or if the technology developer or the human driver fails to comply with any of the conditions of the authorisation.

10 As provided by r 14 of the AV Rules.

11 Such data as prescribed in r 17 of the AV Rules must be kept for three years from the date of recording, despite the authorisation period ending earlier than the period of data storage.

12 Land Transport Authority, Enterprise Singapore, Standards Development Organisation & Singapore Standards Council, “Singapore Develops Provisional National Standards to Guide Development of Fully Autonomous Vehicles” (31 January 2019) <<https://www.lta.gov.sg/content/ltagov/en/newsroom/2019/1/2/joint-media-release-by-the-land-transport-authority-lta-enterprise-singapore-standards-development-organisation-singapo.html>>(accessed 22 September 2019).

Liability insurance

The Specified Person must obtain liability insurance that will indemnify the owner and the authorised driver or operator of the AV, especially in relation to death or bodily injury and damage to property caused by the use of the AV on the road.¹⁰ If the Specified Person fails to obtain the liability insurance from an insurer of an insurance business for the approved trial or use of the AV, then a security of S\$1.5 million may be deposited with the Authority instead to insure the odds of those road accidents happening.

Installation of data recorder

The value of having AV trials is in the data collected. Under the Rules, every AV must be installed with a data recorder and be able to capture data such as the vehicle locations, sensor data and camera or video footage.¹¹

Provisional national standards for AV companies

Apart from the AV Rules, Technical Reference 68 (TR68) was jointly published by the Authority, the Standards Development Organisation and the Singapore Standards Council in January 2019 with the intention of providing provisional national standards to guide AV companies in rolling out their products and services safely.¹² There are four parts to TR68 which prescribe:

- (i) the basic behaviour of the AV, such as conduct of autonomous driving and interpretation of road signs;

- (ii) the functional and operational safety requirements of the AV on the road;
- (iii) the cybersecurity principles and assessment, safeguards to cybersecurity; and
- (iv) the management of vehicular data types and formats.

However, TR68 is not publicly available and is sold separately by the Singapore Standards Council,¹³ presumably to be purchased by serious AV companies only. In Singapore, compliance with Singapore Standards is voluntary and only becomes mandatory when used by government bodies in regulations or administrative requirements for safety, environmental and health issues.¹⁴

United Kingdom

In addition to compulsory motor insurance where victims could sue another human driver for reckless driving (for example), the Automated and Electric Vehicles Act 2018 (**AEVA**) provides expressly for victims to sue the vehicle manufacturer directly where the accident was a result of a failure in the vehicle itself and not a result of human error.¹⁵

The primary law regulating AVs in the UK is contained in the first part of the AEVA, which only addresses liability of the insurers in the AV industry.¹⁶ Unlike Singapore which prescribes for the technology developer to follow a list of legal requirements in the Rules, the UK's Code of Practice for Automated Vehicle Trialling (**Code**) only requires that those conducting public trials adhere to three of the following legal requirements:

- (i) A driver must be present to override and resume control of the vehicle, whether he or she is in or out of the vehicle (e.g. controlled remotely);
- (ii) the vehicle is roadworthy in accordance with the Road Vehicles (Construction and Use) Regulations 1986; and
- (iii) that appropriate insurance is in place as provided for in the AEVA.

Other than the three prescribed legal requirements, the Code is a string of recommendations facilitating the trialling of a range of AVs, from automated pods and shuttles to passenger, goods and public service vehicles. According to the Code, trialling organisations in developing the AV technology should take into account the following recommendations:

- (i) General requirements including legal requirements, insurance, passenger and freight services, data access, data protection and cyber security;
- (ii) Guidance on engaging with relevant authorities and the public;
- (iii) Safety driver and operator requirements to oversee trials, the license requirements, training and the behaviour required to operate the AV;
- (iv) Vehicle requirements such as at in-house trials, testbeds, remote-controlled operations, conditions for data recording and transition between automated and manual modes.¹⁷

13 Singapore Standards <<https://www.singaporestandardseshop.sg/Product/SSPdtDetail/1cd3d49e-e896-4f33-b1d0-dda96f55bf74>> (accessed 29 September 2019).

14 Maritime and Port Authority of Singapore, "FAQs on Standardisation" <<https://www.mpa.gov.sg/web/wcm/connect/www/865af8b8-a672-42f4-a0ea-208a5932800d/060927d.pdf?MOD=AJPERES>> (accessed 29 September 2019).

15 AEVA, s 2.

16 AEVA is a two-part legislation that provides for:

- (i) legislation pertaining to the liability of insurers in AV-related accidents; and
- (ii) the installation and operation of charging points for electric vehicles.

17 Centre for Connected & Autonomous Vehicles, "Code of Practice: Automated Vehicle Trialling" (February 2019) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/776511/code-of-practice-automated-vehicle-trialling.pdf> (accessed 19 September 2019).

Although they are merely “recommendations”, the Code states that failure of adherence may still have its legal consequences, presumably under existing laws, and any expectations set by the Code do not guarantee immunity from liability in any way.

Extension of insurance in automated mode

The AEVA, therefore, deals primarily with extending the conventional motor vehicle insurance to cover AVs when they are in an automated mode (SAE Levels 4 and 5). The idea is that the insurers would have to initially be liable to pay compensation to any victims affected by the faulty AV — whether they are the driver who handed control of the AV, passengers in other vehicles or just pedestrians on the road — and then recover the costs from the appropriate liable party under common law.¹⁸

The law goes on to extend the insurer’s liability to include accidents causing death, personal injury or damage to the property of others other than the AV in question, any goods carried for hire or reward or property in the custody of the insured person or person in charge of the AV at the time.

