MarshMcLennan

Recharging driverless mobility

How electrification can unlock the potential of autonomous vehicles

Marsh · GuyCarpenter · Mercer · OliverWyman

Introduction

Advances in enabling technologies are catalyzing the development of autonomous vehicles (AVs). However, concerns around safety and scalability continue to stifle commercial viability. The electrification of AVs to create electric autonomous vehicles (E-AVs) will help alleviate some of this anxiety, while helping businesses and governments achieve their goals — from creating new revenue streams to helping countries achieve net-zero emission targets.

The convergence of a core group of enabling technologies — such as 5G, LiDAR (light detection and ranging), high-definition cameras, and human-machine interface systems — is facilitating the creation of advanced autonomous driving technologies. As these innovations converge, deep neural networks are increasingly able to make sound driving decisions.

However, the pandemic and subsequent economic slowdown, divestitures, and recent AV road accidents have put a damper on AV commercialization. In contrast, the global stock of electric vehicles (EVs) registered a 43 percent year-on-year increase in 2020, and a 160 percent rise in EV registrations during 1H21, buoyed by incentives and subsidies in several countries.[1,2] In a prospective deal between a large rental player and an automotive manufacturer in the US, the rental company plans to convert 20 percent of its fleet to the automaker's electric cars by end of 2022.[3] Developing E-AVs could capitalize on the growing demand for EVs while enhancing the safety, profitability, and sustainability of AVs.

Manufacturers aspiring to provide full autonomy have already developed driverless cars that can navigate complex urban settings. However, their success depends on large amounts of data harvested from very specific driving environments. The mammoth costs associated with gathering such intricate data and the existing debate over which technologies should be included in AV stacks (with a major American manufacturer excluding LiDAR) have raised concerns about their ability to scale up fully autonomous services safely and economically.

Meanwhile, semi-autonomous features, like lane-keeping assistance, which bolster safety, have become increasingly common. Data collected from these advanced driver assistance systems (ADAS) will help improve deep learning algorithms, potentially facilitating safe and scalable full urban autonomy. Firms across the autonomous vehicles value chain such as vehicle and component manufacturers, technology providers, insurance providers, etc., will need to grapple with increasing cyber risks, evolving privacy regulations, and stiff competition for recruiting and retaining skilled employees to harness the potential of this data.

While EV and AV technologies each have their challenges (see sidebar on p.4), electrification could generate short-term revenues through the provision of ADAS equipped EVs", compound

---

1 Perkins, R. (2021, January 20). *Europe overtakes China in EV sales growth in 2020.* S&P Global Platts. Retrieved August 04, 2021, from https://www.spglobal.com/platts/en/market-insights/latest-news/coal/012021-europe-overtakes-china-in-ev-sales-growth-in-2020

2 Skidmore, Z. (2021, September 23). *Electric Vehicle sales surge in 2021.* Power Technology. Retrieved November 08, 2021, from https://www.power-technology.com/news/electric-vehicle-sales-surge-in-2021/

3 Boudette N. & Chokshi N. (2021, October 25). *Tesla Value Tops $1 Trillion After Hertz Orders 100,000 Cars*. The New York Times. Retrieved November 08, 2021, from https://www.nytimes.com/2021/10/25/business/hertz-tesla-electric-vehicles.html

technological benefits and enable commercially viable E-AV business models while helping cities and corporations achieve ever more ambitious ESG goals. Not surprisingly, governments see the potential of EV and AV technologies in combination (see Exhibit 1): A bill has been introduced into the California state legislature that would require all autonomous vehicles to also be zero-emission by 2025.[4] If passed, it would have an impact on the ride-hailing, delivery, and trucking sectors. And it could initiate changes that would increase the adoption of E-AVs.

Initially, E-AVs are likely to be deployed in freight due to the standardized nature of their operations. Data collected from these vehicles will aid city planners, manufacturers, and insurers, facilitating more accurate risk assessments and enabling the provision of new forms of insurance. This will help improve profitability, build public confidence, and eventually pave the way for fully autonomous ride-hailing and fleet operations.

Exhibit 1: The growing need for electric autonomous vehicles

Crowded cities

Over 55% of the world population reside in urban areas.[5]

That is 4.2 billion people. According to the UN, that number is set to balloon up to 6.7 billion by 2050. Traffic congestion is already sizeable in many urban centers; unsurprisingly, many of these cities also rank among the world's most polluted

The environmental toll of transportation

Transportation accounts for 21% of global carbon emissions.[7]

Several countries including Germany, Netherlands, and India have set targets to prohibit the sale of internal combustion engine vehicles within their borders after 2030. Many others like Denmark and Japan have instituted subsidies and incentives to boost EV sales

The promise of electric autonomous vehicles (E-AVs)

Autonomous vehicles will reduce traffic congestion by at least 35%.[6]

Aside from the benefits of using electricity from low carbon sources instead of fossil fuels to power vehicles, research suggests that a fleet of connected AVs will reduce traffic congestion, thereby minimizing commute time and further compounding energy savings

First forays in E-AV deployment

Heavy duty vehicles account for ~19% of total greenhouse gas emissions within the EU.[8]

Given the looming labor crunch for long-haul truck drivers, significant investments in charging infrastructure, and the standardized routes of operation, the freight industry will likely be the first to adopt E-AVs

Source: Marsh McLennan Advantage.

4 Bellan, R. (2021, March 5). *California bill would require all self-driving vehicles to be zero emission by 2025.* TechCrunch. Retrieved August 04, 2021, from https://techcrunch.com/2021/03/05/california-bill-would-require-all-self-driving-vehicles-to-be-zero-emission-by-2025/

5 United Nations Department of Economic and Social Affairs. (2019). *World urbanization prospects.* Retrieved November 22, 2021, from https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf.

