Counting Down to Autonomous Deployment

By Louis Bedigian

The auto industry has made incredible progress in its effort to bring self-driving cars to market, but there's still more work to be done. In addition to the technical hurdles and current limitations that stand in their way, autonomous vehicles also suffer from an image problem among the general public.

"One of the things we're hearing from consumers is an increasing level of skepticism regarding full self-driving vehicles," said Kristin Kolodge, executive director of driver interaction and HMI at J.D. Power. "This has been an emotion that has grown year over year."

That skepticism could be due to a lack of firsthand experience. Thus far, automakers have only been willing to demonstrate autonomous car technology in a closed off, closely regulated environment that leaves little room for error. Consequently, very few have been able to ride in a self-driving vehicle. Grayson Brulte, co-founder and president of Brulte & Company, thinks it's time to change that.

"As the technology matures, we have to educate the public about the technology that resides in the vehicles," said Brulte, whose company develops and implements innovation technology strategies for a global marketplace. "One of the biggest things that's holding them back is fear of the unknown. You see reports that say consumers aren't comfortable with autonomy. I believe the only way to solve that is with autonomous vehicle demo days."

April Sanborn, driver programs manager for the Nevada Department of Motor Vehicles, has seen a lot of trepidation from consumers. She attributes any fears to a lack of awareness. She said that while those within the auto industry are very familiar with the technology, the general public – even technicians working at Nevada DMV field offices – are mostly unaware about the true capability of autonomous technology.

"I think we're seriously lacking in educating the public on the reality of what automated driving is now, what it's going to be in the very near future and then what the far-reaching future is going to look like," said Sanborn.

Radovan Miucic, technical specialist at Changan US R&D Center, compared the reaction to autonomous technology to the way consumers reacted when elevator operators were first removed. Said Miucic: "People were very afraid of elevators when they first started. It took a while for people to get adjusted – you press a button and it takes you up. In the beginning there was an operator. Now we don't see them anymore."

Looking to soften consumers' views of autonomy, Brulte has spent the last two years trying to secure a demo day on Rodeo Drive in Beverly Hills, California. Automakers have continually told him that they loved the idea, but when it came time to put things in motion, they backed out.

Breaking down the legislative barriers

Consumer acceptance is certainly a hurdle to deployment, but automakers are also waiting for legislators to propose, finalize and pass laws that will allow autonomous vehicles to operate legally.

Thus far, more than a dozen states have passed legislation related to autonomous vehicles. Several others are considering their own sets of laws, which could pose new challenges for the future of mobility. If each state has different rules pertaining to how and when self-driving cars can operate – and who can or cannot sit behind a wheel without touching it – mobility could come to a screeching halt.

"We don't want that to happen," said Dr. Amitai Bin-Nun, VP of autonomous vehicles and mobility innovation at Securing America's Future Energy (SAFE), an advocacy organization and think tank in Washington, D.C. "Safety has always been regulated at the national level. One of the worst things a state can do is put in its own framework for determining the road readiness of a vehicle and create its own system for figuring out if vehicles are allowed on the road."

Amanda Essex, a transportation policy specialist for the National Conference of State Legislatures, thinks this issue can be resolved if the states work together with the federal government.

Said Essex: "We have NHTSA's federal policy, the guidance released in September of last year, that was intended to provide some clarity. However, it's not a rulemaking. It doesn't directly address some of these questions. I think it's going to be a matter of states working with the federal government because so much of this is within state authority to regulate."

Dr. Bin-Nun said that congress could play an important role in preventing a "patchwork of state legislation" from going into effect. He added: "We have 50 states in this country and they have a lot of different needs and perspectives. Some states, like California, have always seen themselves as leaders in safety and technology. They're knee-deep in thinking about the road-worthiness aspect of autonomous vehicles. Other states are not that interested in the regulatory side. It highlights the need for federal guidance because this is not one of those cases where 50 states taking different approaches helps us."

Learning from the road

Waymo, the autonomous car development company from Alphabet (Google's parent company), has invested millions of dollars in its self-driving programs. The company is one of many that have conducted road tests on both real roads and closed courses, hoping to improve their functionality and gain new insights into the many variables of driving.

Road tests can only go so far, however. New challenges are bound to come when these vehicles are officially deployed. They will need to learn from other vehicles (particularly those that are being manually driven), adapt to changing road conditions and identify potential hazards that haven't been pre-programmed into the system.

In order to accomplish this, future automobiles will require robust computers with advanced artificial intelligence that are capable of learning. Drive.ai and Argo AI are among the startups that are trying to help automakers build smarter cars. Neither company has committed to a firm deployment date for their AI solutions, but that hasn't stopped automakers from pushing ahead. Many of them – including Ford and BMW – hope to have their autonomous cars ready no later than 2021.

