



Consumer Reports Auto Industry Insights: ADAS Lane Systems

May 2021

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CR Consumer
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Data Intelligence



About This Report

Consumer Reports continually reviews new technology and uses several inputs to evaluate the design and implementation of these new systems. As part of CR's efforts to shape the marketplace in favor of consumers, this report has been written for the industry to share our latest consumer-driven data and expert insights about lane systems.

The 2020 ADAS Survey of CR members was conducted from October to December 2020. Responses were collected from owners of 56,900-plus vehicles from model years 2017 to 2021. All survey participants were required to have used ADAS features in their vehicles. Only vehicles that are known to have ADAS were chosen for inclusion in the survey data analysis. Data points have to meet a minimum sample size threshold of 50 responses to be included in this analysis.

Is the survey data available?

Data is available for licensing through the CR Data Intelligence program. Please direct inquiries to dataintelligence@cr.consumer.org.



ADAS Terms & Definitions

- **AEB (automatic emergency braking):** Detects potential collisions with a vehicle ahead, provides forward collision warning, and automatically brakes to avoid a collision or lessen the severity of impact. Some systems also detect pedestrians or other objects.
- **Backup Camera:** Displays the area behind the vehicle when in Reverse gear.
- **BSW (blind spot warning):** Detects vehicles in the blind spot while driving and notifies the driver of their presence. Some systems provide an additional warning if the driver activates the turn signal.
- **FCW (forward collision warning):** Detects a potential collision with a vehicle ahead and alerts the driver. Some systems also provide alerts for pedestrians or other objects.
- **LDW (lane departure warning):** Monitors vehicle's position within the driving lane and alerts driver as the vehicle approaches or crosses lane markers.
- **LKA (lane keeping assistance):** Provides steering support to assist the driver in preventing the vehicle from departing the lane. Some systems also assist to keep the vehicle centered within the lane.
- **RCTW (rear cross traffic warning):** Detects vehicles approaching from the side at the rear of the vehicle while in Reverse gear and alerts the driver. Some systems also warn for pedestrians or other objects.
- **Reverse AEB:** Detects potential collisions while in Reverse gear and automatically brakes to avoid or lessen the severity of impact. Some systems also detect pedestrians or other objects.



Key Takeaways

- 1. The industry should focus on lane systems.** Manufacturers have the most opportunity to improve lane systems with respect to driver satisfaction, demand, adoption, and proper usage.
- 2. Consumer education is important for system satisfaction.** The data suggests that there is higher consumer satisfaction among systems that are actively promoted and explained by manufacturers.
- 3. Safety and collaboration go hand in hand.** Drivers are more likely to feel safe with systems that allow for driver collaboration and do not work against the driver.
- 4. Drivers tend to disable warning systems.** While warning systems had higher satisfaction rates and safety perceptions than intervention systems, drivers find warning systems to be annoying on low-speed roads. This can lead drivers to disable warning systems altogether, preventing the use of them in highway driving, where there is a higher perceived benefit.
- 5. Drivers expect LKA to center in the lane.** LKA systems that hold the vehicle in the center of the lane (as some refer to as lane centering) appear to have higher satisfaction and are used more often, likely because the majority of drivers expect this behavior of any system that provides steering input.

CR Recommendations for Lane Systems

System implementation should meet consumer expectations. Systems that provide steering input should keep the vehicle in the center of the lane. Because this may increase distraction, any vehicle with LKA should also be equipped with a camera-based direct driver monitoring system.

Direct driver monitoring can be used to tune the systems based on attentiveness. Tuned correctly, this could help prevent false alerts and increase use and satisfaction.

Systems should not be overly intrusive. They should allow for collaboration between the driver and the system. Drivers should be able to easily override the system, without fighting it, to adjust their placement within the lane.

Systems should not jerk the steering wheel. Startling the driver can cause a quick counteraction.

ACC and LKA do not need to be linked. Independent activation allows drivers to use their prior experience with each feature separately to mitigate increased performance expectations of the system. Drivers may want to use the LKA system and manually control speed.

Drivers should be able to set thresholds at which the LDW features activate. The driver's preferred speed is more meaningful and memorable for drivers than an unchangeable default setting.

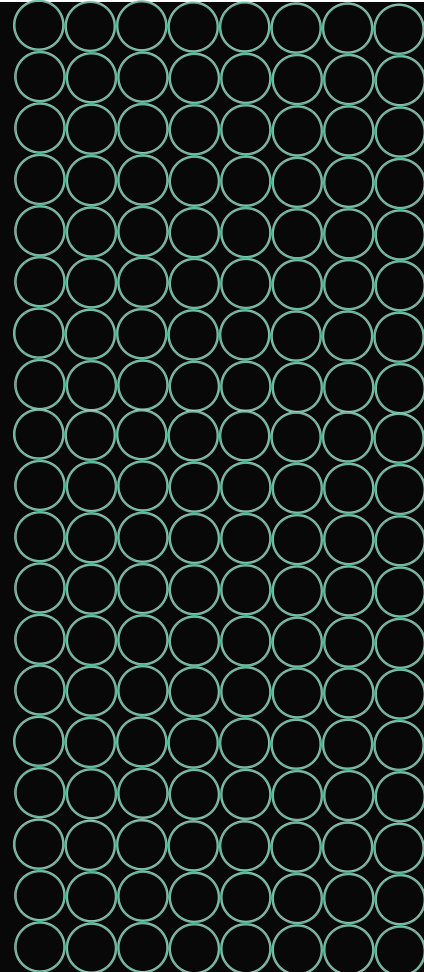
Eliminate extraneous alarms. This may prevent drivers from turning off the warnings entirely.

Audible LDW alerts should be replaced with steering wheel vibrations. Steering wheel vibrations that replicate rumble strips communicate road edges in a way that requires no new driver training.

