

IN-CAR

VOICE ASSISTANT
CONSUMER ADOPTION

REPORT

JANUARY 2020



voicebot.ai™



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About Voicebot

Voicebot produces the leading online publication, newsletter and podcast focused on the voice and AI industries. Thousands of entrepreneurs, developers, investors, analysts and other industry leaders look to Voicebot each week for the latest news, data, analysis and insights defining the trajectory of the next great computing platform. At Voicebot, we give voice to a revolution.

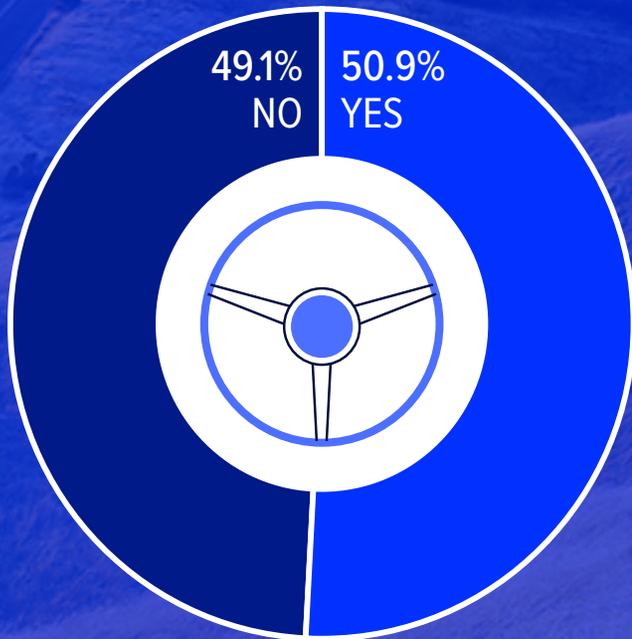
Methodology

The survey was conducted in early January 2020 and was completed by 1,090 U.S. adults age 18 or older that were representative of the U.S. Census demographic averages. Because we reached only online adults which represent 89% of the population according to Pew Research Center, some totals are adjusted downward to provide device and usage numbers relevant to the entire adult population. Other findings are relative to device ownership and do not require adjustment.

About Cerence

Cerence is the world's leading provider of AI-powered automotive assistants to top automakers and suppliers, delivering immersive experiences that make people feel happier, safer, more informed, and more entertained in their cars. Its track record is built on more than 20 years of knowledge and almost 325 million cars on the road today. For more information, visit www.cerence.com.

U.S. Adults That Have Used a Voice Assistant of Any Kind in the Car



Voice Assistants in Cars Are More Prevalent Than Smart Speakers

For many people, voice assistants are still synonymous with smart speakers. There is plenty of talk about Alexa and Google Assistant and the widespread adoption of smart speakers. However, dig a bit deeper and you'll hear about Apple's Siri or Google Assistant on Android smartphones and it is clear that voice is not a speaker revolution but traverses myriad device surfaces.

Cars are a good example. There are more total users and monthly active users of voice assistants in the car than on smart speakers. That was true in our 2019 report and remains true today. It may be easy to overlook the voice revolution that is going on in cars because we are not talking about a new shiny device for your living room.

However, it is nothing short of revolutionary. Voice assistants are at the nexus of an entirely new set of consumer expectations around the driving experience and auto-

makers are fiercely competing to meet those expectations and reinvent the driving experience.

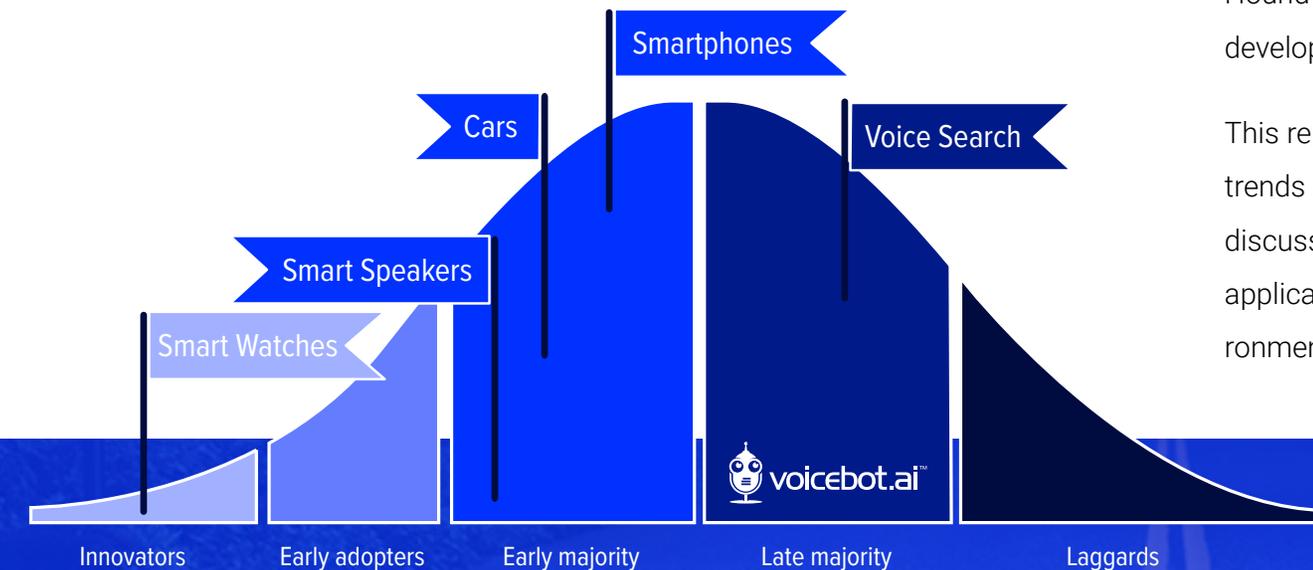
Mercedes, BMW, Ford, and other automakers are leading this change that goes beyond engine power, handling, and styling. Consumers increasingly want many of the same conveniences they have in the home or on their smartphone to be readily available while driving. However, since a driver's hands and eyes are occupied with the task of handling the car, digital interactions are best served by voice access. Voice assistants are helping make digital services more readily and safely available while driving.

That is a big reason why over 50% of U.S. adults say they have tried voice assistants in the car and about one-third are monthly active users while driving.

In-Car Use a Key Driver of Voice Assistant Adoption

Trial of a new technology does not necessarily equate to adoption by consumers. As a result, it is important to look at monthly active users of a technology to truly gauge adoption. In-car voice assistant use also shows strong progress in this regard. There are nearly as many monthly active in-car voice assistant users as there are total smart speaker device owners.

Voice assistant use on smartphones has the broadest adoption among consumers but is not that far ahead of use in cars. Many people are surprised that the first voice interactions arrived in cars in 2000. The Jaguar S-type enabled drivers to control a few car features with voice but it is best thought of as voice control. The new voice assistants go well beyond these capabilities both in terms of how users can speak and the services they can access.

