The future is autonomous: How self-driving trucks will revolutionize logistics, supply chain, and transportation sectors

By Daniel Covarrubias


Covarrubias

We have recently seen groundbreaking innovations in robotics and artificial intelligence. The emergence of autonomous trucks, also known as self-driving trucks or autonomous commercial vehicles (ACVs), has been fueled by these quickly evolving developments, as well as by increasing shipping demand and a growing driver scarcity.

ACVs have been a hot topic in transportation for several years as they can thoroughly revolutionize the transportation industry. These self-driving vehicles are no longer a distant reality – they are already being tested and deployed by various companies around the globe. Outfitted with cutting-edge sensors and machine-learning algorithms that enable them to operate without human intervention, these vehicles will change how commodities are delivered, making their transport quicker, safer, and more effective.

As a result, they have the potential to reduce transportation costs, improve safety, and increase efficiency. However, many challenges still need to be addressed before ACVs become a reality. This column will delve into the transformative potential of autonomous trucks, their impact on the logistics and supply chain sectors, and the benefits they bring.

ACVs are vehicles that can operate without human intervention. They use a combination of sensors, machine-learning algorithms, and software to navigate roads and make decisions. These trucks can "understand" their surroundings and identify obstructions in their path thanks to sensors, including cameras, radar, and lidar (light-detection and ranging). They learn from their experiences and modify their behavior through machine-learning algorithms. Finally, the software controls the vehicle's movements and decides how to respond to different situations. Together, these technologies enable ACVs to function autonomously without needing a human driver.

Self-driving trucks, once thought of only in science fiction and futuristic movies, are becoming a reality. Major players in the industry are actively testing these state-of-the-art vehicles. Several trailblazing companies have made big steps in their development, including Tesla, Waymo, Embark, Kodiak Robotics, and TuSimple.

In recent years, the state of Texas has emerged as a leader in autonomous truck testing and development. With its vast highway system, favorable autonomous vehicle regulations, and thriving technology sector, Texas has provided an ideal setting for companies to test their autonomous trucks. The state has attracted essential industry companies such as Waymo, Kodiak Robotics, and TuSimple, who have chosen Texas for their testing grounds.

Texas has several designated testing areas, such as the Texas Connected Freight Corridor and the Texas Innovation Alliance's Automated Vehicle Proving Grounds. Likewise, the Texas Department of Transportation (TxDOT) has taken proactive steps to facilitate the growth of the autonomous trucking industry by collaborating with stakeholders and investing in intelligent transportation systems. These efforts have positioned Texas at the forefront of the autonomous truck revolution and established the state as a key player in shaping the future of logistics and supply chain sectors.

TuSimple, an autonomous trucking company, has been testing its autonomous trucks from Dallas to El Paso. This demanding route, with long stretches of open roads and erratic weather, makes it the perfect testing ground for the company's advanced technology. In collaboration with prominent corporations like UPS, TuSimple has expanded its autonomous freight network, which now includes over 50 routes across Texas and the Southwest United States.

Kodiak Robotics tests its autonomous trucks in the Dallas area, using advanced sensors and artificial intelligence to navigate busy city streets. They recently partnered with home goods giant IKEA and announced a pilot program to make daily deliveries.

Embark, a leading developer of autonomous trucking technology, has launched a coast-to-coast autonomous trucking network across the United States. Thanks to a partnership with Ryder System Inc., a major provider of transportation and logistics solutions, Embark has access to Ryder's extensive network of maintenance facilities, enabling efficient servicing and support for its autonomous trucks.

Waymo Via is Alphabet Inc.'s, (Google's parent company), autonomous trucking division. It has been testing its self-driving trucks and scaling up operations in Texas, Arizona, and California. In February 2022, Waymo announced a collaboration with C.H. Robinson to oversee a pilot test in which Waymo Via's test fleet of autonomous trucks will make deliveries, traveling a 240-mile route between Dallas-Fort Worth and Houston.

Tesla, a leader in electric and autonomous vehicle technology, has been developing its Tesla Semi. This ACV is a long-haul, electric autonomous semi-truck that travels in platoons that automatically follow a lead vehicle. This past November, Tesla announced that its Semi program completed a 500-mile test drive with a total weight of 81,000 pounds. Tesla aims to produce 50,000 trucks in 2024.

The potential benefits of widespread autonomous truck adoption in the logistics and supply chain sectors are immense, with a focus on efficiency and opportunities for workforce transition. While the 24/7 operation of autonomous trucks can lower operating costs and boost efficiency, it's essential to consider the potential effects on the labor market. As the industry evolves, it is crucial to invest in workforce development and upskilling programs that allow workers to transition into new roles within growing technology and logistics sectors. This way, the industry can maintain a balance between technological advancements and workforce sustainability.

Furthermore, the rise of autonomous trucks can create new opportunities within the industry, such as remote truck monitoring, advanced vehicle maintenance, and technology development roles. This shift aligns with the growing demands of e-commerce, wherein consumers increasingly seek faster and more reliable shipping options. By focusing on the benefits of autonomous trucks while actively addressing workforce transition, the industry can capitalize on increased efficiency and ensure sustainable job opportunities for the future.

Autonomous trucks also hold the promise of road safety improvements. ACVs can handle complex traffic scenarios, avoid obstacles, and respond to changing conditions more quickly than human drivers because they are equipped with advanced sensors, cameras, and machine-learning algorithms. This could result in a considerable decrease in truck-related accidents and fatalities, leading to safer highways for all road users.

The environmental sustainability of autonomous trucks is another significant benefit. As many leading companies in this field are developing electric vehicles, the widespread adoption of autonomous electric trucks could substantially reduce greenhouse gas emissions. The Environmental Protection Agency estimates that 26% of transportation-related greenhouse gas emissions in the U.S. are caused by medium- and heavy-duty vehicles. The logistics and supply chain industries may significantly contribute to reducing global warming by transitioning to a fleet of autonomous electric vehicles.

Self-driving trucks will revolutionize how goods are transported. These operations will be faster, safer, and more efficient. While there are still some challenges to overcome, the exponential technologies powering Autonomous Commercial Vehicles are advancing rapidly. It's simply a matter of time before these autonomous trucks become an everyday presence on our highways. As we look to the future, it's evident that autonomous trucks will become a new reality and produce an industry-changing role in shaping the supply chain, logistics, and transportation industry for decades.

Dr. Daniel Covarrubias is the Director of Texas A&M International University's Texas Center for Economic and Enterprise Development housed in the A. R. Sanchez, Jr. School of Business.