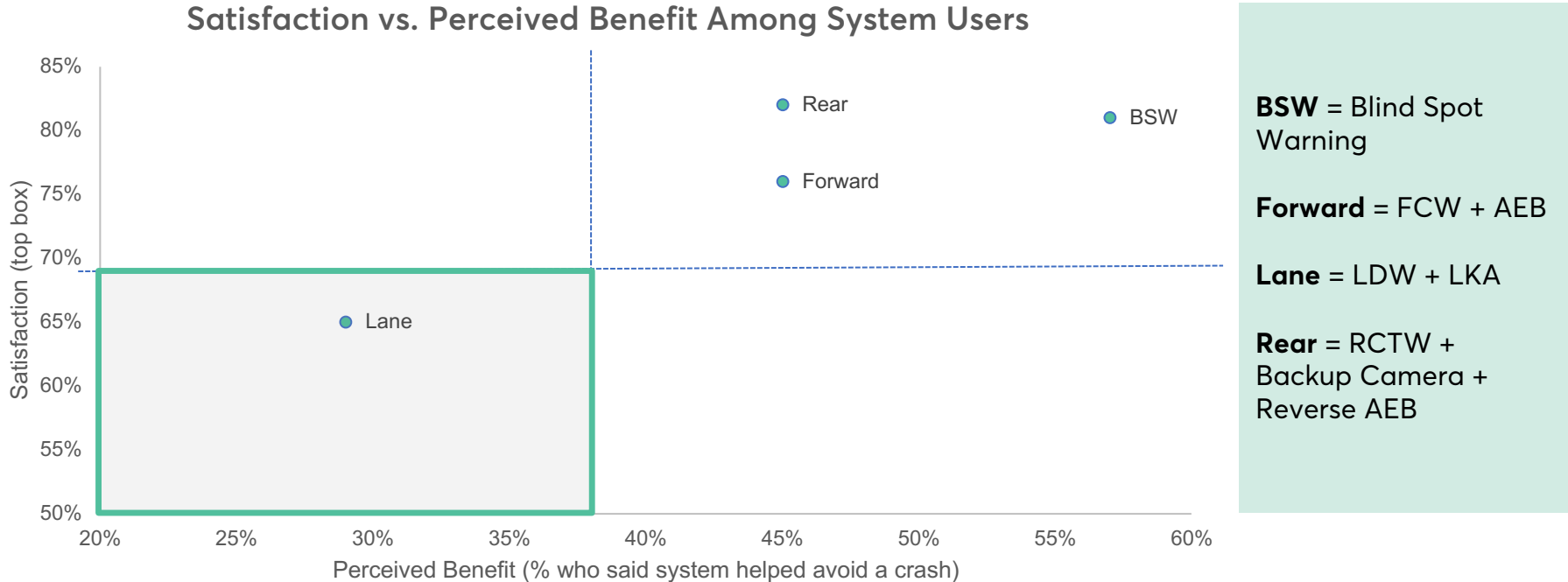


LANE SYSTEMS: OVERVIEW

Among ADAS features, lane systems lag behind in terms of satisfaction, perceived benefit, and consumer demand, which is why lane systems are not yet awarded bonus points at CR.

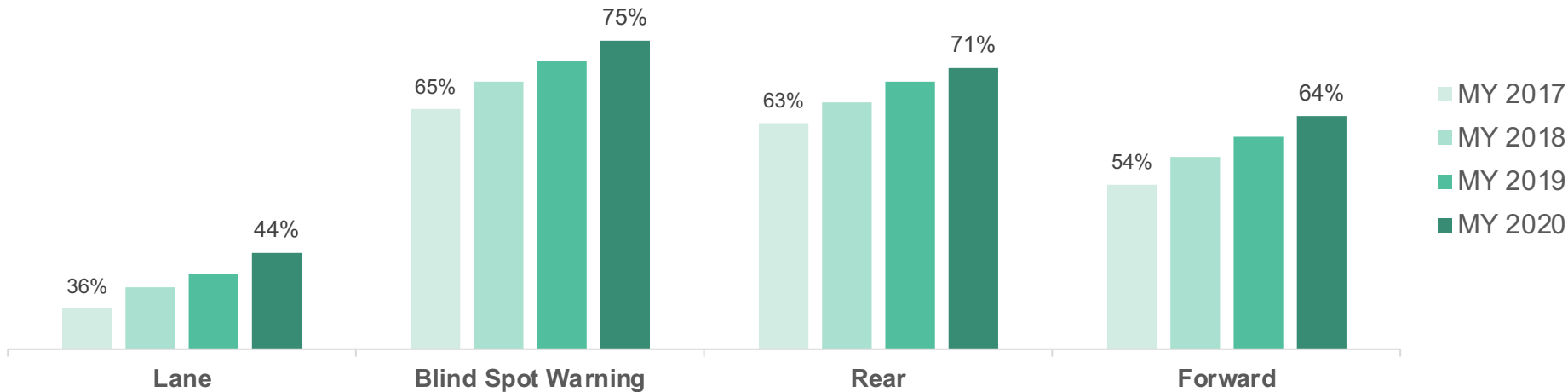


Survey results show that there is room to improve lane systems from the perspective of consumer satisfaction and perceived benefit



Consumers with newer cars say they are more likely to seek ADAS in their next vehicle, but demand for lane systems continues to lag

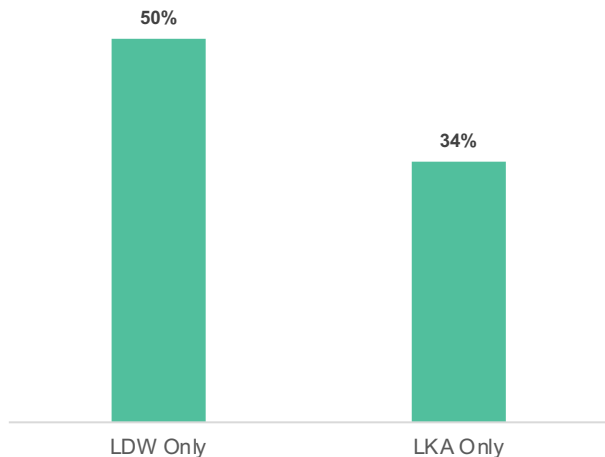
Percentage of all respondents who said these ADAS types are important to have in their next vehicle



Lane = LDW + LKA **BSW** = Blind Spot Warning **Rear** = RCTW + Backup Camera + Reverse AEB **Forward** = FCW + AEB

Sentiment analysis of verbatims shows that drivers feel more positively about LDW than LKA systems

More drivers left 'Very Positive' verbatims* for LDW only than for LKA only



*Percentage of verbatims related to LDW only or LKA only that had a "Very positive" sentiment

LDW verbatims

The audible and visual alerts are excellent—they don't activate unless there's really a problem. This is a really good feature.