"I think it's so exciting that so many companies have made commitments to when they'll get the technology on the road," said Dr. Bin-Nun. "This is certainly the beginning of the story. We're not going to be completely autonomous all the time by 2021, that doesn't sound realistic. But it's really exciting and promising that so many companies are embracing that autonomous vehicles are the future."

AI could benefit each car individually, but there has been widespread speculation about the benefits of connecting that information to a vast network of autonomous vehicles. This, along with the promise of safer roads through V2V and V2I, has bolstered the notion that connectivity will be necessary to reach Level 5 autonomy. Miucic does not think that's the case.

"My personal opinion is that it does not require full-time connectivity," said Miucic. "Think of yourself: you don't need to be connected to the Internet to drive. You don't necessarily need maps to know how to drive. DSRC and V2V can help with environmental perception awareness of what's happening around the vehicle. Connectivity can help get maps updated through a cellular network. But at the moment I don't think it is absolutely necessary for autonomous driving."

Miucic added that connectivity might arrive alongside autonomous vehicles and help each other, but that doesn't mean one cannot exist without the other.

A new form of communication

In the distant future, autonomous cars might eliminate the need for many of the control and user interface features that are found in automobiles. Passengers could

feasibly hop in an Uber, speak to the in-car system (ex: IBM Watson) and head to their destination automatically. That's the dream, and automakers are working hard to make it a reality.

But what happens when those outside of the vehicle – pedestrians, construction workers, police officers, etc. – need to communicate with an autonomous car? One possible solution involves replacing a traditional windshield with a large display that projects messages, which could be as simple as "walk" or "don't walk," mirroring those of a traffic signal.

Alistair Adams, automotive business program manager for The Qt Company, acknowledged the necessity to create a communication method between autonomous cars and pedestrians.

"With autonomous, its occupants are just passengers with no real driver, so you need that [communication]," said Adams. "These are challenges of the autonomous car."

Automakers currently use The Qt Company's software framework to develop in-car infotainment experiences. Adams didn't have any insight into how they might evolve as cars become more autonomous, but he speculated that consumers might favor their own devices when using an automated mobility service.

Said Adams: "If you hail a ride, do you need a UI in there? Is it a bit like a train or airplane where you bring your own device?"

That might be a convenient option for most consumers. However, it could introduce new security challenges for those who don't wish to share their personal data with every Uber in town.

"If you're taking an Uber and you're just a passenger in the car, you've got to think about security," said Adams. "If you're actually running applications on that device, what personal information are you leaving behind? Maybe it becomes a dumb projection screen that's just bigger and gives you more real estate."

More sensors may not be needed

The path to autonomy may very well prove that less is more. Though it might be tempting to add as many sensors as possible, doing so may not yield better results. Sudipto Bose, marketing director, automotive radar at Texas Instruments, expects automakers to test other ideas instead.

"Think of the way any normal adult drives: you need to have a very detailed view of the scene in front of the car," said Bose. As a result, he believes a greater number of

sensors will be allocated toward the front of the vehicle, with fewer designated for side and rear sensing.

Bose added: "Before you overload the car with sensors, where you essentially hang a sensor in every free space that you have, I believe you will see some innovation in vehicle to vehicle and vehicle to infrastructure. For example, let's say every traffic light in the U.S. sends out a signal indicating when cars can go or stop."

From an engineering perspective, Bose thinks that might be an easier solution than adding more cameras or additional radar sensors. But all vehicles must first be capable of receiving traffic signals. If some can but others cannot, V2I solutions might be more difficult to implement.

That is not Bose's only concern. He also spoke about the inherent limitations of applying autonomous tech in vehicles where energy consumption is still an issue.

"There are practical limits of how much computing you can put in a car," Bose continued. "If the electronics you end up with consume a significant portion of the battery that the car is driving on, then you get to a point where it will start to pinch. You'll start to realize that if you run this car in full autonomy mode, you're not getting the range you would normally get."

Obstacles remain

There are still many challenges ahead for autonomous vehicles, but not all of them are obvious. Luc Langlois, VP of marketing at LeddarTech, said there are "multiple obstacles" outside of the car itself.

"My personal opinion is that deployment is going to be done for certain areas, roads or cities," said Langlois. "The infrastructure, as well as the legal aspects, is going to need to be adjusted. Many of the projects that we see right now for autonomous driving are in restricted areas, so it's not so much an issue. This is also because there are a limited number of cars. But when you imagine there's going to be 5% to 10% of cars on the road in autonomous driving mode, it's obvious the infrastructure is one of the hurdles."

It is not yet known how a Level 3 or Level 4 autonomous vehicle might handle the transition between driver and driverless modes, but Langlois speculated that the car would simply pull over until the driver responds.

"If you're sleeping, the car will park [itself]," he said.