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Automotive World

From safety aid to safety risk: new tech elicits unintended consequences

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Some of the advanced safety technologies making their way into vehicles carry unintended consequences for driver behaviour, writes Megan Lampinen

The spread of advanced driver assistance systems (ADAS) into mainstream vehicles is impacting driver behaviour, but not always as it's expected. These new technologies, designed to make driving safer and less demanding, carry with them some unintended consequences. The Advanced Vehicle Technology (AVT) Consortium, set up by a group of companies in October 2015, studies driver behaviour and associated safety risks related to increasingly automated driving technology.

"Semi-autonomous technologies are coming to the mass market very quickly," Jeff Blecher, Senior Vice President of strategy at Agero, told *Automotive World*. Agero is one of the consortium's founding partners, along with the Massachusetts Institute of Technology (MIT), Touchstone Evaluations, Delphi, Liberty Mutual Insurance, Jaguar Land Rover, Toyota and Autoliv. More participants are expected to join in time. "The research at the AVT Consortium is focussed around understanding the interaction between technology and human behaviour," explained Blecher.

While considerable work is going on in a lab environment from an engineering perspective, there's very little work with advanced technologies in a naturalistic environment. What the consortium is doing is looking at how humans interact with these technologies, observing their behaviours and how they change. Specifically, researchers are looking out for unintended consequences – anything from increased driver distraction to an educational misunderstanding of the technology capabilities.

"We saw the tragic accident with Joshua Brown back in May," said Blecher, referring to the man who died when his Tesla Model S crashed during Autopilot mode. It has been suggested that he placed too much reliance on the self-driving system, which still requires active monitoring. "I'm sure that won't be the last one."

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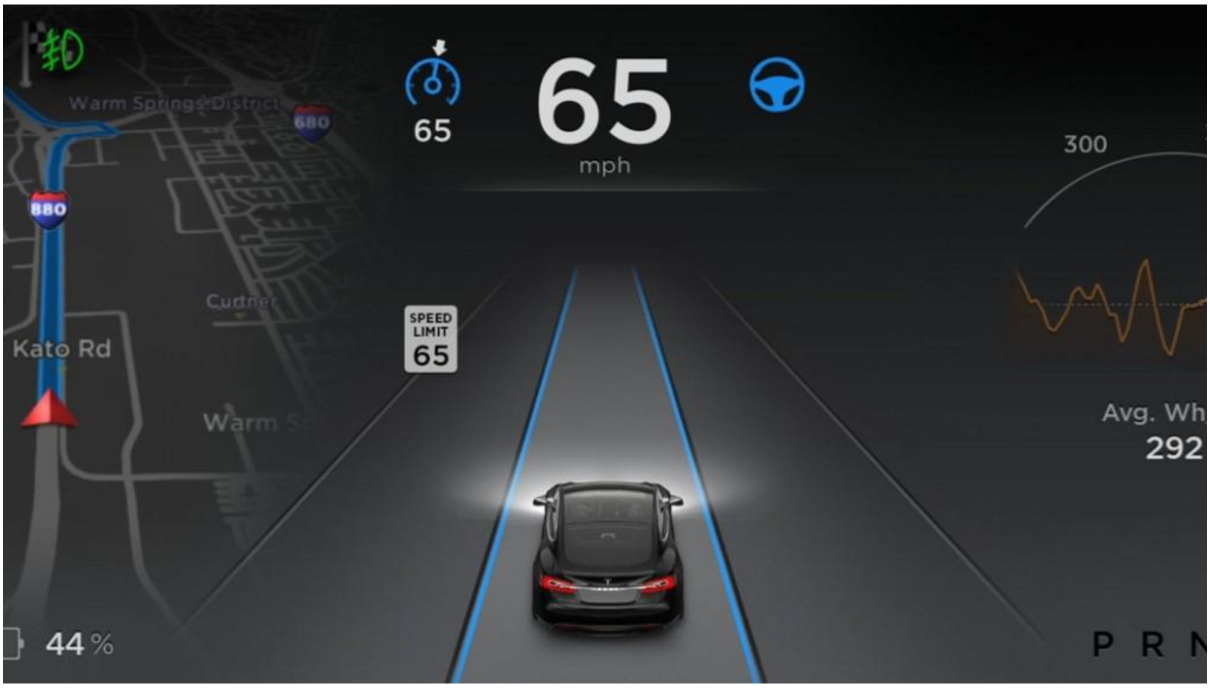
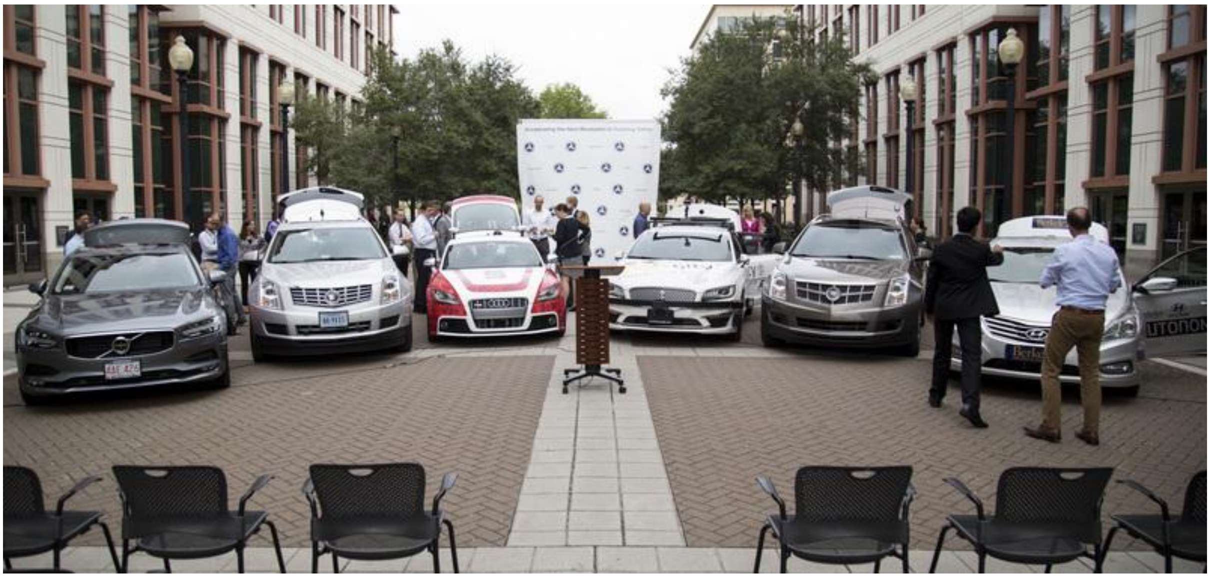