—2020 Mazda CX-5 driver

The audio and visual alerts are very clear, fast and distinct. Great safety device.

—2020 Honda Accord driver

Works very well. Audible alert has a unique sound.

—2020 Porsche 911 driver

LKA verbatims

I do not feel comfortable when the steering wheel is always moving left and right. I don't feel in control when the system is on. I never use it.

—2019 Kia Sorento driver

It automatically pulls you back into your lane, which I don't like. Prefer to just be warned and manually control movement.

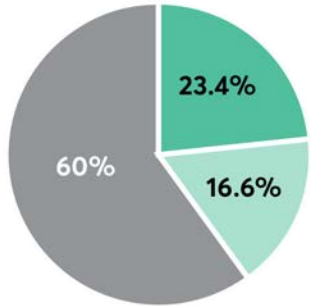
—2019 Audi A5 driver

Lane control pressures my steering. Not my idea of a good idea.

—2020 Jeep Grand Cherokee driver

Consumers expect any lane keeping system, regardless of 'centering' performance or design intent, to keep the vehicle in the center of the lane

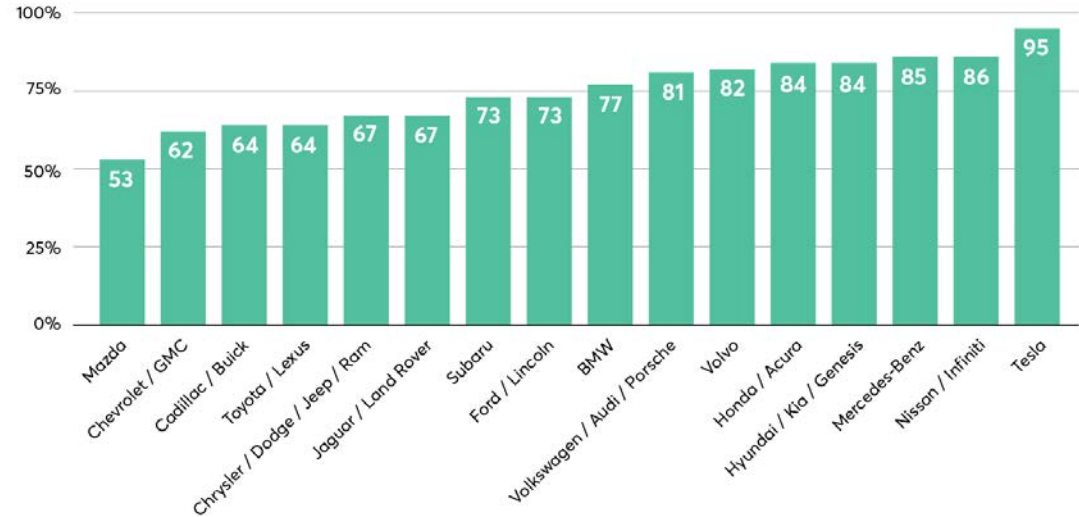
How respondents describe their automatic steering feature (LKA marketwide)



- LKA momentary: "automatic steering only when vehicle crosses a lane line."
- LKA continuous: "automatic steering that keeps your vehicle in the center of the lane."
- BOTH: respondents selected both choices.

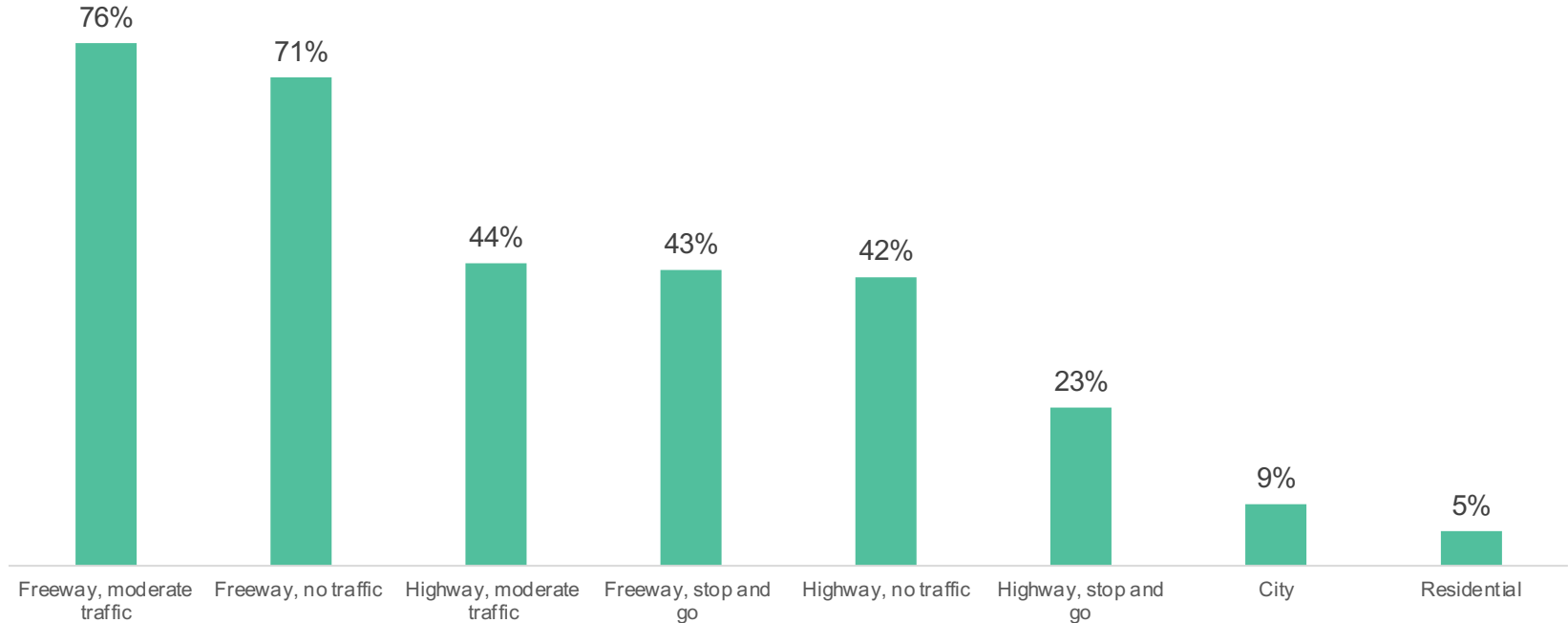
Percentage of respondents who said the LKA system in their car has a feature that uses automatic steering to keep their vehicle centered in the lane

Only respondents who have an LKA system are included.