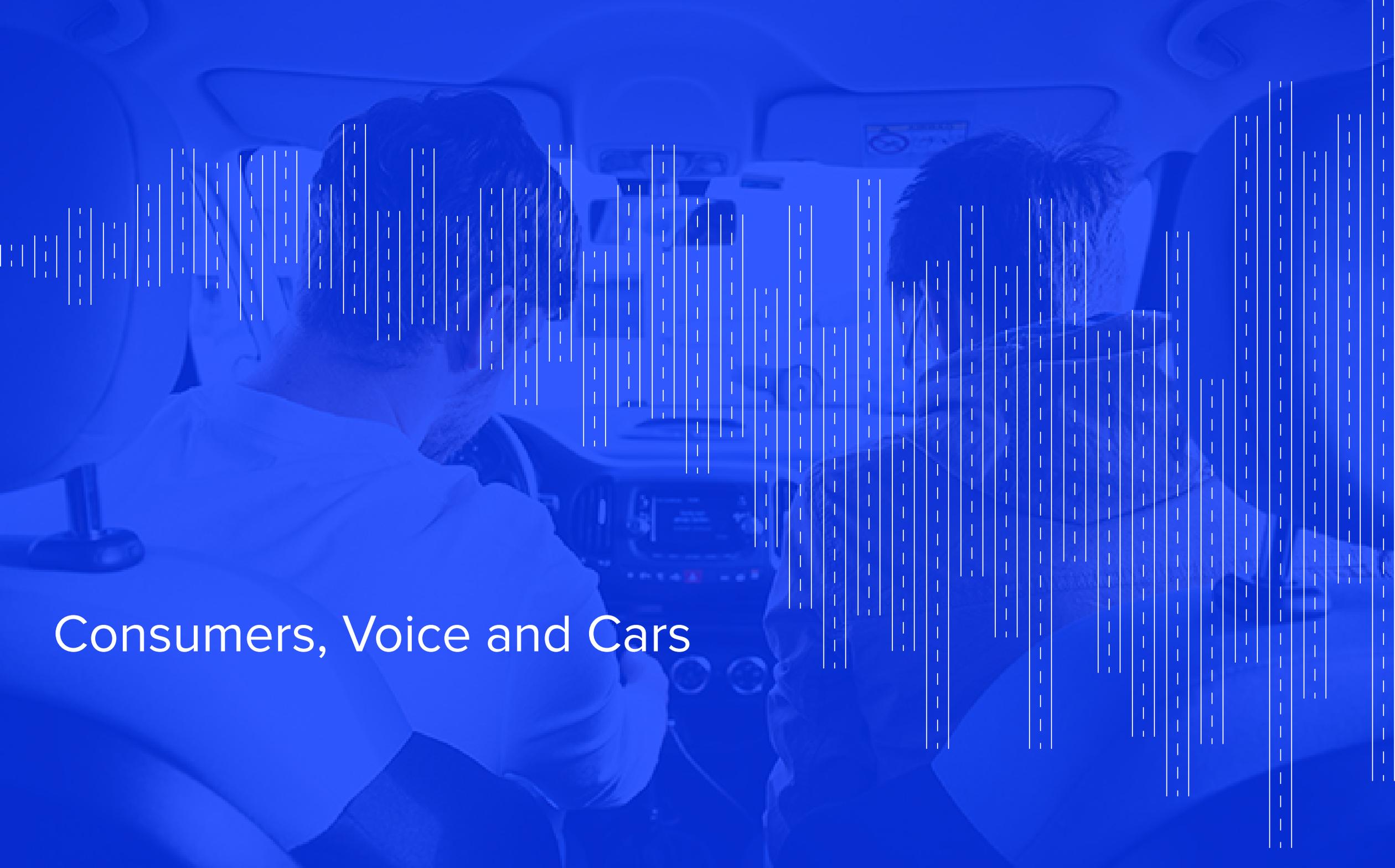


Voice Assistants in the Car Are Different

An important hallmark of the rising use of voice assistants in the car is that the use cases differ from use on smartphones and smart speakers. The most frequently used voice assistant feature while driving is not accessing music or asking questions. Although both of those use cases are employed by drivers, nothing matches the use of voice to place a phone call or navigate to a destination.

Even more intriguing are use cases for pre-ordering food before arriving at a quick service restaurant or searching for a product and then asking to navigate to the nearest location where it is available. Or, consider how entertainment and games can be tailored to the in-car voice assistant experience. Few developers are focused on the intersection of voice assistants and drivers today but it is a large market. As a result, the voice assistant platforms provided by companies such as Amazon, Apple, Cerence, Google, and SoundHound are filling some of the app gaps but there is plenty of opportunity for third-party developers to tailor new experiences for drivers.

This report is divided into two sections. The first section focuses on consumer adoption trends and statistics. That is followed by analysis of the key news from the past year, a discussion around the voice platforms serving the auto industry and some updates on applications and devices designed to offer voice experiences tailored for the in-car environment.



Consumers, Voice and Cars

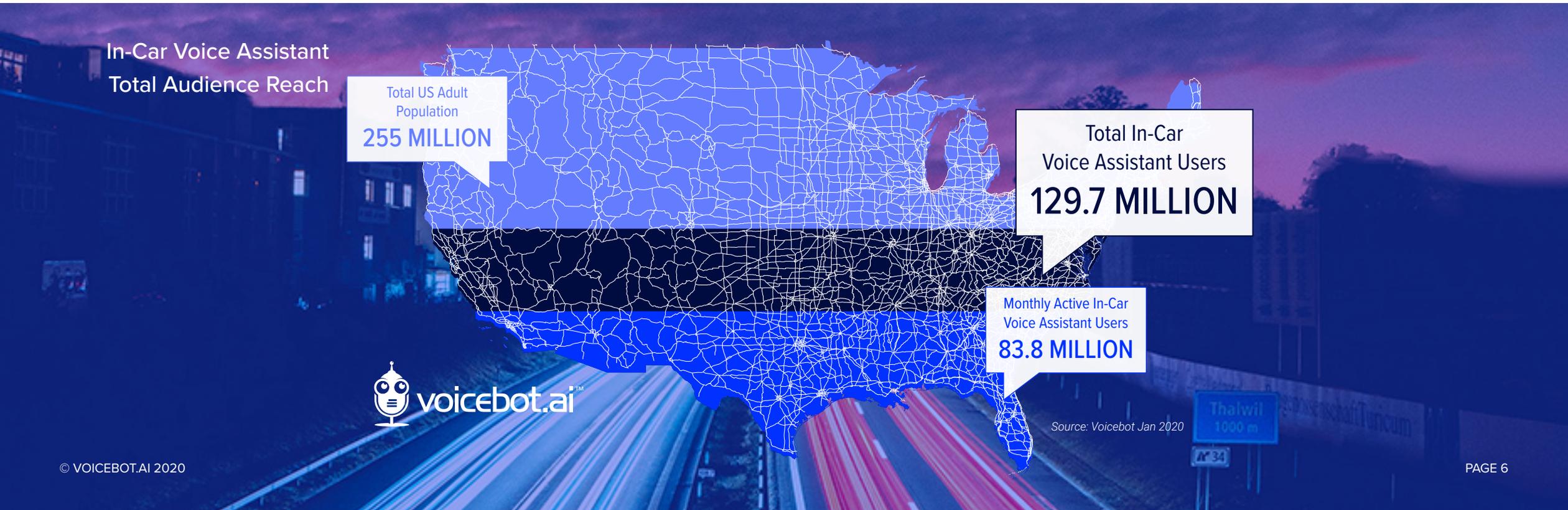
In-Car Voice Assistant Users Rise

With any technology it is critical to understand how broadly it is used. Voice assistants have quickly established large user bases and the car is second only to the smartphone in terms of total reach and monthly active users. As of January 2020, nearly 130 million U.S. adults say they have used a voice assistant while driving and about 84 million are monthly active users of the technology.

The unique aspect of the car compared to other devices is that the audience is captive. Drivers do not have the freedom to use extensive touch navigation or view content on a screen. Voice and audio are the primary input and output methods that can be safely

used while driving. Voice is not just a complementary convenience while driving like it may be on a smartphone.

U.S. Census Bureau studies conclude that car travel averages about 200 hours per year per driver just in their daily commutes. Data from the AAA Foundation for Traffic Safety counts total driving hours at over 70 billion as of late 2017 which reflected a three year rise of 8%. Voice assistants are well suited to these environments whether it is for in-car control features or to access digital services that traditionally would only be accessible through touch and sight. Automakers are responding with better voice recognition solutions that have access to more digital services while also offering increased support for multiple voice assistant options.



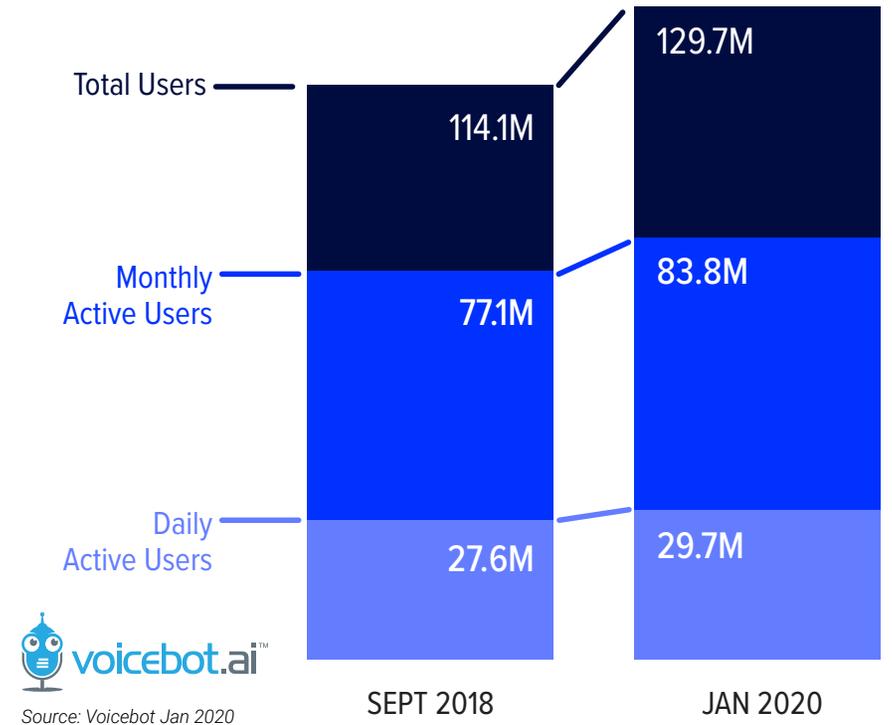
In-Car Voice Assistant Use Is Rising

In-car use of voice assistants is clearly a large market. It is also a growing user base. The 129.7 million users that have employed voice assistants while driving as of January 2020 reflects a 13.7% rise from September 2018. That is about one million new users per month during the period.