Tesla’s Autopilot system requires the driver to remain alert

Understanding risk

Exactly how these technologies impact driver safety are of great interest to insurance providers. “Insurance companies are looking to be more proactive in understanding the risks that these technologies create,” observed Blecher. “Underwriting in the insurance space is like driving through your rear view mirror. You’re always looking at the historical accident data, but it’s very hard to use that data when new technologies are quickly entering the marketplace.”

Over-the-air updates are an additional complication for insurers, offering OEMs the opportunity to frequently update their models. The Tesla Model S offers a clear example of the challenge this technology poses. A Model S produced a year ago and purchased in autumn 2015 would have had Autopilot hardware but not software. Now that same model will have version 8 of the software. “As an insurance company, how do you think about the impact of these updates on risk?” asks Blecher. “How do you take a very data-driven approach to understanding these relationships? You can’t just take some of the anecdotal evidence that exists from a particular accident here or there, but you need to really understand what’s happening in the field.”



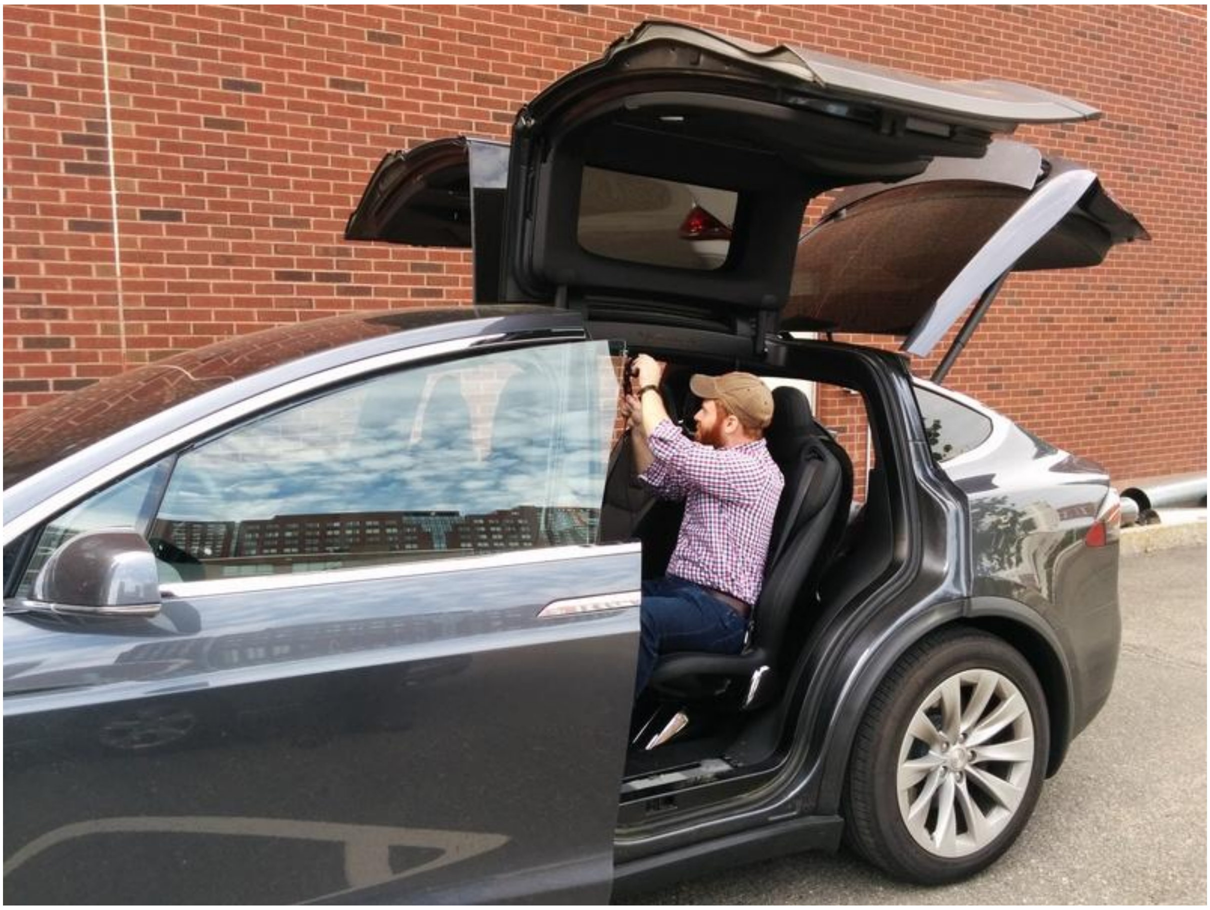
A range of test vehicles are providing vast amounts of data for AVT researchers to analyse

What is the norm?

At the same time as observing behaviour, researchers need to understand how common the responses are. For example, are accidents like Joshua Brown's representative of what most consumers with Autopilot are doing with their cars or are they really just one extreme? "I think consumers act probably along a normal distribution of technology acceptance, and you have the tail of the normal distribution where people grow really comfortable with a technology very quickly and over trust it, leading to incidents like the Joshua Brown one. I suspect that is the tail, not the norm. We have to understand what the norm is and where most people fall within this technology spectrum."

Sensing, technology and data pipelines

The AVT Consortium has been in operation for nearly one year now. During this time work has been carried out to create the sensing, technology and data pipelines needed to instrument test vehicles appropriately and collect the vast amount of data that they are generating. Researchers are hardwiring cars with three high definition cameras that record what the driver is doing, what the driver is seeing out of the front windshield, and what the driver sees on the dashboard. "It is important to understand