Drivers tend to use lane systems in less-complex situations

Percentage of drivers who use their systems in particular scenarios



Drivers disable lane systems because of overly sensitive warnings and overbearing steering interventions during low-speed driving

*I drive on a lot of **2-lane roads**, and I don't like that the steering adjusts if I go a little over the line, so I disabled it upon purchasing.*
—2020 Toyota Camry Hybrid driver

*On **narrow rural county roads** with a center line and outside line, it's almost impossible to keep it from alerting on a regular basis. It is annoying and not helpful. I've yet to drive far enough outside a wider, say freeway, lane to activate it in normal driving.*
—2020 Subaru Outback driver

I have disabled it because it activates on lines of tar in the middle of the lane as well as the painted lines at the edge. I was constantly fighting it in order to keep it from driving me out of the middle of my lane.
—2020 Honda Civic driver

*I do not like the car taking control of the steering. On **narrow roads** it is sometimes necessary to move close to the lines, as when passing someone on a bicycle. I then have to fight the car. I disabled the system, though I may use it on interstate roads at some point.*
—2020 Hyundai Palisade driver

*Sometimes it is too sensitive and warns when unnecessary on **local roads** that are irregular.*
—2020 Kia Telluride driver

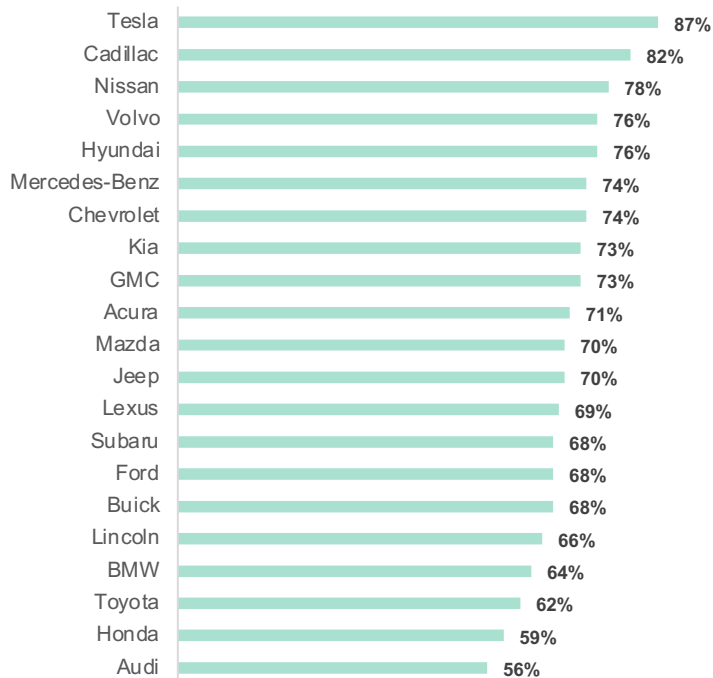
*I only use this system on the highway, during long drives, I disable this system during daily everyday driving. I don't like this system for **local driving**.*
—2020 Honda Pilot driver

*It works well, but it is very hard to keep it from beeping when on a **curvy narrow road**. It would be nice to be able to disable it more easily while driving.*
—2020 Kia Sportage driver

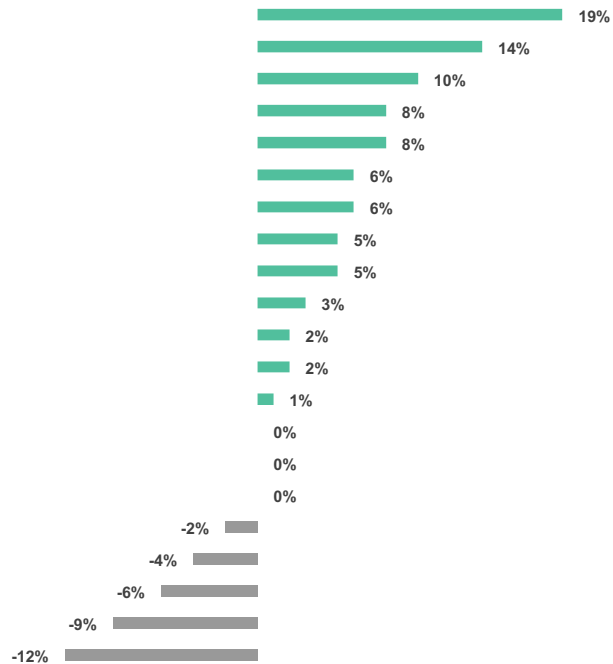
Consumer satisfaction with lane systems varies by brand

Percentage Who Are Very Satisfied With Lane Systems

model-year 2020-21 vehicles



Gap to Industry Average



Satisfaction also varies across models; verbatims suggest misalignment in consumer expectations around lane centering for lower-satisfaction models

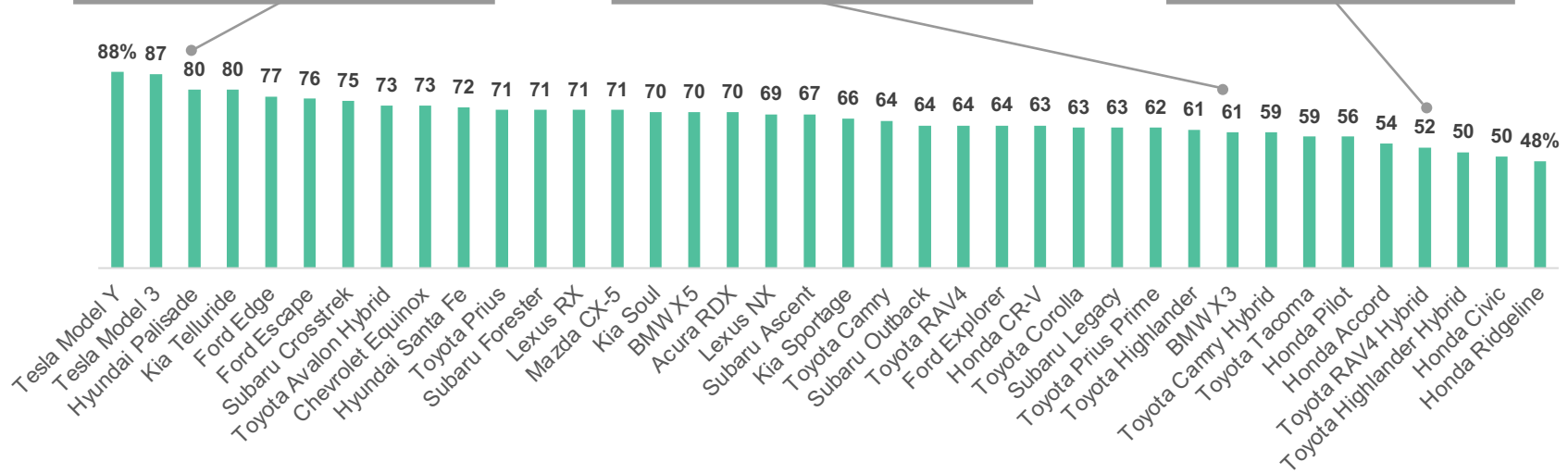
Percentage Who Are Very Satisfied with Lane Systems