Monthly and daily users also rose during the period although at lower rates than overall users that have at least tried the services. Monthly active voice assistant users in the car rose 8.7% from 77.1 million to 83.8 million while daily active users were up 7.6% from 27.6 million to 29.7 million.

The key takeaway from this data is that beyond the numbers showing a large market, we are also seeing more consumers make voice assistant use a habit while driving. This likely reflects more availability of voice assistants in cars through the dashboard, Apple CarPlay, Android Auto, and Bluetooth through a smartphone. At the same time, each of these services is also improving performance and expanding services while users are employing voice assistants more on the phone, through smart speakers and other home appliances. The combination of improved availability and performance along with higher user familiarity is likely to continue increasing these figures for in-car use in the coming years.

U.S. In-Car Voice Assistant Users



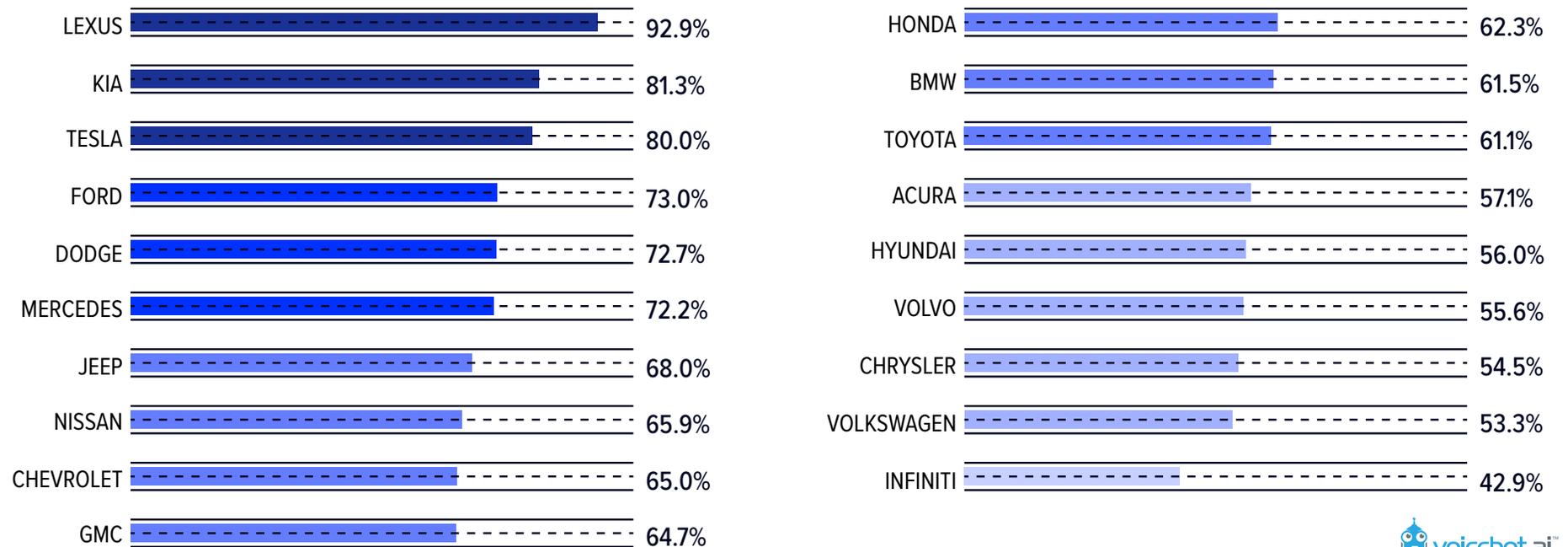
In-Car Voice Assistant Monthly Users By Brand

Some auto brands seem to have drivers that are more likely to convert from voice assistant trial while driving to regular use. U.S. adults that drive Lexus are the most likely to be monthly active users of voice services in the car followed by Kia and Tesla. This reflects a significant rise for Kia up about 10% from September 2018. However, Tesla was in last place in terms of monthly active voice users in the car during our 2018 survey and jumped from about 50% to 80% this year. During this period we should note that Tesla also added new voice commands and expanded its capabilities.

Auto brands with the highest rate of use of their own embedded voice assistants were Tesla, Volvo, Chrysler, BMW, and Lexus. Volvo, Lexus, and BMW were in the top three in this category in September 2018 and continue to outperform most of their peers in this regard.

The highest rate of use for Apple CarPlay while driving in January 2020 was Mercedes followed by Nissan. Android Auto use was about one quarter of Apple CarPlay use on average across brands. GMC registered the highest proportion of Android Auto users.

Best Conversion Rates of Voice Assistant Trial to Monthly Use by Brand



Source: Voicebot Jan 2020

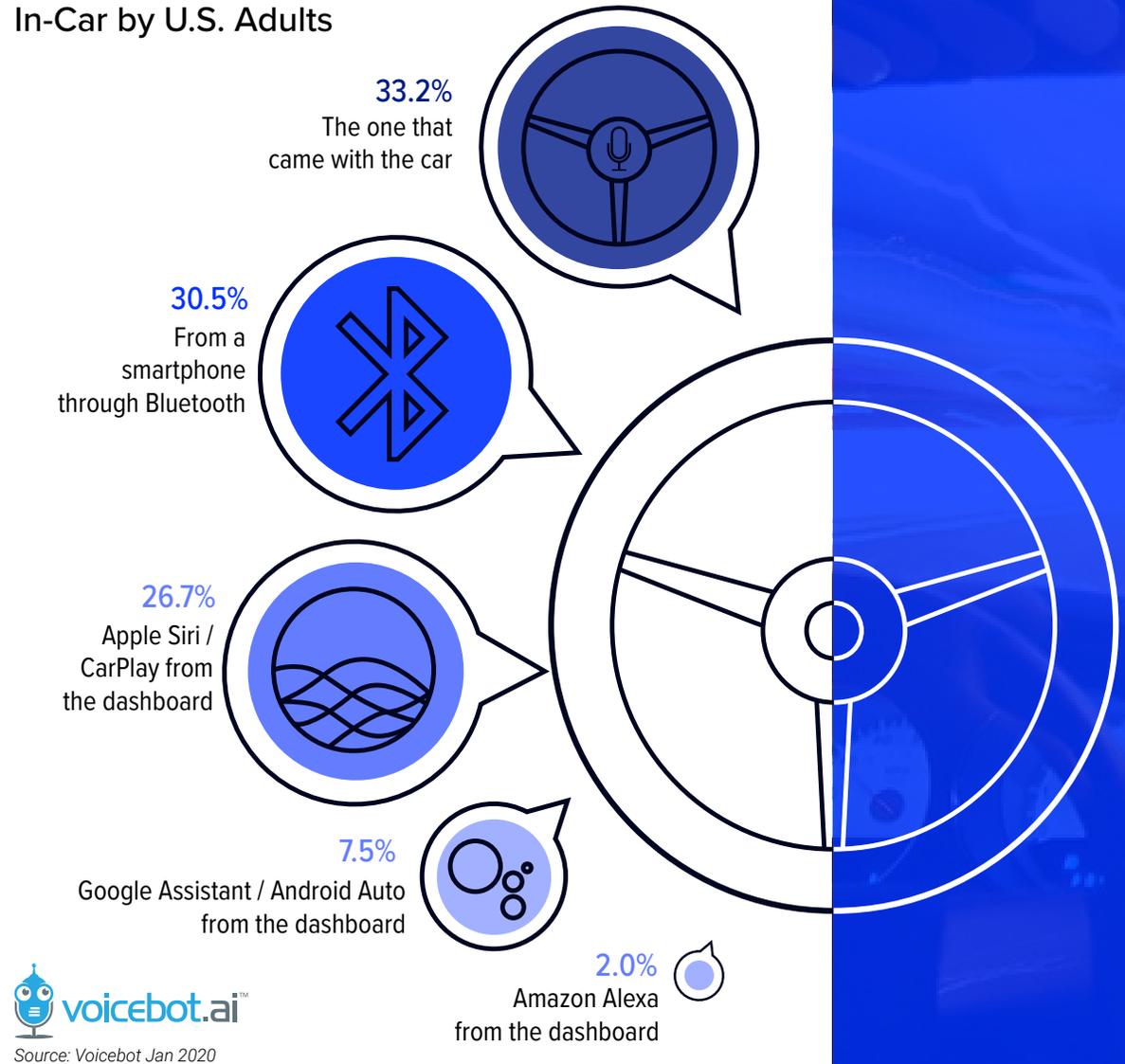
In-Car Voice Assistant Use By Type

The most common way for consumers to access a voice assistant while driving is to use the embedded solution that comes with the car. That figure was up marginally to 33.2% in January 2020 from 32.0% in September 2018. Falling marginally during that period was accessing a smartphone voice assistant through the car using a Bluetooth connection, from 32.1% to 30.5%. However, both of these top two responses were close and within the margin of error.