6 Wang, S., & Ge, M. (2019). *Everything You Need to Know About the Fastest-Growing Source of Global Emissions: Transport*. Retrieved November 22, 2021, from https://www.wri.org/insights/everything-you-need-know-about-fastest-growing-source-global-emissions-transport

7 University of Cambridge. (2019, May 19). *Driverless cars working together can speed up traffic by 35 percent.* Retrieved August 04, 2021, from https://www.sciencedaily.com/releases/2019/05/190519191641.htm

8 Ucci, F., Kelp, R., & Ferrero, M. (n.d.). *To meet 2030 decarbonization targets, European Trucking Need.* Retrieved November 22, 2021, from https://www.marshmclennan.com/insights/publications/2021/september/2030-decarbonization-targets.html

The evolving AV and EV technological landscape

	AUTONOMOUS VEHICLES	ELECTRIC VEHICLES
Enabling Technologies	• LiDAR (Light detection and ranging) and high-definition cameras to monitor the driving environment • AI-powered neural networks (layers of algorithms that enable autonomous decision-making) and human-machine interface systems • High-performance computers and ultra-fast 5G networks to monitor risks in real-time and enable a car to operate safely • V2X (Vehicle-to-everything) communication technologies to enable vehicles to communicate and coordinate with each other	• Energy storage devices such as various types of batteries (primarily lithium-ion), fuel cells, and ultra-capacitors along with electric propulsion • AI-powered battery management and energy optimization systems • Energy-efficient motors and high-performance control circuits • Onboard inverters which apply pulse-width modulation control to convert direct current (DC) power stored in an onboard battery into alternating current (AC) power to drive the motor
Key Advances	• Reduced cost of a fully equipped hardware system (LiDAR, cameras, sensors, radar, and electronics): from $75,000 to $7,500 • Solid-state LiDAR has helped eliminate moving parts in the optical mechanisms, reducing the price and size of these sensors[9] • Hardware costs may eventually come down to 30 cents per mile, well under the $2-3 per mile that many ride-hailing companies are charging as of now[10]	• Various battery technologies are in development[11]: – Sulfide-based, solid-state batteries which last 30 years – Batteries that don't use cobalt (which is one of the most expensive components presently) – Graphene-based batteries which can charge in 15 seconds and supplement lithium-ion batteries • Vehicle-to-grid (V2G) technologies will enable EVs to become low-cost energy storage resources that return energy to the grid in times of peak demand, raising the residual value of batteries by increasing the scope for their reuse as energy storage devices
Limitations/ Challenges	• 5G, which is essential to autonomous driving, is only now being rolled out but will eventually facilitate high-speed, low-latency connectivity • Inclement weather conditions (heavy snow, extreme heat, rain, or fog) significantly inhibit the sensing and "seeing" capabilities of AVs • Accidents, regulatory uncertainty, and concerns about the ethical biases of algorithms continue to limit public confidence in AV capabilities	• Limited advances in battery technology and the relatively shorter distances fully charged EVs can travel compared to gas-powered cars • Relatively high selling price compared to internal combustion engine alternatives • Scarcity of charging infrastructure in most countries • EV batteries comprise hundreds of lithium-ion cells, which contain hazardous materials and can explode if disassembled incorrectly. Presently, only 5 percent of EV batteries are recycled[12], but governments are increasingly mandating manufacturers to take responsibility for recycling

9 Wantabe, N., Rygen, H. (2021, May 30). *Cheaper lidar sensors brighten the future of autonomous cars*. Nikkei Asia. Retrieved August 04, 2021, from https://asia.nikkei.com/Business/Automobiles/Cheaper-lidar-sensors-brighten-the-future-of-autonomous-cars

10 Moreno, J. (2021, January 22). *Waymo CEO Says Tesla Is Not A Competitor, Gives Estimated Cost of Autonomous Vehicles.* Forbes. Retrieved August 04, 2021, from https://www.forbes.com/sites/johanmoreno/2021/01/22/waymo-ceo-says-tesla-is-not-a-competitor-gives-estimated-cost-of-autonomous-vehicles/?sh=6507f161541b

11 Driivz Team. (2021, July 19). *5 EV technology innovations for easier and Faster EV charging future.* Driivz. Retrieved August 04, 2021, from https://driivz.com/blog/ev-charging-technology-innovations/

12 Woollacott, E. (2021, April 26). *Electric cars: What will happen to all the dead batteries?* BBC News. Retrieved August 04, 2021, from https://www.bbc.com/news/business-56574779