model-year 2020-21 vehicles

Hyundai Palisade owners found it extremely effective in ideal situations like highways, roads with clear markings, etc.

BMW X3 drivers felt that their systems seemed to make the car wander back and forth rather than stay centered.

Toyota RAV4 owners felt that the system wasn't really keeping them in the center of the lane.

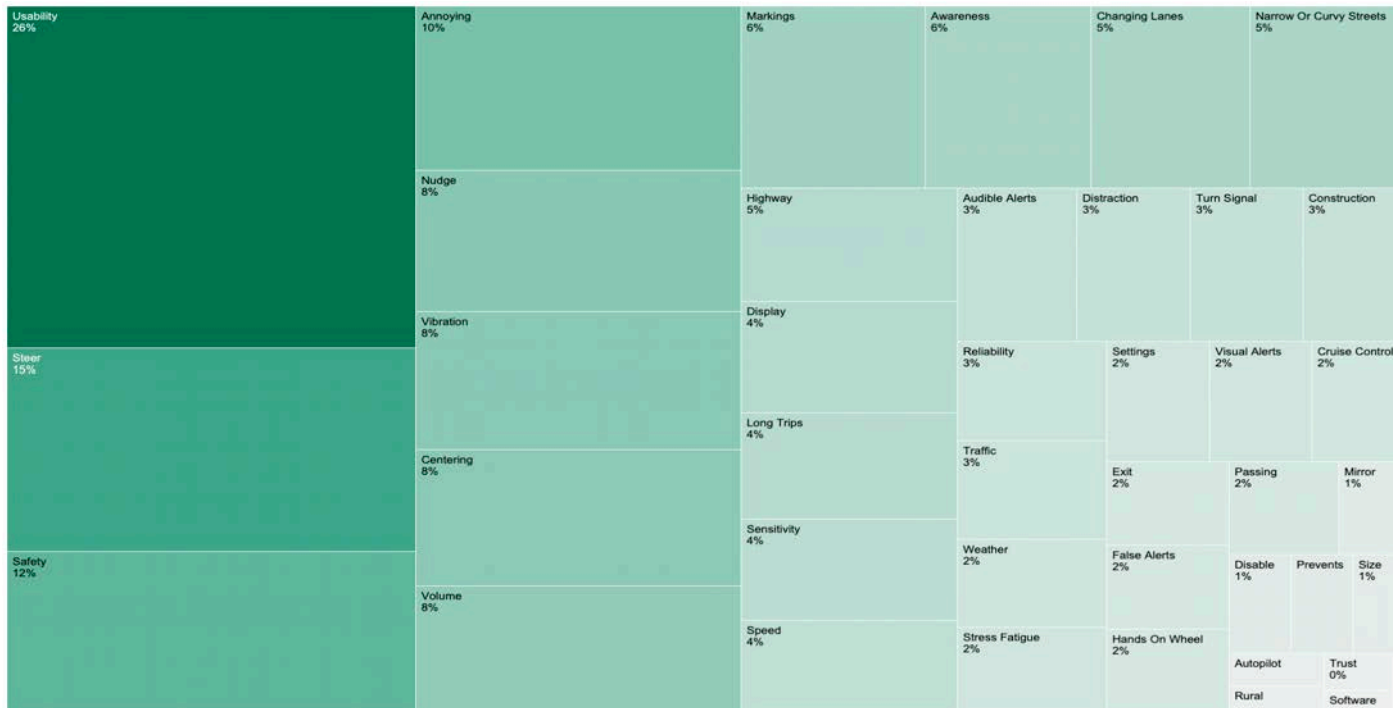




LANE SYSTEMS: VERBATIMS

According to almost 20,000 consumer verbatims, 'usability' and 'steering' are the most common topics among both very satisfied and very dissatisfied drivers.

'Very satisfied' drivers of 2020-21 model-year vehicles have positive sentiment toward 'usability,' 'steering,' and 'safety'



Drivers are happy with systems that are adjustable and intuitive, and make them feel safe without being intrusive

Very reliable with faster reaction times than I have personally.

—2020 Volvo XC90 driver

When cruise control is activated, the lane-keep assist gives a gentle nudge of the steering wheel when I wander in the lane. Nice. The car also has a more aggressive setting that will actually steer the car for you. It works pretty good, but has tried to swerve into oncoming traffic a couple times.

—2020 Subaru Outback driver

It is very user-friendly and is a good reminder to be attentive when driving.

—2020 Chevrolet Silverado 1500 driver

I can set it to give a lane departure warning sound only, OR to provide a gentle tug on the steering wheel to bring it back into the lane.