You see slightly more contrast when you look at monthly active users (MAU) of voice assistants while driving. For this segment, accessing through Bluetooth was 39.1% compared to 35.1% for the embedded solutions from the automakers. Close behind was Apple CarPlay at 34.8% among MAU. That is significantly higher than the 26.7% that CarPlay measured among all drivers using voice assistants. Apple CarPlay was the only voice solution that showed clear gains during the period.

Android Auto users were only 7.5% in January 2020, down from 9.5% in September 2018. That is within the margin of error but suggests there is no growth and maybe decline in Android Auto's relative market share as new users are adopting CarPlay and embedded solutions. Amazon Alexa users were minimal showing up at 2% of users. About 20% of consumers indicated they had tried more than one method of voice assistant connection while driving.

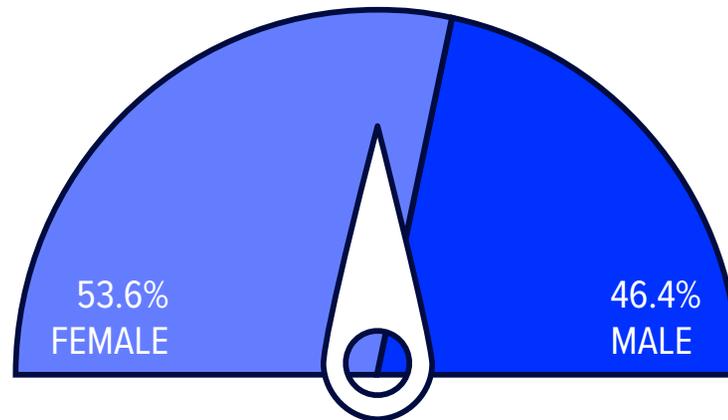
Voice Assistant Used In-Car by U.S. Adults



In-Car Voice Assistant Use by Gender & Income

Voice assistant users in the car skew slightly toward female drivers. Women represent about 51% of the overall U.S. population but 53.6% of the voice assistant users in the car compared to 46.4% for men. Monthly active users represent a nearly identical ratio by gender. When it comes to use of embedded voice assistants provided by the auto-makers, the skew is even more tilted toward women at 54.4% to 45.6%. However, men are more likely to have used Android Auto or Alexa while driving than women.

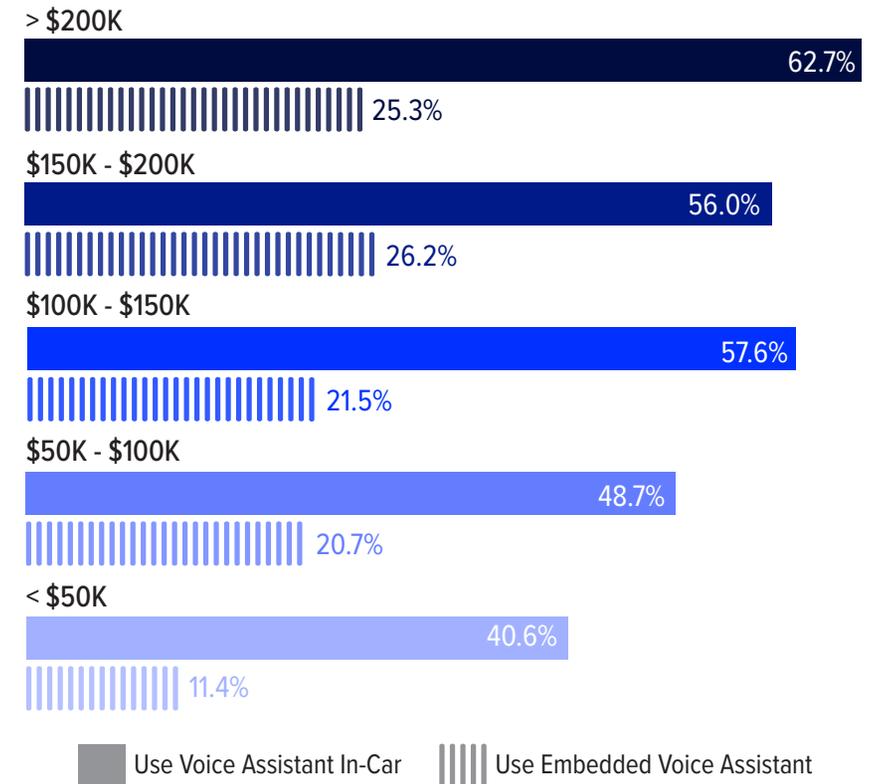
In-Car Voice Assistant Use by Gender



Source: Voicebot Jan 2020

As you might expect, higher income adults are more likely to have used voice assistants while driving. Experience with in-car voice assistants tends to rise consistently with income bracket. This is also true of embedded voice assistants. Adults with incomes below \$50,000 annually are about half as likely to have used an embedded assistant as those in the \$50,000 - \$150,000 segment. Much of this may be driven by availability as few of the entry level priced vehicles and used cars commonly owned in this income bracket have embedded voice assistants.

In-Car Voice Assistant Use by Income



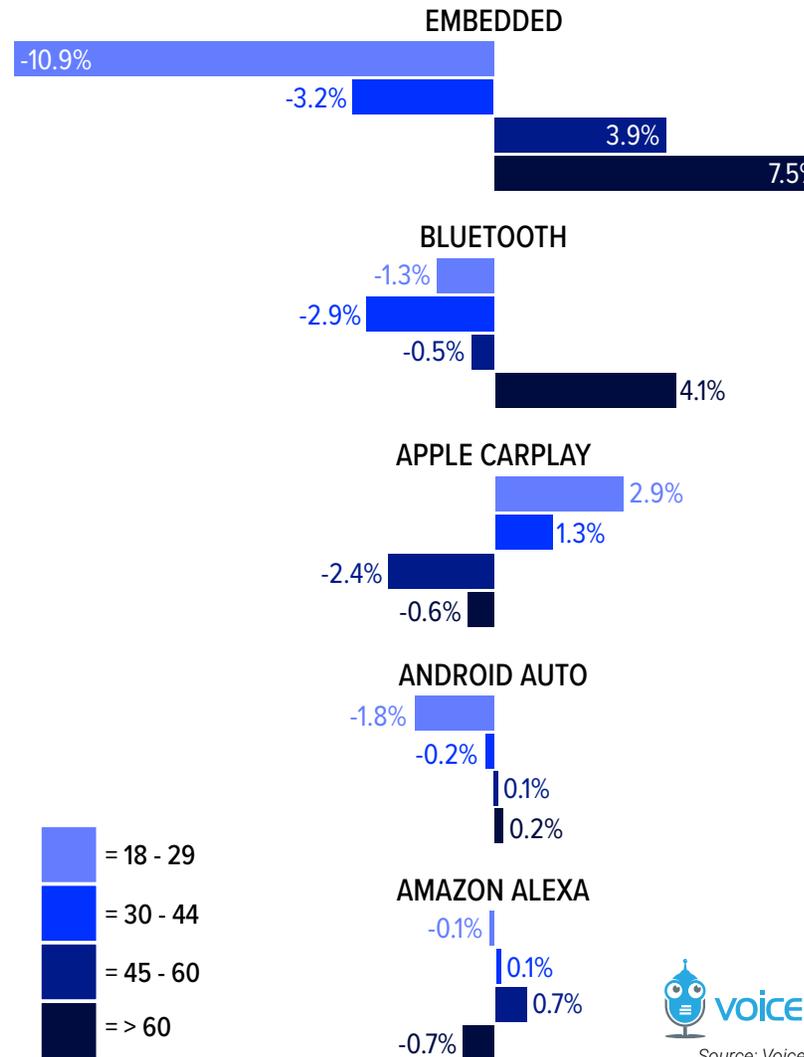
In-Car Voice Assistant Use by Age

For the second year-in-a-row the age group least likely to use a voice assistant while driving is the youngest cohort. The rate of use doesn't appear to have increased and may have decreased. For example, 18-29 year-olds are 10.9% less likely to have tried an embedded voice assistant in the car than the total population average. This may be due in part to younger adults often owning used cars and lower priced models that don't necessarily have all of the latest technology integrations or onboard assistants.