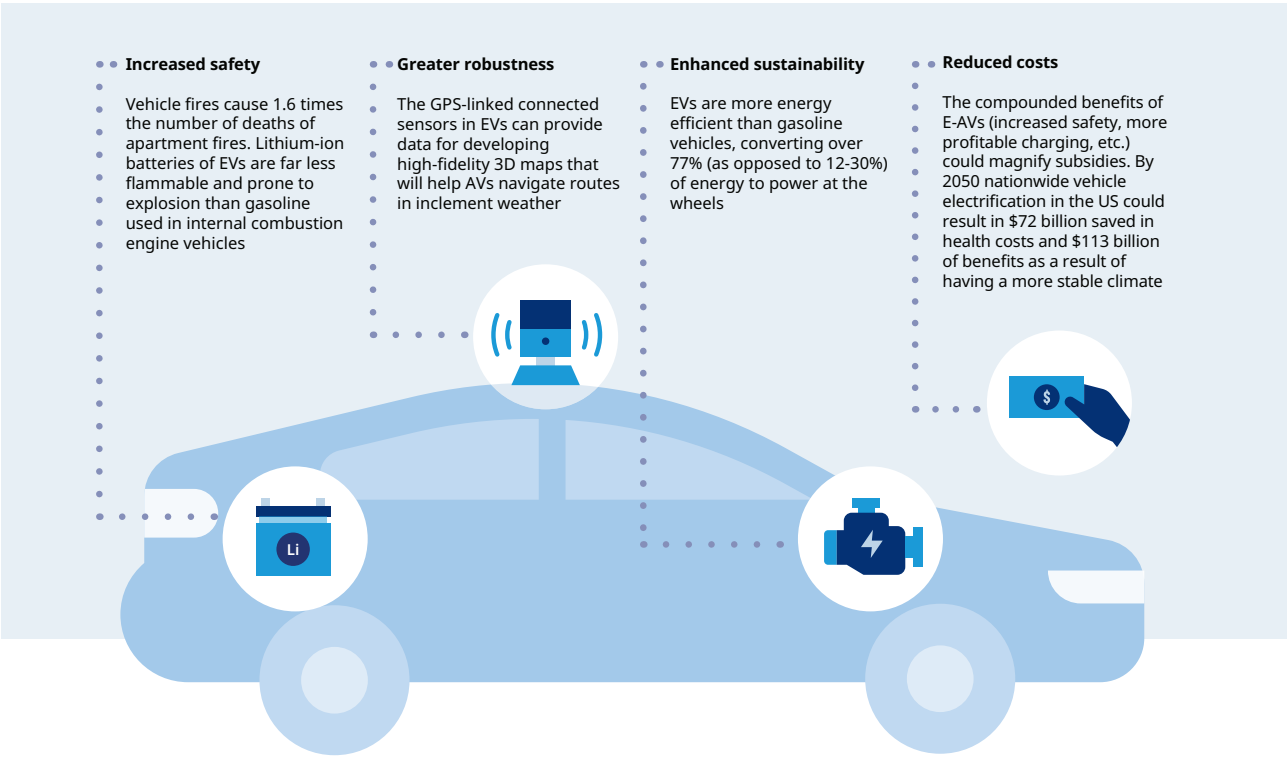
Jump-starting autonomous vehicles

Safety concerns have undermined public confidence in autonomous mobility. Electrification can alleviate these fears by reducing risks and adding a layer of additional benefits that will boost profitability and improve people's lives.

Safety concerns have long bedeviled the acceptance of AVs by the public. However, EV technologies can help overcome those anxieties and unlock the potential of driverless mobility — from the reduced risk of combustibility to greater energy efficiency.

The convergence of crucial EV features together with those innovative technologies such as edge computing, machine learning, AI, and 5G that are central to autonomous driving will increase the safety, robustness, and sustainability of AVs while reducing costs (see Exhibit 2), eventually leading to a growing acceptance of AVs.

Exhibit 2: How electrification can unlock the potential of autonomous vehicles



Source: Marsh McLennan Advantage

Increased safety

When it comes to safety, the great promise of AVs lies in their potential to save lives (see Exhibit 3).

Exhibit 3: Shortcomings of conventional vehicles

94%

Traffic accidents result from human error

$200 billion

Economic losses due to traffic accidents caused by human error (in the US)

Source: National Highway Traffic Safety Administration[13]

With greater levels of autonomy, a vehicle will be able to monitor its surroundings and minimize risk. In the presence of a potential hazard, the car would pull over automatically to ensure passenger safety, and a human driver would be able to take control of the vehicle. Consumers already see the benefits of ADAS-equipped vehicles: Many traditional cars come equipped with technology that helps drivers avoid making unsafe lane changes or automatically brakes if a vehicle ahead of them stops suddenly.

The efficacy of such functions depends on the quality and volume of data available to AV deep neural networks, putting manufacturers with operational ADAS-equipped EV fleets in pole position to develop safer autonomous functionalities.

There's also the added safety of electric power. The lithium-ion batteries found in EVs are far less prone to explosion than internal combustion engine vehicles.[14] In 2018, an estimated 212,500 vehicle fires caused $1.9 billion in direct property damage in the US. Indeed, vehicular fires in the US caused 4.5 times the number of deaths as nonresidential structure fires and 1.6 times the number of apartment fire deaths.[15]

Greater robustness

Autonomous vehicles must be able to pinpoint their exact position and surroundings in a wide range of unfavorable weather and environmental conditions.

Currently, AVs rely on a combination of overlapping technologies, including GPS, sensors, cameras, and LiDAR[16] — all of which have their shortcomings under actual road conditions. GPS solutions, which in and of themselves are insufficient to maintain a vehicle within a lane, can fail because of radio frequency jamming, buildings, trees, and other scenarios involving signal blocking. LiDAR and camera map-based localization can fail when optical devices become obscured by snow or dust or changes to road surfaces (asphalt vs. gravel).

Researchers and manufacturers have been trying to tackle the issue of extreme weather conditions, which inhibit AV sensing capabilities. One technology under development is localizing ground-penetrating radar (LGPR), which uses 3D maps and electric pulses that go through the ground to let AVs determine their exact location without the use of cameras or LiDAR.

Typically, connected EVs (with ADAS features) are fitted with multiple sensors and connected devices that allow manufacturers to determine enhancements based on usage patterns. The convergence of 5G, connected devices, advanced sensors, and the data generated by EVs could allow LGPR to realize its full potential one day. Such geofenced information can play a vital role in supporting the development of high-fidelity 3D maps that would help E-AVs use LGPR to navigate routes under any weather condition.