the contextual elements that the driver is receiving from the user interface," pointed out Blecher. "It's important to understand whether they are on autopilot mode or not, as well as what's happening in the field around them. We also want to understand what that driver is doing. Are they more apt to pick up their phone and start texting or emailing or even playing a game? We've seen some crazy things."



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At the same time, the video cameras collect high definition imagery from the vehicle while telematics sensors in the vehicle provide insight into what the vehicle is doing. An accelerometer GPS helps shed light on the movement of the vehicle. “We are collecting all of this data from these vehicles and then we’re using a cloud-based system with computer vision automation to actually understand what drivers are doing at any point in time so we can begin to quantify things,” he noted.

One of the most important things to understand is the transition between human control and automation, when a driver turns on or off the autopilot function. “We want to understand what is causing those transitions and how humans react to them,” explained Blecher. “Are they alert? Are they aware? Are they engaged when they do have to take back control? If it is initiated by the human, why is the human taking back control? Is it because they were unhappy with what the automation was doing and they got nervous? Or was it because they reached a point in the roadway where they just wanted to take back control?”

The project has captured thousands of hours of video, which a computer vision system automatically quantifies. Much of the work over the past year has been on this area and the project has now reached the point where it can start scaling it up. Volunteers will be observed using a range of different test vehicles, which include Volvo S90s with Pilot Assist 2, Tesla Model S units with Autopilot functionality along with the new Range Rover Evoque, some Mercedes-Benz models and a Chevrolet with advanced cruise control.

“This mix of vehicles with different implementations of level two technologies gives us an opportunity to not only understand how consumers respond to level two technologies, but also how they respond to different user interfaces. Every auto maker uses a slightly different interaction mental model,” observed Blecher. “We want to understand how consumers react to these different implementations. This data will help the engineers, Tier Ones and the automotive manufacturers really understand how these systems are used in the real world and how best to configure them.”