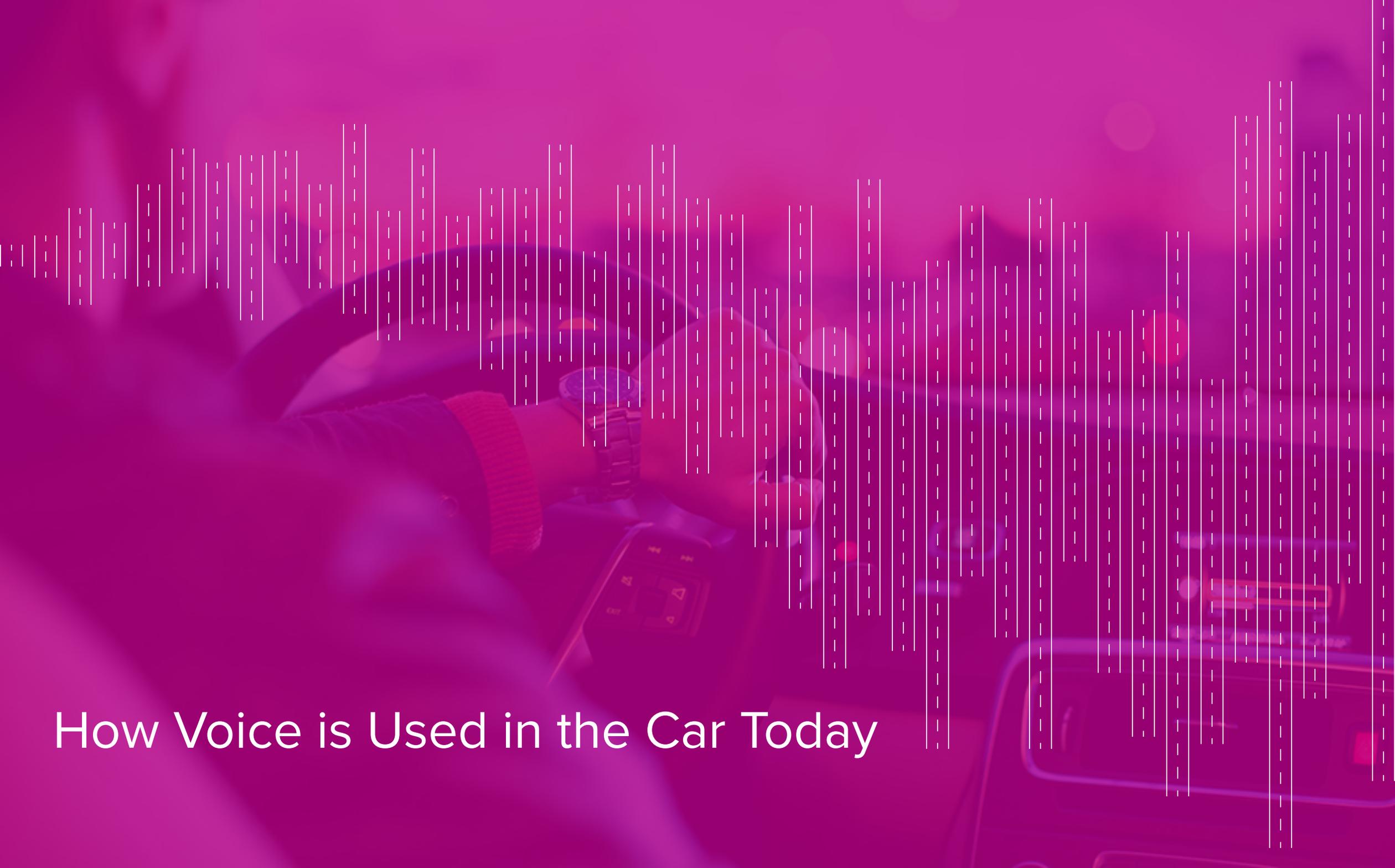
However, younger drivers did stand out for their higher likelihood to use Apple CarPlay. They were 2.9% more likely than the average to use the service despite being the least likely to use a voice assistant of any kind in the car.

The oldest age cohort has a couple of favorable skews in terms of voice assistant usage. Drivers over 60 are 4.1% more likely to have used Bluetooth to access a voice assistant on a smartphone while in the car. They are also 7.5% more likely to have used an embedded assistant from the automaker. The 45-60 age group is 3.9% more likely to have used an embedded assistant. Overall that is the most notable skew in the adoption patterns by age with 45 and over about 5.7% more likely to use embedded assistants. This may also be impacted by older drivers being more likely to have cars that support more advanced technologies such as voice assistants.

Relative Use of Voice Assistants in-Car by Age Group



Source: Voicebot Jan 2020

A close-up photograph of a person's hand resting on a car's steering wheel. The hand is wearing a blue watch and a red wristband. The background is a blurred view of the car's interior, including the dashboard and center console. A white digital audio waveform is overlaid on the image, extending across the top and right sides. The entire image has a semi-transparent purple overlay.

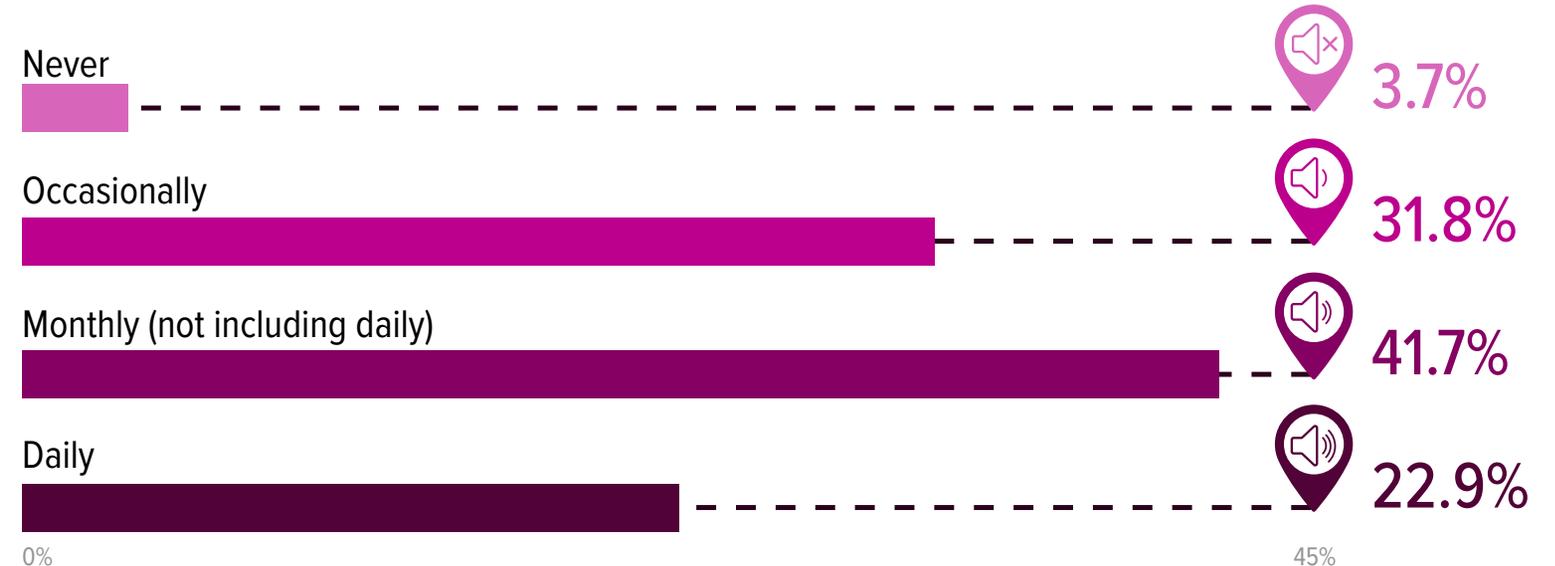
How Voice is Used in the Car Today

Frequency of Use is Higher Among Smart Speaker Owners

Just shy of two-thirds of adults that have tried a voice assistant while driving claim to be monthly active users (MAU) and about 23% daily active users (DAU). Both figures from January 2020 are down slightly from September 2018. This could be the result of the expanding user base not converting yet to regular users or merely a reflection of sampling variability. It is safe to say MAU and DAU ratios are flat or slightly down from a year earlier but the base is still large at nearly 84 million monthly and 30 million daily users.

There is an apparent correlation between smart speaker ownership and frequency of use of voice assistants while driving. Among smart speaker owners, MAUs rise to 47.9% and DAUs to 24.9% for in-car voice assistant use. The combined data show that 64.6% of all voice assistant users in the car are at least MAUs compared to 72.7% for smart speaker owners. Data from numerous studies suggest that ownership of smart speakers is a catalyst for higher use of voice assistants on other devices as well.