—2020 Subaru Ascent driver

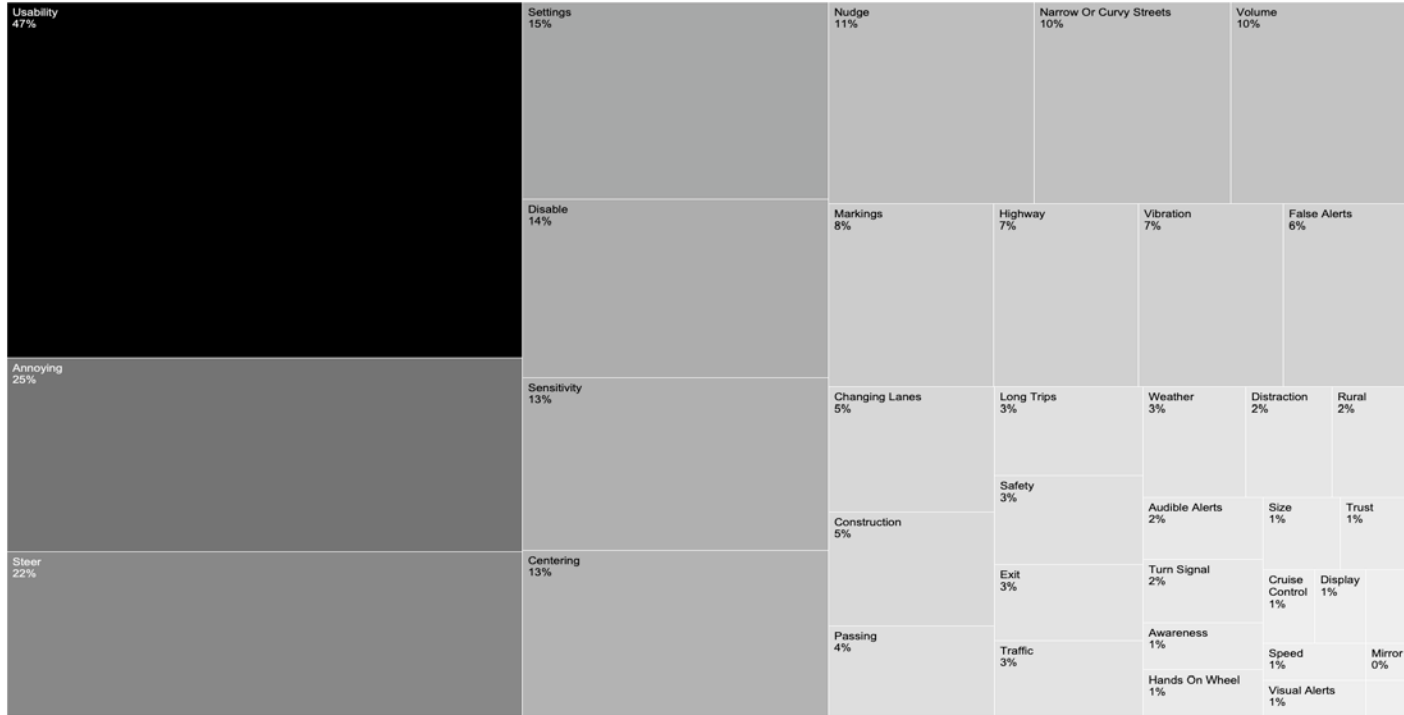
It's a great safety system for those times when I lose my total situational awareness.

—2020 Mercedes-Benz GLE driver

The warning system is effective but not intrusive. The auto-steer (stay in lane) system can be sensitive. The driver must keep some resistance to the steering wheel or the system will turn itself off, but if the driver applies too much resistance, the system thinks the driver is trying to take control back and again will turn itself off. The driver gets a warning whenever it turns itself off so this is not a safety concern.

—2020 Tesla Model 3 driver

'Dissatisfied' drivers of model-year 2020-21 vehicles have negative sentiment toward 'usability,' 'steering,' and 'settings'



Drivers want steering that will keep them in the center of the lane and controls that are easy to activate/turn off

Feels like it wants me to drive a foot or so to the right of where I think it should. Warns a LOT about poor lane markings.
—**2020 Lincoln Corsair driver**

I don't mind the beep when approaching the sideline or centerline, but it goes off really early, with more than 2 feet clearance. The auto-recover-steer is awful!!! When going over a slight hill on two-lane roads, it will attempt to steer you toward the centerline and it is abrupt. I have also had scary situations when it reacted at turn lanes and widening or narrowing lane markings. I like using cruise control, but I foresee problems if this can't be adjusted.
—**2020 Toyota RAV4 driver**

Controls and safety features are too difficult to set up and activate. VERY poorly written operator's manual.
—**2020 Hyundai Sonata driver**

Barely adequate. When vehicle starts drifting or the road curves, the system starts making adjustments. These adjustments get quite severe with the vehicle going from side to side rapidly as if your drunk uncle is driving. Probably should be taken out of vehicles so drivers have no false sense of security.
—**2020 GMC Sierra 1500 driver**

Display does not stand out, and when on, always feel it constantly and annoyingly tugging at the steering wheel
—**2020 Genesis G70 driver**

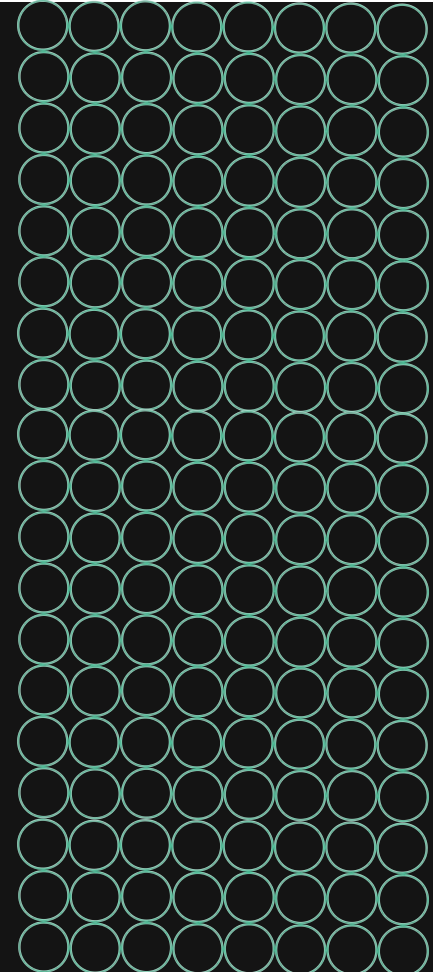
The visual alert requires me to take my eyes off the road. The vibration alert could be stronger.
—**2020 Ford Ranger driver**

There's a bug in the software. When lane departure is set for audible alert only while cruise control is activated, it will fight my steering efforts to keep the car centered where it thinks it should be.
—**2020 Subaru Outback driver**