---

13 National Highway Traffic Safety Administration. (n.d.). *Automated vehicles for safety. NHTSA.* Retrieved August 04, 2021, from https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety#:~:text=What percent20are%20the%20safety%20benefits,to%20human%20error%20or%20choices.

14 Kia Motors. (n.d.). *Are electric cars safe?* Retrieved August 04, 2021, from https://www.kia.com/sg/discover-kia/ask/are-electric-cars-safe.html.

15 Ahrens, M. (2020, March). *Vehicle Fires.* Retrieved August 04, 2021, from https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/US-Fire-Problem/osvehiclefires.pdf

16 Beresford, C. (2020, November 13). *Autonomous cars struggle in snow, but MIT has a solution for that.* Retrieved August 04, 2021, from https://www.caranddriver.com/news/a31098296/autonomous-vehicles-snow-mit-researchers-solution/

Enhanced Sustainability

In addition to cutting down on traffic accidents and saving lives, autonomous transport can positively affect the environment. AVs handle driving more efficiently — optimizing power quality, avoiding stop-and-start driving, and calculating the smartest route to get to their destination.

By making greater use of cruise control features, AVs could reduce energy consumption by 3.3 percent. And once the number of AVs reaches a critical mass, traffic pattern optimization will reduce congestion considerably, minimizing commute time and compounding energy savings. Besides the well-known environmental benefits of using electricity from renewable sources instead of fossil fuels, EVs also offer other sustainability benefits (see Exhibit 4).

Exhibit 4: Sustainability benefits of E-AVs

35%

Reduction in congestion expected when AVs will reach a critical mass[17]

77%

Electical energy converted to wheel power by EVs (compared to 12%-13% in internal combustion engines)[18]

Source: University of Cambridge; US Office of Energy Efficiency and Renewable Energy

Expanding the penetration of shared E-AV solutions could also serve public interests by increasing energy savings and cutting costs to as little as $0.15 per mile, versus $0.60 per mile for an individually owned AV, improving access, affordability, and sustainability.[19]

AVs can also improve ride-sharing programs: Moving toward self-driving cars means that they will remain on the road even at times when a human driver might prefer to be off the clock, thus making the most of this disruptive technology.

Reduced costs

Deploying AVs for commercial use is likely to be prohibitively expensive — to the tune of tens of billions of dollars for a fleet of 100,000 cars.[20] Government tax incentives and subsidies have made EVs more affordable for the average consumer. Similarly, government subsidies aimed at commercial E-AVs could turbocharge broader E-AV adoption.[21]

By leveraging government support, businesses could increase demand and achieve profitability. Indeed, enhanced safety, lower congestion, reduced need for public parking, and the trove of AV solutions' data could justify government subsidies and incentives.

Besides government support, the insurance industry will also play a critical role in reducing costs. Insurers can also ensure adherence to stringent safety standards, using the data collected by sensors and connected devices in E-AVs to thoroughly evaluate risks before issuing policies, thereby increasing public confidence in driverless mobility.

Regulation and infrastructure will need to keep pace for E-AVs to realize their potential — the availability of low-cost charging stations will be critical in this regard. Given the standardized nature of freight hauling and ADAS solutions such as hands-free highway driving, it's likely that E-AVs will soon be deployed at scale in the trucking sector.

---

17 University of Cambridge. (2019, May 19). *Driverless cars working together can speed up traffic by 35 percent.* Retrieved August 04, 2021, from https://www.sciencedaily.com/releases/2019/05/190519191641.htm

18 Office of Energy Efficiency and Renewable Energy. (n.d.). *All-electric vehicles.* Retrieved August 04, 2021, from https://www.fueleconomy.gov/feg/evtech.shtml#:~:text=EVs%20have%20several%20advantages%20over,to%20power%20at%20the%20wheels

19 McCafrey, F. (2019, July 09). 3Q: *The future of our transportation systems.* Retrieved August 04, 2021, from https://energy.mit.edu/news/3-questions-future-transportation-systems/

20 McGee, P. (2021, July 19). Robotaxis: *Have Google and amazon backed the wrong technology?* Retrieved August 04, 2021, from https://www.ft.com/content/46ff4fe4-0ae6-4f68-902c-3fd14d294d72

21 Xue, C., Zhou, H., Wu, Q., Wu, X., & Xu, X. (2021). *Impact of Incentive Policies and Other Socio-Economic Factors on Electric Vehicle Market Share: A Panel Data Analysis* from the 20 Countries. Sustainability, 13(5), 2928.

Plugging the gap:
How charging infrastructure could become more profitable

Expanding the charging infrastructure and reducing the time taken to charge a vehicle will be crucial to commercially viable E-AV business models. Fast chargers for electric vehicles are expensive, especially if they need to be integrated with existing infrastructure in residential/office buildings, while charging hubs are only profitable if they see heavy use.

At the same time, it's important to distinguish between the consumer EV market and the commercial EV/E-AV markets. The charging station for a consumer vehicle is not the same as a charging station designed to meet the needs of commercial vehicles.

With 80 percent of charging undertaken at home, where the cost is less than half of the rates charged by commercial providers, creating a profitable business model for consumer-oriented electric charging stations is a tough challenge.[22]

However, as solar power achieves scale on the grid, there will be excess capacity between 8 AM and 3 PM, making electricity cheaper during the day.[23] Presently, the opposite is the case. Power is most affordable at night due to lower demand, so many users charge their vehicles at home overnight. With power cheaper in the day when vehicles are likely to be away from home charging points, the commercial viability of fast-charging hubs could improve.