Frequency of Voice Assistant Use in the Car



Source: Voicebot Jan 2020

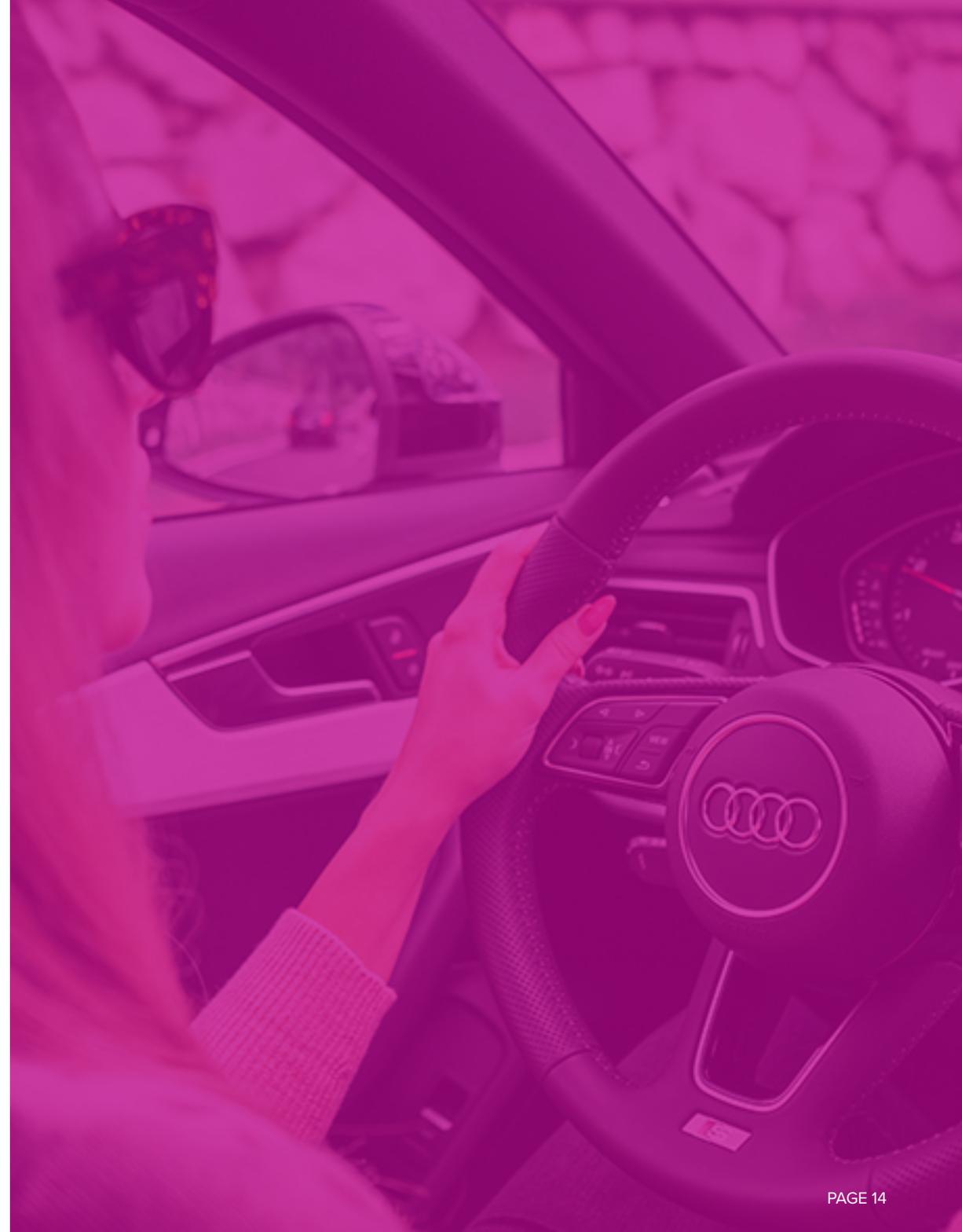
Use Cases Favor Talk, Go, Play

Lisa Falkson is now with Amazon on the Alexa team but back in 2017 she was the lead voice experience designer for Chinese electric car startup NIO. In a Voicebot interview, Falkson commented that the defining voice use cases for the car fall into three categories: talk, go, play. That is precisely what we see for the highest frequency use cases in our survey data from both 2018 and 2020.

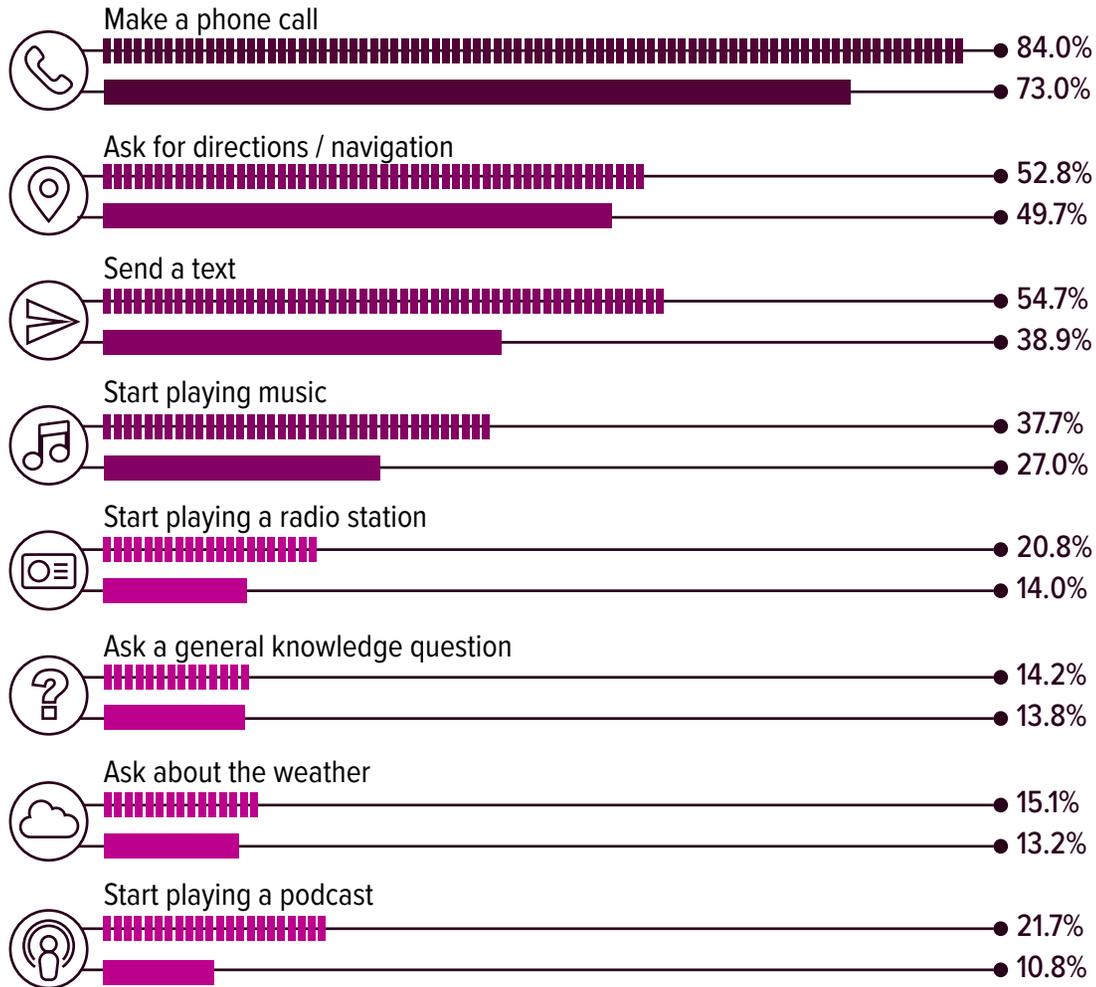
Topping the list is making a phone call followed by asking for directions or navigation, texting, playing streaming music, and turning on radio stations. Talk, go, and play are represented in each of the five most employed voice use cases while driving. Those are followed by asking a general knowledge questions or about the weather and then back to podcasts which fits into the play category.

A fairly low frequency use case today is using voice to control in-car features such as heating and windshield wipers. It may be that the existing manual controls for these features are so commonly used that consumer behaviors have not shifted yet to voice. However, it is likely also influenced by the fact that many consumers are using voice assistants that cannot control in-car features. Users of embedded voice assistants are nearly twice as likely to say they use them for car feature controls while they are about half as likely to ask a general knowledge question or send a text.

There is little difference between male and female use of assistants although men ask for information about the weather at a materially higher rate. Also, daily active users of voice assistants in the car are twice as likely to start playing a podcast and about 50% more likely to use voice to access the radio.