Exclusion of liability: Failure to install safety-critical software updates

The AEVA also allows the exclusion or limitation of the insurer’s policy by distinguishing the accidents caused by the AV’s software being altered in breach of the insurance policy, and when there has been a failure to install safety-critical software updates that the insured person knows, or ought reasonably to know, that the AV is unsafe to use without the updates being installed.¹⁹

Conclusion

Even though both Singapore and the UK are providing for the testing and development of the more automated SAE levels, it would appear that they have different styles of regulating the industry. Singapore may invest more in strategic planning and project a greater readiness for change to the automotive industry, but the prescriptive legislation in Singapore’s AV Rules can be seen as placing restrictions on testing and reducing the flexibility for innovation. The UK is minimal on its legal requirements and is only specific about the type of insurance that parties should be responsible for. However, the UK’s approach with the Code seems to suggest more openness to collaborate with the AV companies, taking on a more consultative role.

In March 2019, Singapore’s Nanyang Technology University — together with Volvo and the Land Transport Authority — unveiled the first autonomous electric bus and the trial of two driverless shuttles in Sentosa.²⁰ ComfortDelGro has also just recently launched its fully driverless shuttle at the National University of Singapore’s campus after a year-long study of gauging the AV’s commercial viability.²¹ The self-driving car startup NuTonomy, a Massachusetts Institute of Technology spinoff, chose Singapore as its central location to work on AV technology and to roll out a driverless taxi system because of its infrastructure, R&D and supportive government.²²

In the UK, the first demonstration of an autonomous fleet in London (former Olympic Park in Stratford) was held in October 2019. Trials have been conducted by the UK tech firm Oxbotica in Oxford to test the ecosystem of AVs, hackers, communications technology and the legal framework.²³ It is expected that while there may be limited

18 AEVA, s 5.

19 AEVA, s 4.

20 “NTU Singapore and Volvo Roll Out ‘World’s First’ Self-driving Electric Buses” *Singapore Business Review* (5 March 2019) <<https://sbr.com.sg/transport-logistics/news/ntu-singapore-and-volvo-roll-out-worlds-first-self-driving-electric-buses>> (accessed 14 October 2019).

21 Luz Wendy Noble, “Singapore Revs Up Engines for Autonomous Vehicle Race” *Singapore Business Review* (8 July 2019) <<https://sbr.com.sg/transport-logistics/exclusive/singapore-revs-engines-autonomous-vehicle-race>> (accessed 14 October 2019).

22 Yanting Sum, “How Driverless Car Startup NuTonomy is Building the Future of Transport” *Tech in Asia* (2 February 2018) <<https://www.techinasia.com/driverless-car-startup-nutonomy-future-transport>> (accessed 14 October 2019).

23 Gwyn Topham, “It’s Going to be a Revolution’: Driverless Cars in New London Trial” *The Guardian* (3 October 2019) <<https://www.theguardian.com/technology/2019/oct/03/driverless-cars-in-new-london-trial-in-complex-urban-environment>> (accessed 3 October 2019).

availability of autonomous transport, the full service of robotaxis and autonomous vehicles on public roads in the UK may only be about five to 10 years away.

Although the Malaysia Automotive Robotics and IoT Institute, or MARII, has made announcements of the Ministry of International Trade and Industry's readiness to test AVs in Malaysia,²⁴ the nation's readiness to offer such mobility on demand was supposedly set to be revealed in the National Automotive Policy 2019-2030, outlining the regulatory framework for autonomous vehicles as well as "flying cars".²⁵ However, as it turns out, not a lot was expounded on the adoption of autonomous driving other than to "accelerate usage of automation through adoption of technology and digitalisation in transport" as a strategy to implement smarter infrastructure.²⁶

Just like the trend in the disruption of the financial services industry in Malaysia, we would benefit greatly from providing flexibility to such innovations and encouraging collaborations between the government and AV companies as it will inspire business confidence that will, in turn, stir growth for R&D in this industry. If we decide to adopt a prescriptive approach, Malaysia may face great challenges simply because we may not have the infrastructure to support the technology of AVs. The public's access to the latest technologies, broadband and uninterrupted access to the internet (preferably 5G in the case of AVs)²⁷ would certainly help to increase consumer confidence and subsequent policymaking on AVs, but until Malaysia's road infrastructure is improved, especially when it comes to the planning and quality of the roads, we may perhaps be better off focusing on flying cars. **LH-AG**

24 Ayisy Yusof, "Malaysia to Roll Out Tesla-like Battery for Electric Vehicles by 2020" *New Straits Times* (20 January 2019) <<https://www.nst.com.my/business/2019/01/452602/malaysia-roll-out-tesla-battery-electric-vehicles-2020>>

25 "New NAP to Outline Regulatory Framework for 'Flying Cars'" *Bernama* (22 March 2019) <<https://www.mida.gov.my/home/8435/news/new-nap-to-outline-regulatory-framework-for-%E2%80%98flying-cars%E2%80%99/>> (accessed 19 September 2019).

26 Ministry of Transport Malaysia, National Transport Policy 2019-2030, at p 43.

27 Ted Kritsonis, "The Role of 5G in Autonomous Vehicles" *Futurithmic* (30 January 2019) <<https://www.futurithmic.com/2019/01/30/role-of-5g-autonomous-vehicles/>> (accessed 30 September 2019).