Infrastructure providers are also looking to generate profits by franchising dining and shopping outlets at charging hubs. Some estimates suggest that customers spend a dollar for every minute they're in-store while waiting for their vehicles to charge.[24] To capitalize on this trend, a leading American EV manufacturer has even applied for three new trademarks in the restaurant industry.[25] For ride-hailing fleets, utilization is likely to be higher during the day, and the ability to charge a vehicle between rides or while a customer is dining, shopping, or working near such a charging hub could reduce downtime.

Heavy-duty vehicles like trucks could strain electrical grids in some countries, and their lack of compatibility with charging stations for cars will warrant the establishment of separate charging infrastructure. Although such investment will be expensive, trucking operations' fixed routes and hub-like nature will ensure high utilization rates and therefore justify the costs.[26] Three major European automakers have already announced plans to invest $593 million to set up a network of 1,700 charging points across Europe for heavy-duty electric trucks and buses.[27]

---

22 Baker, D. (2021, April 30). *Electric Car-Charging Business Is Doing Everything But Making Money.* Retrieved August 04, 2021, from https://www.bloomberg.com/news/articles/2021-04-30/ev-charging-industry-is-doing-everything-except-showing-a-profit

23 Templeton, B. (2021, June 30). *Can electric car charging be a business?* Retrieved August 04, 2021, from https://www.forbes.com/sites/bradtempleton/2021/01/25/can-electric-car-charging-be-a-business/?sh=445c5bc771e9

24 Energy Select. (n.d.). *5 ways to profit from commercial car chargers.* Retrieved August 04, 2021, from https://www.energyselectllc.com/article/5-Ways-to-Profit-from-Commercial-Car-Chargers

25 Lambert, F., (2021, June 02). *Tesla files trademark for restaurant services — going to grab a bite at a Tesla burger JOINT SOON?* Retrieved August 04, 2021, from https://electrek.co/2021/06/01/tesla-files-trademark-restaurant-services/

26 Lund, J. (2020, June 23). *We should be talking about charging infrastructure for heavy-duty trucks.* Retrieved August 04, 2021, from https://www.greenbiz.com/article/we-should-be-talking-about-charging-infrastructure-heavy-duty-trucks

27 Bellan, R. (2021, July 05). *Volvo, Daimler, Traton invest $593 million to build electric truck charging network.* Retrieved August 04, 2021, from https://techcrunch.com/2021/07/05/volvo-daimler-traton-invest-593-million-to-build-electric-truck-charging-network/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAK-CLaQPzb4KVlU3oCHJWCaY1vpqCtZRiltGN3Ec2e-mcV3xZFua-pusVpHcwocaAEqT5P2UiDESkGq_UqLHjKsHPLfBeved-_yk4Pm5ZcQN8G7ayj5gOT_5FZn8DsQtLORvdlg-4zZ9rxSBVC16pDidVQmVx8rHoxm7LHk_C_ik

The road ahead

The vast amount of data generated and collected by E-AVs will inform and transform everything from city planning to road maintenance. This data will aid in making more robust risk assessments, informing the provision of new types of insurance, instilling public confidence, and boosting the profitability of E-AV business models.

Use in freight

Logistics is about to undergo a paradigm shift: autonomous road freight. Automating the movement of goods will have a profound effect on society. The technology can decrease the cost of transporting goods overland, a change that may underpin what turns out to be the most widespread near-term impact of self-driving technologies.

Governments and corporations have already announced plans to make significant investments in electric charging points for heavy-duty vehicles — from high-speed chargers to electrified roads.[28] The availability and affordability of such infrastructure will undoubtedly help catalyze the deployment of EVs and subsequently E-AVs in freight.

Presently, fuel costs and driver wages together make up two-thirds of carrier expenses. The latter represents the lion's share of motor carrier costs at 43 percent, making for a strong case for E-AV adoption in freight.[29] The average age of a truck driver is 44 in the EU (46 in the US), and fewer young people want to make a career in truck-driving.[30,31] And the fact that freight carriers regularly travel set routes (as opposed to ride-hailing businesses) justifies the high upfront costs of adopting autonomous technologies.

The popularity of semi-autonomous trucks is growing: Already, these ADAS-equipped vehicles are sharing the road (albeit with a human "babysitter" in the cabin as backup). And with an $800 billion-plus US trucking market, the business opportunity for fully autonomous trucking is enormous.[32] Electrifying these semi-autonomous fleets will help freight service providers achieve their carbon-emission targets and allow their clients to inch closer towards net zero, a goal which over a fifth of the world's largest companies have committed to.[33]

---

28 Oliver Wyman. (2021, June 11). *To meet 2030 Decarbonization Targets, European Trucking needs More public-private cooperation.* Retrieved August 04, 2021, from https://www.forbes.com/sites/oliverwyman/2021/06/10/to-meet-2030-decarbonization-targets-european-trucking-needs-more-pub McGee, P. (2021, March 30). How trucks became the next battleground for self-driving technology. Retrieved August 04, 2021, from https://www.ft.com/content/37d25112-3a3d-4547-8bd8-4bbc45986a08 lic-private-cooperation/?sh=577ec4d75c20&utm_source=bambu&utm_medium=social&utm_campaign=advocacy&blaid=1653153

29 World Economic Forum. (2021, March). *Autonomous Trucks: An Opportunity to Make Road Freight Safer, Cleaner and More Efficient.* Retrieved August 04, 2021, from http://www3.weforum.org/docs/WEF_Autonomous_Vehicle_Movement_Goods_2021.pdf

30 European Transport Workers' Federation. (2021, September). *European Truck Driver Shortage: only way forward is good pay and conditions.* Retrieved November 08, 2021, from https://www.etf-europe.org/european-truck-driver-shortage-only-way-forward-is-good-pay-and-conditions/