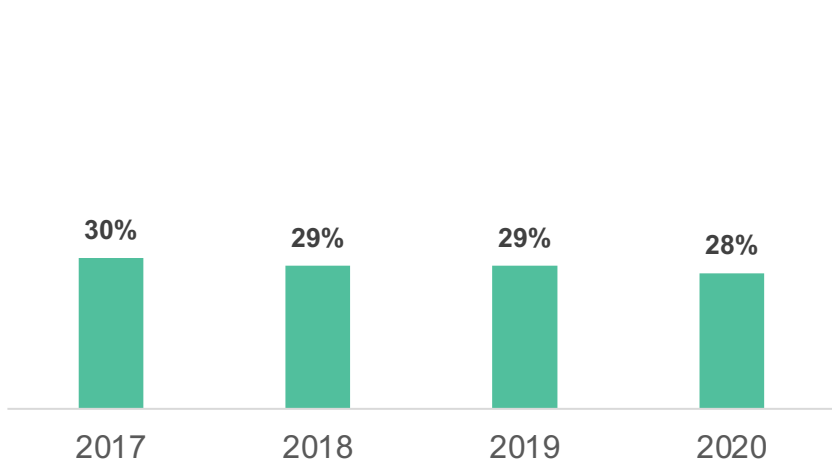
LANE SYSTEMS: SAFETY PERCEPTIONS

Lane systems need major improvement in order to make consumers feel safer.

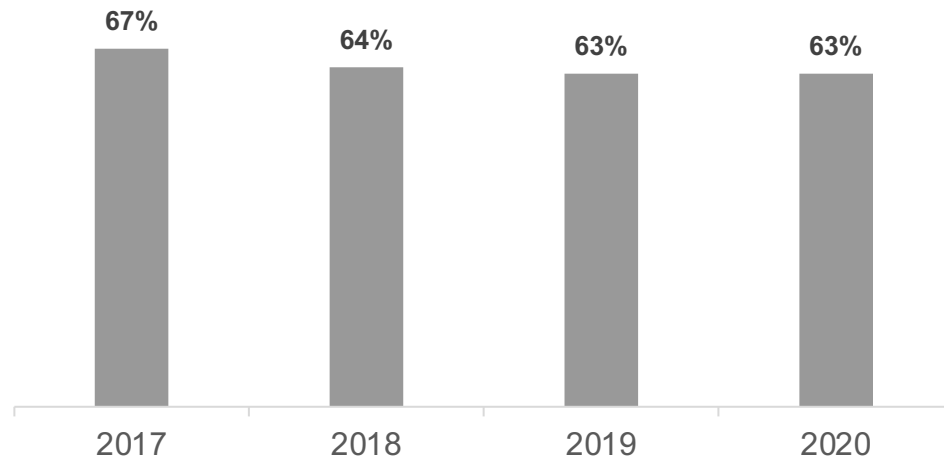


Perceived benefit and safety perceptions of lane systems remain stable across recent model-year vehicles, however...

Percentage who said lane system helped avoid a crash
(by model year, among users of lane systems)



Percentage who said lane system never made them feel unsafe
(by model year, among users of lane systems)

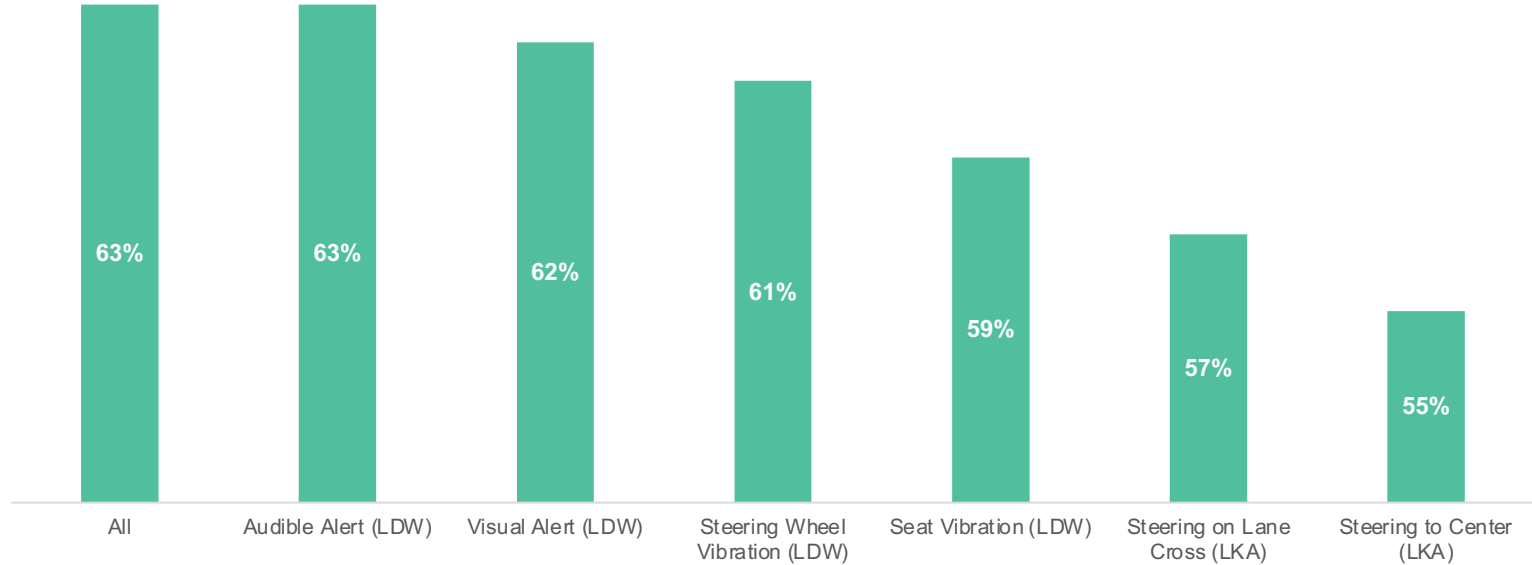


Survey prompt: How often does the lane assistance system in your car do something you feel is unsafe?

