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Hand Gestures And Horses: Waymo's Self-Driving Service Learns To Woo The Public

On a sunny spring day in suburban Phoenix, a white minivan stops at a crosswalk to let a man pass. He gives the vehicle a wave, signaling it should go ahead — which it does, until the pedestrian suddenly steps off the curb and dashes through the crossing. The van, sporting the green and blue logo of Alphabet's self-driving car unit, brakes to a halt.

Six months after Waymo started offering a driverless taxi service near Phoenix, the robot vehicles and — and the public — are learning to coexist. Technically, the rollout has been a success. The Pacifica Hybrid minivans can make split-second adjustments after reading cues like a hand gesture, a sophisticated step for autonomous cars. They handle tricky turns and brake more smoothly compared to previous test rides by *Forbes*. More than 1,000 people are signed up to use the Waymo One service; tens of thousands are waiting to sign on. Outrage over the too cautious maneuvering of the programmed vehicles seems to have died down.

As a commercial endeavor that could ultimately become a source of billions of dollars of income for its digital advertising-dependent parent, however, progress looks almost glacial. Waymo is keeping safety drivers at the wheel for most rides and airport and highway runs aren't yet an option. It's also not saying when it will transition to a service without safety drivers and launch in bigger, denser markets — currently, it's in a 100-square-mile stretch including the Phoenix suburbs of Chandler, Tempe, Mesa and Gilbert.

"We've always had a very conservative approach to making both our users and the public feel safe with this technology and what it is we're doing here," a Waymo spokeswoman said. Ride rates are in line with what Lyft and Uber charge but the company isn't saying how many people it's hauling a day or sharing revenue details. (*Forbes*' recent Waymo One trip cost $8.53.)

The cautious expansion, partly driven by a public that is both intrigued by the prospect of a digital chauffeur and easily spooked by self-driving blunders, contrasts with some of the more ambitious roadmaps projected by Waymo rivals. Tesla CEO Elon Musk claims his electric car company can deliver a self-driving future as early as next year–assuming his new computer and self-driving software, perfected by utilizing camera and sensor data collected in "shadow mode" from hundreds of thousands of Teslas on the road work as promised. General Motors' Cruise unit has its own aggressive market plans, and Uber and Lyft are also pursuing own self-driving car technology as a way to keep the cost of rides low. Getting the cars to navigate on their own is just the start; getting the public comfortable with both driving alongside and in a car without a driver is another big

challenge.

Numerous surveys of public sentiment, such as one released in March by AAA, show a high level of worry over driverless vehicles, especially in the wake of a deadly 2018 accident in which a self-driving Uber test vehicle struck and killed a pedestrian in Tempe and fatal crashes involving Tesla drivers who may have overestimated the capabilities of the carmaker's Autopilot software. A new Capgemini study finds a majority of people surveyed globally are awaiting the technology with "anticipation," plus "a degree of uncertainty and concern," says Markus Winkler, Capgemini's head of automotive research.

Which is why Waymo's commercial rollout in Arizona is a test case for the entire industry. The service, which launched late last year, operates like Lyft or Uber, with users hailing rides with a Waymo-designed app. (In fact, some Waymo One vehicles are also migrating to Lyft's network in Phoenix.) Each of the several hundred Waymo One vans in Chandler arrives with a safety driver at the wheel. But that may be more about public relations than technical necessity. During a recent trip, the human in the driver's seat didn't take her hands off her lap during a trip from the library to a shopping mall a few miles away in light, late morning traffic.

"Part of it's just education and getting people really comfortable right out of the gate," the spokeswoman said.

There's another piece of the Arizona program that's closer to Waymo's long-term plans of full autonomy. A few hundred people are getting rides in Pacificas with no safety driver through its Early Rider program, an earlier test rollout. Unlike Waymo One users, Early Riders have to sign nondisclosure agreements and aren't allowed to discuss the program.

Early Riders are also a way for the company to observe how people adapt to a robotic service and the options they want. Recently Waymo integrated Google Play music into the Waymo One app to let riders automatically listen to their preferred songs and artists. Video streaming, games and other in-vehicle options that leverage Google's many services are likely additions, though Waymo won't verify that.

Community Relations

Leaders in the self-driving car race often tout improvements in vision technology, sophisticated HD mapping and advances in artificial intelligence geared toward avoiding accidents on the road. But Waymo One's rollout shows that's only part of the battle.

The fire and police in Chandler, where Waymo One is based, have been working with the company and Arizona's Department of Public Safety to set standards for handling accidents or emergencies that will happen at some point.

"Beyond the initial shock of not seeing a person in the vehicle, which we're getting used to, protocols are being established," says Chandler Police Chief Sean Duggan. "As a police officer, one of the first questions that gets asked is 'who gets the ticket? How do you contact whomever?"

There have been a "half a dozen" collisions involving a Waymo vehicle, Duggan says, but not ones where the Waymo vehicle was at fault. In fact, the department hasn't issued any

citations to Waymo in the past couple of years.

Chandler, a mid-size city of 260,000 people with year-round good weather, seems unpanicked by the growing number of robotic vans picking up and dropping off people around town. Mayor Kevin Hartke is a Waymo One user, occasionally hailing rides to get to city functions. There are lots of interactions with drivers, pedestrians, cyclists and emergency vehicles, but the vans have also adapted to encountering horseback riders, a common occurrence in Arizona. (The animals aren't particularly fazed by the vans, but Waymo says in at least one case a human rider's nerves had to be calmed.)

"When you put Chandler on a scale with Beijing or New York City, it's so far on the simplistic side, but it's where you need to start," said Bryan Reimer, a research scientist at the Massachusetts Institute of Technology's AgeLab. "And if you can't do it there, there's no sense getting bigger."

Ahead of the commercial launch, there were reports that the vans irritate local commuters because they take too long to make left turns and of assaults on Waymo vans including rock throwing, a slashed tire and even an individual who aimed a gun at one.

"People tend to be frustrated when a vehicle is actually obeying the law" by stopping completely at intersections and making turns cautiously, Dugan said. "That happens regardless of if it's self-driving or a person." The pistol incident was more about mental health, he says. Both he and Chandler Mayor Hartke say angry events involving Waymo vehicles are rare and that locals aren't making a stink about them. (Discussions with a few residents didn't reveal any particular frustration, and some local high school students said they hadn't ridden in Waymo vans yet but hope to.)

MIT's Reimer thinks it could take decades of refinement until robots truly change how most people get around. For now, winning public acceptance for the technology means finding ways to validate how well it performs in the real world. In other words, a steady ground game is better than a Hail Mary pass for autonomous technology.

"The view for companies like Waymo is `we have to be able to show functional safety. Otherwise, we can't protect our decisions in a court of law, where this will all end up long term,'" he said. "Elon is working mostly on the deep neural net side where a good chunk of it is a black box. Documenting, defending that in court is going to be tough."

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