31 American Trucking Association. (2020, November). *US Trucking Battles Surging Demand and a Dearth of Drivers.* Retrieved November 08, 2021, from https://www.bloomberg.com/news/newsletters/2020-11-11/supply-chains-latest-u-s-truckers-battle-multiple-headwinds

32 McGee, P. (2021, March 30). *How trucks became the next battleground for self-driving technology.* Retrieved August 04, 2021, from https://www.ft.com/content/37d25112-3a3d-4547-8bd8-4bbc45986a08

33 Shetty, D. (2021, March 24). *A fifth of world's largest companies committed to net zero target.* Retrieved August 04, 2021, from https://www.forbes.com/sites/dishashetty/2021/03/24/a-fifth-of-worlds-largest-companies-committed-to-net-zero-target/?sh=27f3b321662f

Truck platooning — a system whereby a manually operated lead truck equipped with ADAS features guides a convoy of fully autonomous trucks that maintain a predetermined, close distance between each other — represents the most viable near-term use for E-AVs. Even the use of semi-autonomous "follow" fleets for truck platooning could allow drivers to rest and take shifts driving the lead truck, potentially increasing asset utilization by 90%.[34]

Data collected from semi-autonomous electric trucks will enable informed decision-making — guiding the safe deployment of autonomous trucks through platooning, identifying optimal charging locations, etc.

Leveraging data: Better decisions, more significant consequences

Data is everything in E-AV business models. The information derived from E-AV trucks moving goods, in turn, will enable OEMs to gather granular data bolstering the safety of E-AVs transporting people.

Besides improving safety, this data can be used by urban planners, infrastructure providers, and even retailers to inform business decisions and influence consumer behavior. For example, an alert regarding a faulty traffic signal can be immediately sent to maintenance crews.

Autonomy will transform the vehicle into a platform from which drivers and passengers can use their transit time for other activities — including the enjoyment of novel forms of media and services — thereby creating new avenues for generating data. That said, this could expose businesses and service providers to greater cybersecurity and regulatory risks, reinforcing the need for firms to adopt a privacy-by-design approach as they work towards addressing issues of data ownership, access, and privacy. Firms will need to reevaluate data management practices in light of evolving regulations, especially those like the California Consumer Privacy Act (CCPA) that can even penalize firms not based in California as long as they have customers in the state.

Data will also be a critical asset in assessing and consequently mitigating risks. The convergence of technologies like 5G, edge computing, LiDAR, and machine vision will enable automated real-time reporting that makes accident investigations and claims processing faster. This data will also make autonomous driving algorithms more accurate and robust, resulting in lower insurance premiums.[35]

Managing risk: Insurance as a key enabler

Insurance and risk management will need to be addressed differently as the industry shifts from a primarily driver-controlled situation to a fully autonomous mode. The convergence of various enabling technologies adds complexity to the automotive supply chain and subrogation processes, necessitating the provision of more holistic insurance as multiple forms of coverage (errors & omissions, product liability, auto liability, cyber, etc.) begin to overlap.

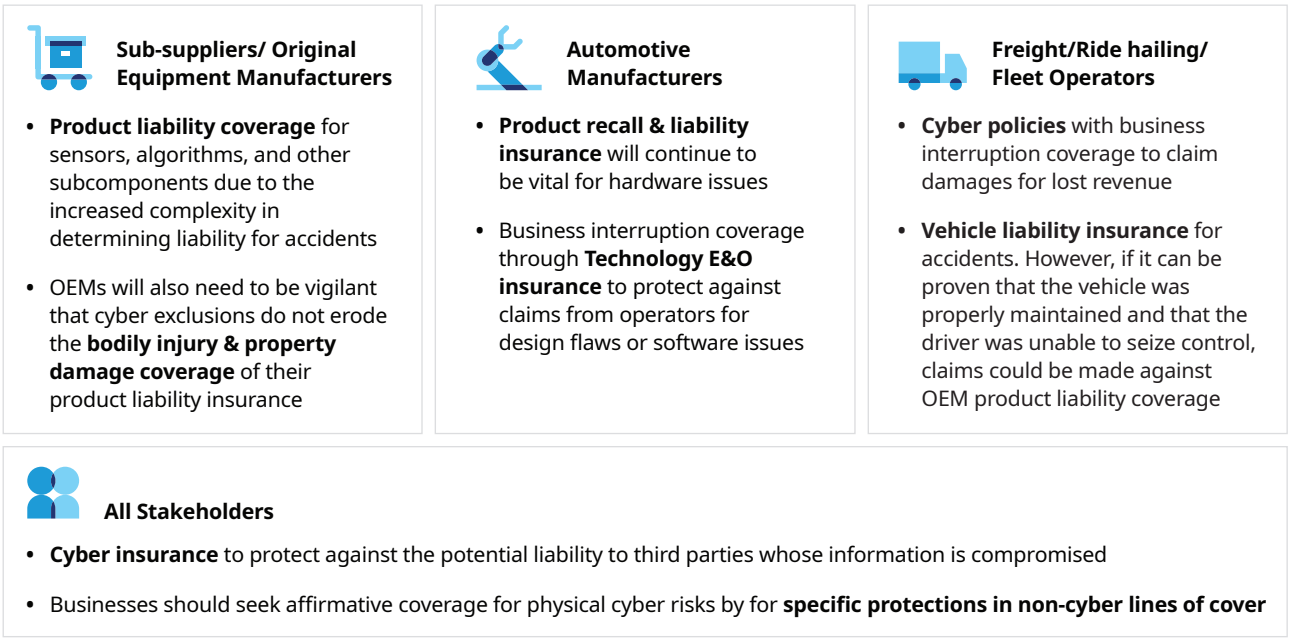
To mitigate the impact of the risks arising from increased complexity and capitalize on the potential of E-AVs, each category of stakeholder along the value chain — from OEMs and their suppliers to manufacturers and finally to the freight/ride-hailing/