...drivers tend to feel less safe with LKA systems than with LDW systems

Percentage who said they never felt unsafe with lane systems

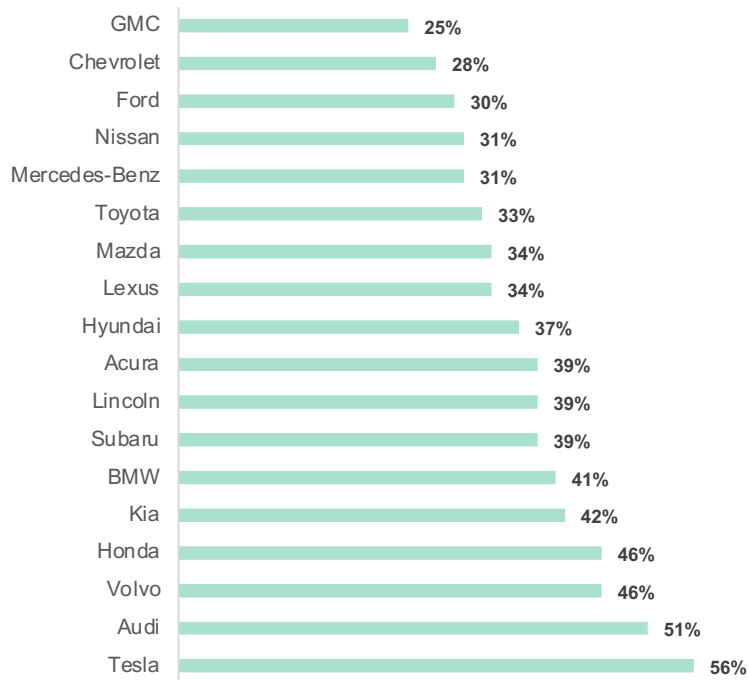
(model 2020-21 vehicles, among users of these systems)



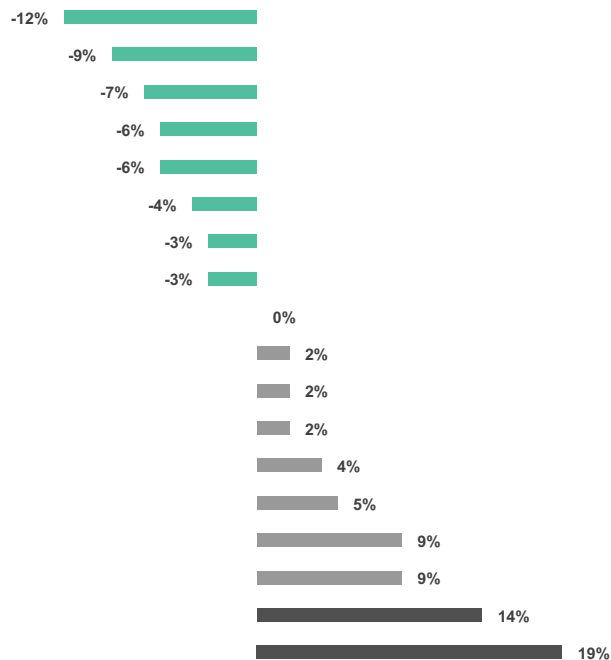
Survey prompt: How often does the lane assistance system in your car do something you feel is unsafe?

Safety perceptions of lane systems differ greatly by vehicle make

Percentage of drivers who said their lane systems made them feel unsafe at least once
(model year 2020-21 vehicles)



Gap to Industry Average



Safety concerns with lane systems include aggressive corrections and lack of driver collaboration

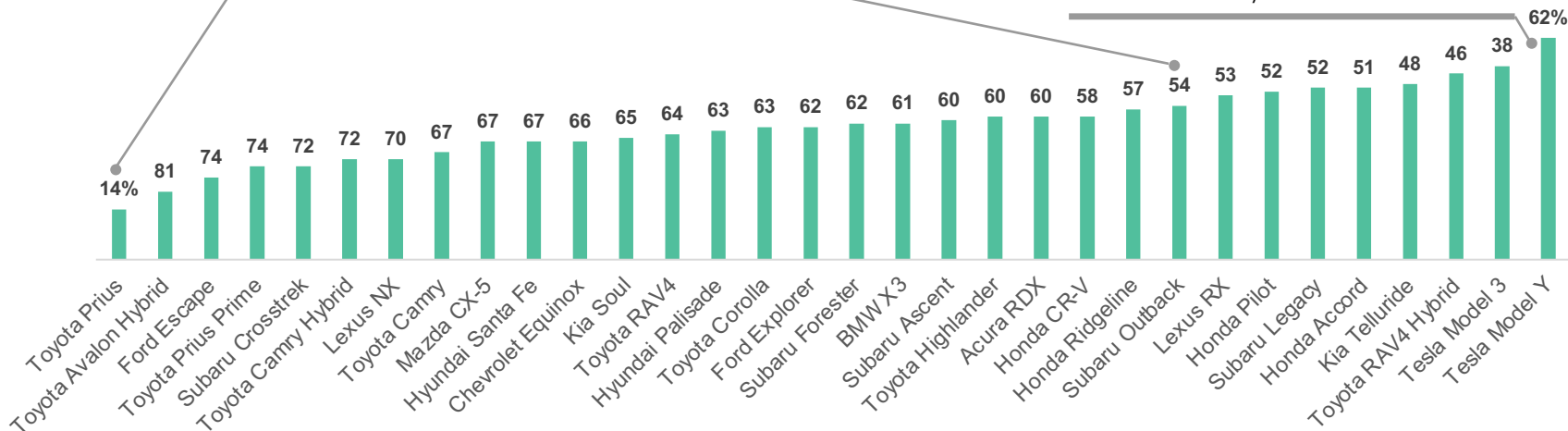
Percentage of drivers who said their lane systems made them feel unsafe at least once

(model year 2020-21 vehicles)

The Prius notifies you if you drift out of your lane. This works as long as the painted lane stripes are legible. The Prius provides a modest correction to bring you back to your lane, but you can override it easily if needed. —2020 Toyota Prius driver

Do not like the system pushing the vehicle back into the center of the lane when moving to give more separation from a large vehicle, a truck hauling a wide load, or a stopped vehicle along the side of the road. —2020 Subaru Outback driver

Way too sensitive and does not make decisions I would make. If another car is attempting to merge into my lane, Tesla will slow down to allow other car to pull ahead (contrary to most state laws that require vehicle already on highway to maintain speed). On Navigate on Autopilot, car makes very unpredictable—and sometimes violent—moves that scare my wife. —2020 Model Y driver





Thank You



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