In-Car Voice Assistant Use Cases



Source: Voicebot Jan 2020

Familiarity with Voice Assistants

While there is rising use of voice assistants in the car, consumers offer mixed responses regarding their familiarity with what the embedded solutions can do for them. About 32% are confident they know fully what a voice assistant in the car can do and another 23.6% believe they know many features. Over one-third believe they only know basic functionality and just under 10% express little knowledge on the subject.

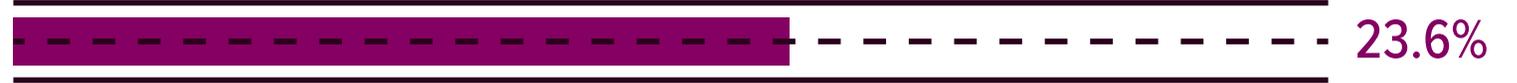
These findings suggest that usage could rise if consumers were more educated on how voice assistants can positively impact the driving experience. There is likely higher awareness around use cases such as calling, texting and navigation that show high frequency of use. Other areas such as in-car feature controls and information about restaurants or pre-ordering food for pickup may see increased use with expanded awareness.

Driver Familiarity with Embedded Voice Assistant Capabilities

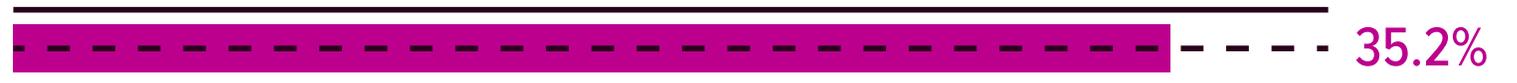
Yes - I fully understand the car's voice assistant capabilities



Somewhat - I know many of the car's voice assistant capabilities



Not really - I just know the basics



No - I don't know what it can do



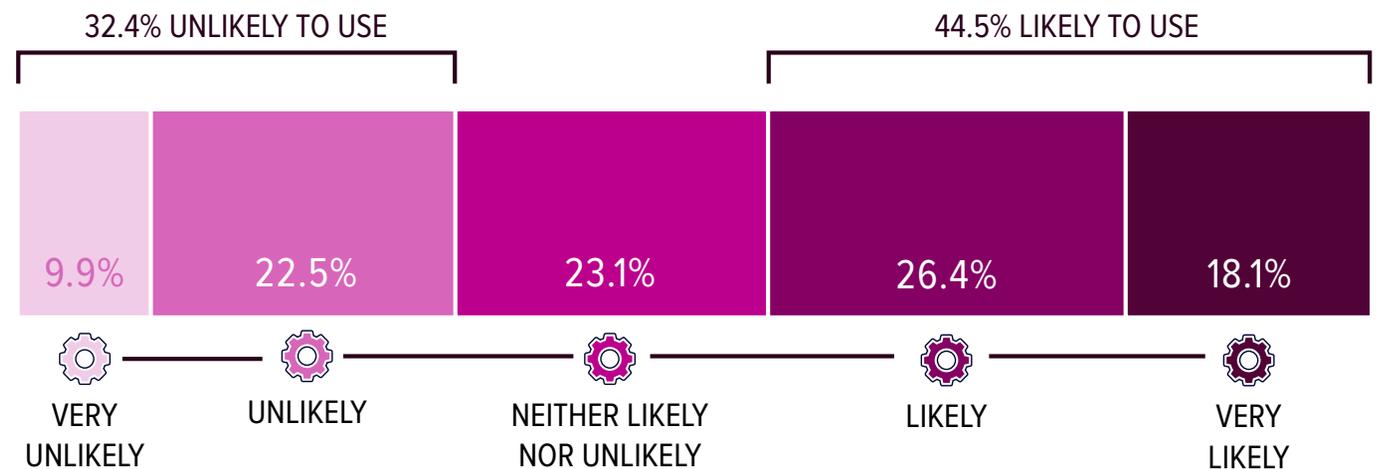
Interest in Tutorials

Even with fairly high levels of stated awareness of voice assistant capabilities, nearly 45% of users said they would use tutorials that would expand their knowledge how to use the services to the greatest effect. Over 18% said they would be “very likely” to use this type of training feature. About one-third said they would not be likely to make use of it.



Source: Voicebot Jan 2020

Interest in Using Embedded Voice Assistant Tutorials





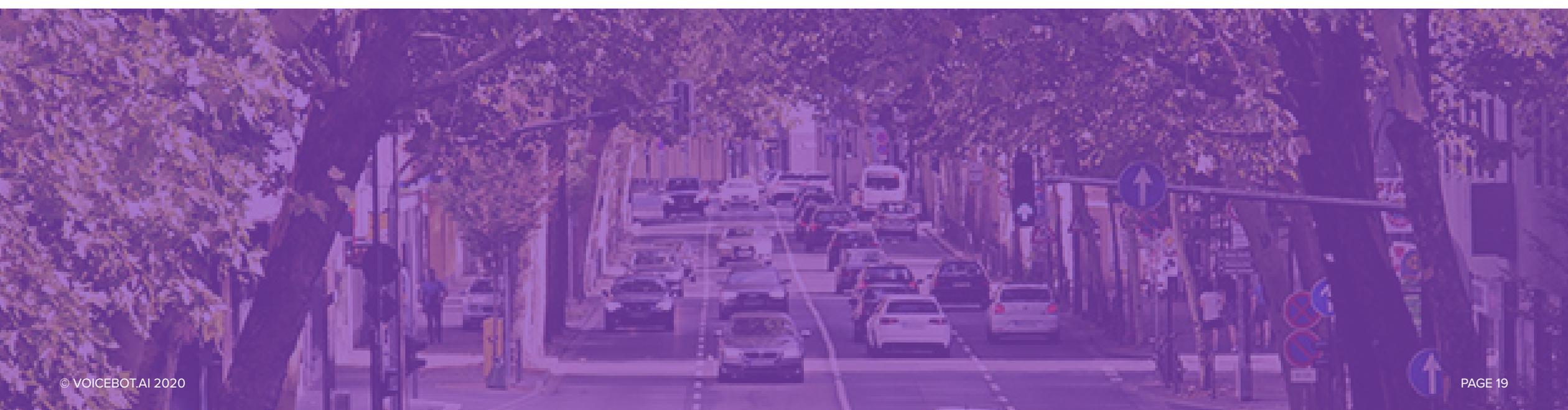
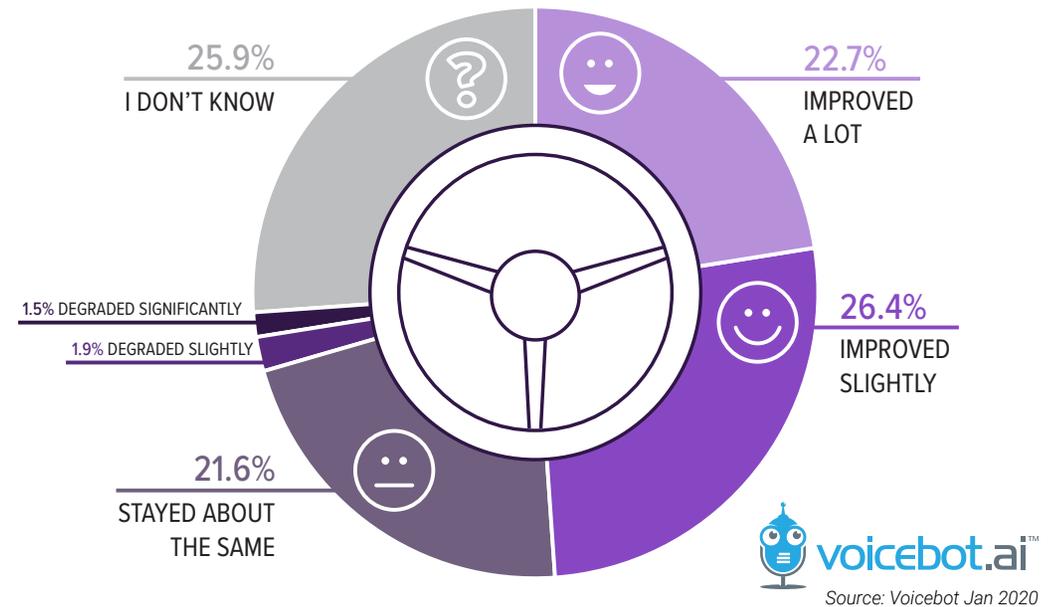
Car Owner and Buyer Sentiment

Consumers Say Voice Assistants Have Improved

A factor that is likely helping drive higher voice assistant adoption in the car is the perception that they have improved. About 49% say that using voice assistants in cars has improved over the past two years compared to about 3.5% that say they have degraded. Just under 22% believe they are about the same as in the past and about 26% don't know, largely because they don't have experience with the services.