34 Razdan, R. (2020, March 21). *Will truck Convoying be the first viable commercial application For AV technology?* Retrieved August 04, 2021, from https://www.forbes.com/sites/rahulrazdan/2020/03/21/will-truck-convoying-be-the-first-viable-commercial-application-for-av-technology-/?sh=2539d45b1454#3de1e14a145

35 Kiera, R. (2018, August 23). *Why 5G Will Rock the Insurance World.* Retrieved from https://www.insurancethoughtleadership.com/why-5g-will-rock-the-insurance-world/

fleet operators — will need to address risks. With some OEMs already partnering with insurers to risk-rate ADAS technologies,[36] providers with access to safety and performance data will be well-positioned to help businesses across the value chain (see Exhibit 5).

Exhibit 5: Key forms of insurance across the commercial E-AV value chain



Source: Marsh McLennan Advantage

36 Swiss Re. (2020, September 21). *Toyota insurance services to join Swiss RE ADAS risk platform: Swiss Re.* Retrieved August 04, 2021, from https://www.swissre.com/media/news-releases/nr-20200921-toyota-insurance-services-to-join-swiss-re-adas-risk-platform.html

OEMs and sub-suppliers

As increasingly autonomous technologies are engaged, determining contractual liability for bodily injury and property damage (BIPD) will become a more significant issue. This underscores the importance of product liability coverage for sensors, algorithms, and other subcomponents used by original equipment manufacturers (OEMs). OEMs will also need to be vigilant that the BIPD portion of their coverage includes the appropriate cyber risks.

Automotive manufacturers

Brokers and insurers will need to help manufacturers structure contract provisions with suppliers and adopt sourcing strategies that allocate risks to responsible parties and set the scope for warranties. While product recall liability insurance will continue to be vital for hardware issues, software glitches may not necessitate physical recalls as many could be resolved remotely. This will elevate the need for technology E&O insurance — coverage that is often overlooked by many at present but will be critical in protecting against claims for design flaws or malfunction.

Operators

Cyber policies with business interruption coverage will be of paramount importance to operators for protection against losses arising from a cyber event that impairs the operation of autonomous fleets. And while regulations are evolving, drivers continue to be held liable in recent accidents in which ADAS equipped vehicles were in "autopilot" mode.[37] For both individually owned and fleet vehicles, traditional auto liability will continue to apply in such instances. Even when fully autonomous technologies are deployed, owners will still be responsible for ensuring their vehicles are in working order and will be required to purchase vehicle liability insurance.

But, if the driver cannot assume control and it can be proven that the vehicle was maintained correctly, the OEM's product liability exposure may increase in the event of technological failures leading to collisions. Thus, manufacturers' product liability insurance may assume an even more prominent role than it does today.

For all stakeholders

Data breach risk will increase potential liability to third parties, underpinning the need for cyber insurance across the value chain. AVs may also be exposed to cyber threats such as sensor jamming/blinding, distributed denial of service attacks, and manipulation of communication equipment. Businesses will need to seek affirmative coverage for these risks from brokers and insurers.

OEMs, service providers, and ride-hailing operators will need to adopt best practices governing artificial intelligence. These include conducting drills to stress test systems, establishing protocols for incident handling and vulnerability discovery, and systematic security validation of AI models.

It will take time to properly quantify these risks and price insurance before making it economical enough to be used en masse. Testing these autonomous technologies through freight transport and delivery, which pose potentially lesser risks to human life than passenger conveyance, will help insurers collect enough data to estimate risks accurately.

Insurance and risk management is seen as a critical tool for increasing public confidence due to insurers' rigorous risk assessments and stringent safety standards.

37 Columbia Business School — The Eugene Lang Entrepreneurship Center. (2021, March 25). *Will self-driving cars disrupt the insurance industry?* Retrieved August 04, 2021, from https://www.forbes.com/sites/columbiabusinessschool/2021/03/25/will-self-driving-cars-disrupt-the-insurance-industry/?sh=5b557ae91dbf

In the driver's seat

Technological advances will be critical in bolstering safety and boosting profitability. However, equipping employees — both blue collar (e.g., freight drivers) and white collar (e.g., autonomous technology specialists) — with the right skillsets to manage complex technologies and building public trust holds the key to unlocking the potential of E-AV business models.

Human Capital

Autonomous technologies could help trucking companies manage the fallout of a looming labor crunch for long-haul drivers — with the shortage in the United States already over 60,000 and expected to balloon up to 180,000 by 2028.[38] In Europe, the shortfall of drivers has crossed 400,000, with the most impacted countries being Poland, the UK and Germany.[39] Meanwhile, other industries, such as mining, that use off-road vehicles, have been gradually reducing their dependence on human drivers by adopting autonomous technologies.

The arrival of the new automated technology will induce fears of redundancy among drivers. Re-skilling/upskilling drivers to manage autonomous technology will help address some of these concerns. Existing jobs must be deconstructed into activities to identify automation opportunities and see whether new technologies substitute, augment, or transform the work done by employees.[40] By understanding the underlying activities and necessary core skills, legacy skills can be transitioned to digital jobs with nominal upskilling. Employers can also identify and communicate other careers that can offer a natural transition for professional truck drivers — however, the transition to full automation is still many years out.

