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From Test Tracks To Real Roads, How And When Will Autonomous Vehicles Get Here?

By Louis Bedigian

Several automakers promise to deploy autonomous vehicles within the next five years. At the same time, technology companies are pushing boundaries by testing their autonomous technologies (both hardware and software) on and off real roads.

Uber dominated headlines when it began testing autonomous Ford Fusions in Pittsburgh. The ride-hailing service was preceded by nuTonomy, a software company that began testing its autonomous fleet in Singapore last August. The company now plans to conduct public road tests in Boston. Uber has since – controversially – begun testing automated Volvos in California.

Navya, a new manufacturer of autonomous shuttles, has tested its prototypes on and off public roads in numerous countries, including France and Switzerland. Google, the granddaddy of them all, has already logged more than 2M miles of autonomous driving, mostly in California.

It all sounds very impressive but there are still a number of obstacles that need to be overcome before the vehicles will be ready for everyday use. "We need to ensure with a very high degree of certainty that autonomous vehicles, when they are on the road, do not cause harm," said Anuj Pradhan, an assistant research scientist in the Human Factors Group at the University of Michigan Transportation Research Institute.

Mark Cund, autonomous vehicle control manager for Jaguar Land Rover, said there are many things to consider in choosing the best technologies to implement in production vehicles. "Each technology has its strength and weaknesses, so it is vital to test and develop these to ensure we deliver the best solution," said Cund. "Listening to what the customer want[s] is important. It is all about user choice. Getting the public involved in trials to demonstrate real cars in real situations is also important." Jaguar Land Rover is doing just that as part of UK Autodrive, a collaborative project with Ford and Tata Motors European Technical Centre.

Karl Iagnemma, co-founder and CEO of nuTonomy, said the industry is "close" to deploying autonomous vehicles but explained that it depends on the use case, as well as the environment. "You can go ride an automated vehicle that's operating in a closed course, like an amusement park or an office park," said Iagnemma. "You can experience that today. On the other end of the spectrum, it's going to be many years before you can hail an autonomous vehicle in New Delhi at rush hour."

David Kidd, senior research scientist at the Insurance Institute for Highway Safety, concurred with that latter assessment. He said that a vehicle that can drive itself from point A to point B is "decades away." "In the meantime, we're going to have technology that bridges that gap," said Kidd. "We have some now that provides sustained control of vehicle speed and acceleration, as well as lane keeping."

Kidd wants to make sure that autonomous technology is deployed responsibly. He's looking for intuitive designs that allow consumers to use the vehicles as intended. He also wants safeguards to be in place to keep these vehicles from being used in conditions where they are not intended or could be dangerous. "The idea is people will be able to use it to its maximum potential without having to be trained or educated in order to achieve those goals," Kidd added.

Complex proposition

Others are bracing for cars that are (at least initially) too complex for consumers to comprehend without key information. Nichole Mace, vice-president of product and experience at Zipcar, said that it will be "absolutely critical to educate consumers" about autonomous features.

Hyundai spokesperson Miles Johnson said the automaker is taking an incremental approach and believes there will be a handoff phase, requiring drivers to remain alert. As such, Hyundai anticipates the need for a system inside the vehicle that can notify drivers when it's time to take over.

Anne Teigen, programme principal for the National Conference of State Legislators, is concerned about the numerous infrastructure challenges that could prohibit the safe deployment of autonomous vehicles. "Lane markings are something very basic that would have to be kept up so much better than they currently are," said Teigen. "Bridge infrastructure and things like that. They are getting older. There would have to be a lot more maintenance to keep up with these cars that are driving themselves because they count on things like lane markings and different infrastructure."

Beyond the safety, technical and educational factors, autonomous vehicles also need to achieve consumer acceptance. Kirk Steudle, director of the Michigan Department of Transportation, thinks this is one of the biggest issues facing autonomous technology. "My experience is, once you've seen what the machine can do with the car, it changes a lot of attitudes," said Steudle.

Inevitable hurdles

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Many hope that autonomous vehicles will one day reduce the number of accidents that occur each year. Technology isn't fool-proof, however; Google has endured more than 12 crashes since 2009 but its cars were only responsible for causing one of the accidents.

Tesla's Autopilot feature was implicated in two deadly accidents, one in the United States and another in China. The automaker has blamed the former accident on a technical failure and denied that Autopilot was responsible.

NuTonomy was involved in a minor, low-speed accident as well when it collided with a truck upon changing lanes. "Every car, whether it's human piloted or self-driving, is going to be involved in accidents because hardware is not perfect, software is not perfect and other drivers on the road are not perfect," said Iagnemma. "We had a very minor fender bender in Singapore. We worked with the Singapore Land Transport Authority to understand the nature of that. Everybody's happy and we put that behind us."

Legislation and NHTSA guidance

Eight states, California, Florida, Louisiana, Michigan, Nevada, North Dakota, Tennessee and Utah, have enacted some form of autonomous vehicle legislation. Washington D.C. has followed suit. Governors from Arizona and Massachusetts have issued executive orders that will pave the way for autonomous vehicles in those states.

National regulations have yet to be determined but the National Highway and Transportation Safety Administration (NHTSA) recently updated its guidelines for the testing and deployment of autonomous vehicles. "The message that came out of the NHTSA guidance was that the federal government is really going to have to work with states and local government to make sure there's a consistent, unified framework," said Teigen. "That is absolutely the goal with those guidelines. It is going to have to be a pretty strategic approach."

Phil Magney, founder and principal advisor of Vision Systems Intelligence, believes that NHTSA's guidance has begun to establish a framework that could help align government with industry forces. "I think that really does represent how this stuff is going to evolve," said Magney. "Level 2 automation systems are, in the grand scheme of things, not that difficult to do. Those problems are largely solved."

Magney added that there will be exceptions and accidents will still occur. But he stressed that responsibility will shift to automakers when they move from Level 2 to Level 3 autonomy. "At Level 2 it can be human failure, whereas in level 3 it is completely up to the computer, at least for certain periods of time," he said. "It shifts the responsibility to the manufacturer. That's a hurdle, obviously."

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Evolving regulations

On a state-by-state level, Steudle said that Michigan's strategy is "closely aligned" to NHTSA's guidance. He did express one concern, however.

"The one piece that we're really not very keen on is this third-party certification," said Steudle. "An automaker or manufacturer comes up with a technology, they send it to a third party to have it tested and then they say, 'Yep, it's good to go,' and it goes out on the road. We prefer that we stay with the self-certification model that leaves all that liability right with the manufacturer. Whoever designed it, they're the ones that know the most about the technology."

Andy Rogers, vice-president of marketing and sales at Navya, is eager for regulation adjustments. He said the states are making progress but acknowledged that this is a very slow process. "We're talking about government agencies, so things don't happen overnight," said Rogers. "If you look at Tesla and Mercedes, they're putting in driver assist pieces. Those are increasing the autonomous level gradually, which is really great because it helps people get used to it."

Others are currently focused on regulation for testing (not deploying) autonomous vehicles. "That's where we're at both as a company, really as an industry and certainly that's where the regulatory landscape is in Boston," said Iagnemma. "We haven't been discussing putting a product or service on the roads yet."

He went on to say that there is a "broad spectrum of thinking" regarding potential regulations. He expects many parts of the world to rely on self-regulation by automakers and service providers. "Companies like mine, Ford and Google are heavily incentivized to do that – to not put a product on the road until they're sure it's very safe," Iagnemma added. "Other parts of the world will have an active role in the regulatory process. That requires having a lot of internal expertise and the resources to enforce the regulation. The reality of it is just very different depending on where you're going to be operating."

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