The talent gap among white collar jobs, however, is the more urgent human capital challenge, with E-AV manufacturers/technology providers facing stiff competition in recruiting and retaining talent with high-demand skillsets. The focus in recruiting such talent has often been placed on ensuring the competitiveness of the "transactional" elements of the rewards package like compensation and benefits to outbid other firms vying for tech talent. To better address workforce challenges, businesses need to adopt a skills-based operating model (versus a job-based one) and take a pragmatic and patient approach.

By engaging business leaders, employees, and unions in looking beyond the current job to track and acquire skills, businesses can prepare their workforce for the transition by upskilling them for how their current roles might change or reskilling them for different tasks. Firms across the E-AV value chain can also learn from other evolving industries and help "Outskill"

---

38 American Trucking Association. (n.d.). *ATA releases updated driver shortage report and forecast*. Retrieved August 04, 2021, from https://www.trucking.org/news-insights/ata-releases-updated-driver-shortage-report-and-forecast

39 Ellyatt, H. (2021, October 04). *After causing chaos in the UK, truck driver shortages could soon hit the rest of Europe.* Retrieved November 08, 2021, from https://www.cnbc.com/2021/10/04/truck-driver-hgv-shortage-in-uk-could-soon-hit-the-rest-of-europe.html

40 Jesuthasan, R., & Boudreau, J. (2018). *Reinventing jobs: A 4-step approach for applying automation to work*. Harvard Business Press.)

employees for placement in adjacent industries. For instance, a leading British consumer goods company was lauded by trade unions and social partners for identifying 2,000 low-skill workers likely to be displaced by automation and retraining them for alternate professions.[41]

Beyond ESG benefits, reskilling employees will also help firms source talent internally, improving engagement and retention. Investing in human capital development will help E-AV companies reap a range of benefits as skilled employees create competitive advantage — by managing complex technologies, establishing partnerships with insurers to mitigate risks, and assuaging public concerns about using fully autonomous vehicles.

Public acceptance: Building trust

The success of E-AVs is contingent on gaining public acceptance and trust. But building trust has to date been a challenge, especially in light of recent accidents involving AVs. By making autonomous vehicles a more familiar sight on the roads through semi-autonomous trucking, social perceptions towards E-AVs ought to improve over time.

A leading American semiconductor company has highlighted key domains upon which manufacturers and OEM operators will need to focus to build trust. Firstly, the vehicle must exhibit comprehensive sensing capabilities and display its findings to passengers to reassure them; secondly, it must be capable of clear bidirectional communication through multiple methods — voice control, screens, and mobile devices; and lastly, it must respond rapidly to changes in driving conditions as slow or imprecise responses may instill doubt.[42]

One Chinese autonomous vehicle market leader has even integrated teleoperation capabilities — ability to control vehicles remotely — in all its cars to reassure customers that a seasoned driver can take control in emergencies. This, coupled with the transparent publication of its safety statistics and its significant investment in cybersecurity capabilities, has assured customers of its commitment to passenger safety.[43] Government audits of such safety statistics will help facilitate trust while informing the creation of regulations and determining appropriate avenues for public expenditure in necessary infrastructure that will reinforce the prioritization of safety, continually boosting public confidence.

While many challenges remain, leveraging EV technologies to deploy electric autonomous vehicles will help realize the potential of driverless mobility by increasing safety, enhancing sustainability, reducing congestion, enabling profitable business models, and improving — and saving — lives.

---

41 World Economic Forum. (2019, December 11). *Hr4.0: Shaping people strategies in the fourth industrial revolution.* Retrieved August 05, 2021, from https://www.weforum.org/reports/hr4-0-shaping-people-strategies-in-the-fourth-industrial-revolution

42 Weast, J., Jordan, A., & Yurdana, M. (2016). *A Matter of Trust: How Smart Design Can Accelerate Automated Vehicle Adoption.* Retrieved August 04, 2021, from https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/trust-autonomous-white-paper-secure.pdf

43 Baidu. (2020, December 16). *Building a self-driving car that people can trust.* Retrieved August 04, 2021, from https://www.technologyreview.com/2020/12/16/1014672/building-a-self-driving-car-that-people-can-trust/

Electrification can eliminate speed bumps on the road to achieving full autonomy. But public acceptance holds the key to unlocking the potential of E-AVs: Trust can be built through successful deployment in freight, the prioritization of safety, responsible data collection, a sound insurance strategy, and the transparent communication of safety information.

Marsh McLennan (NYSE: MMC) is the world's leading professional services firm in the areas of risk, strategy and people. The Company's 78,000 colleagues advise clients in 130 countries. With annual revenue over $18 billion, Marsh McLennan helps clients navigate an increasingly dynamic and complex environment through four market-leading businesses. Marsh provides data-driven risk advisory services and insurance solutions to commercial and consumer clients. Guy Carpenter develops advanced risk, reinsurance and capital strategies that help clients grow profitably and pursue emerging opportunities. Mercer delivers advice and technology-driven solutions that help organizations redefine the world of work, reshape retirement and investment outcomes, and unlock health and well being for a changing workforce. Oliver Wyman serves as a critical strategic, economic and brand advisor to private sector and governmental clients.

For more information, visit mmc.com, follow us on LinkedIn and Twitter or subscribe to BRINK.

AUTHORS

Ben Hoster
Director, Marsh McLennan Advantage
Ben.Hoster@oliverwyman.com

Toshin Sequeira
Research Analyst, Marsh McLennan Advantage
Toshin.Sequeira@oliverwyman.com

CONTRIBUTORS

Elisabeth Case, Ravin Jesuthasan, Swati Khurana, Mike Ponicall, James Rose, Nicole Sivieri, Richard Smith-Bingham

Eva Lim (Designer), Karen Lara (Illustrator), Carmen How (Image Retoucher)