If you remove the consumers that "don't know" you see that about two-thirds have noticed a positive change in performance. These figures from January 2020 were nearly identical to September 2018 so overall there is a consistent consumer belief that voice assistants in cars are getting better.

Consumer Sentiment of In-car Voice Assistant Improvement

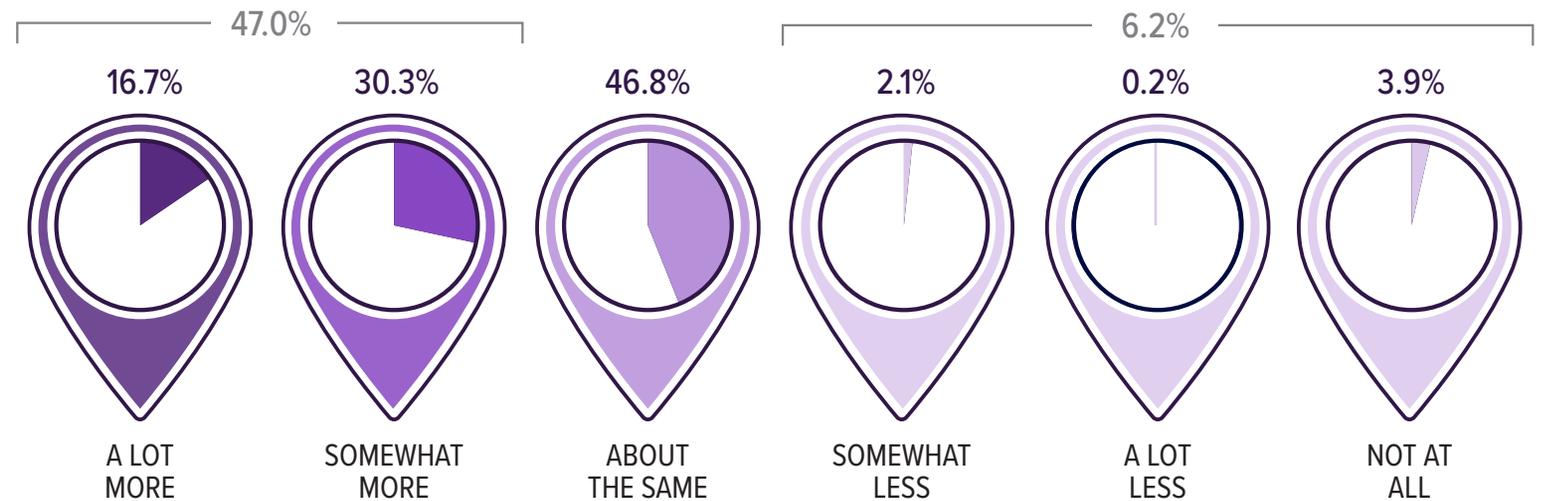


Plans for Using In-Car Voice Assistant in the Future

Perhaps because of the favorable sentiment around voice assistants performance improvements, nearly 94% expect to use them more or the same amount in the coming year. Forty-seven percent expect to use them more in 2020 than in 2019 with just under 47% expecting to use them the same.

Only around 6% of voice assistant users expect to curtail their usage this year. These figures show a similar trend to the September 2018 survey but many more users have shifted from the “somewhat more” to the “about the same” categories. It appears some of these users have increased usage over the past year and intend to maintain that behavior.

Plans for In-Car Voice Assistant Use in the Future

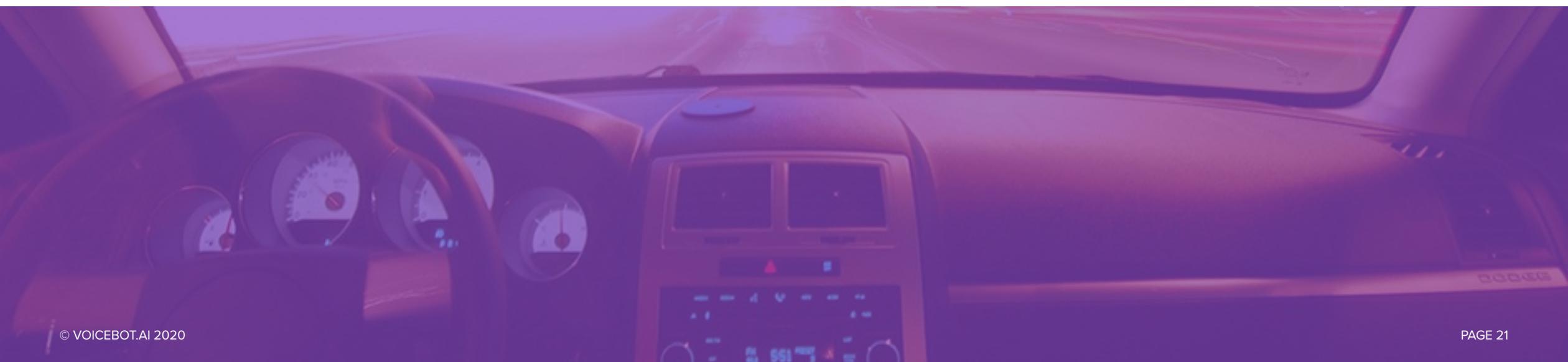
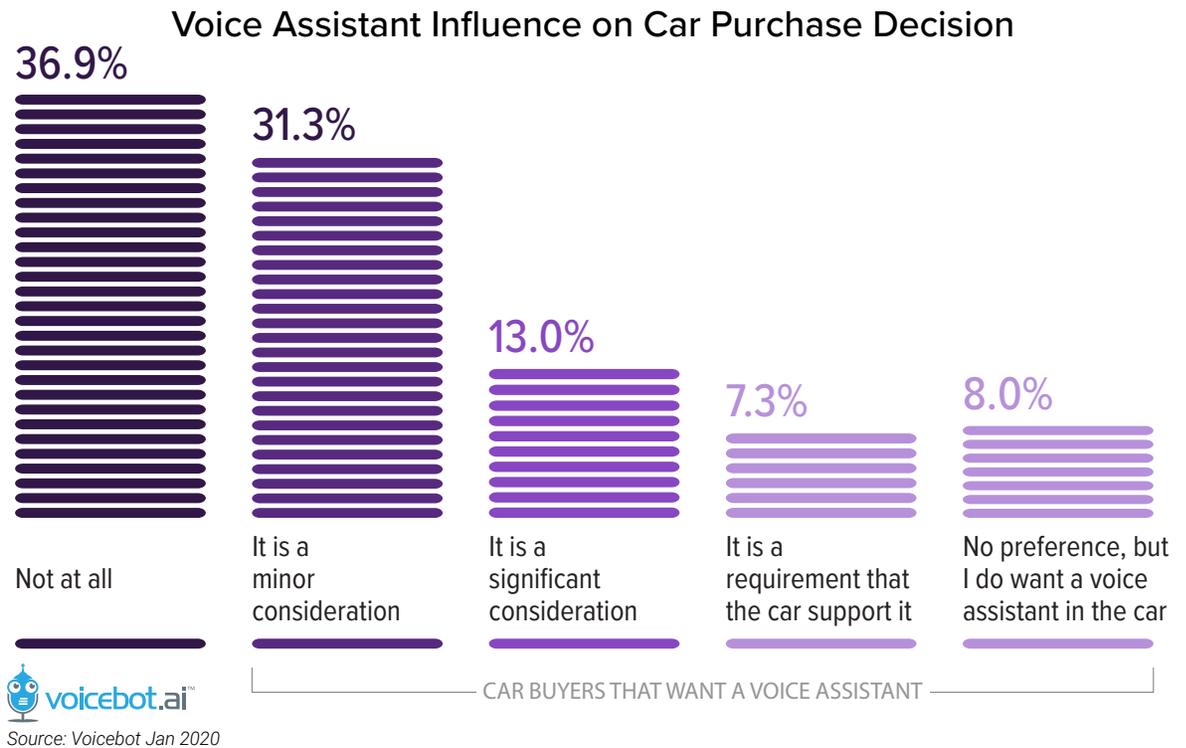


Source: Voicebot Jan 2020

Importance of Voice Assistants for Car Purchase Decisions

For the second straight year, about 60% of consumers say that voice assistants are a factor in their new car purchase criteria. It even rose 1% since asking a similar question in September 2018. About half of car buyers that do care about their voice assistant options say it is only a minor consideration.

However, over 20% of all consumers say that the in-car voice assistant experience is either a “significant consideration” or a “requirement.” The 7.3% that say it’s a “requirement” presumably would look only at car brands offering their preferred voice assistant. Another 8% are more ambivalent about which voice assistant is offered, but are keen to have one in their new car.



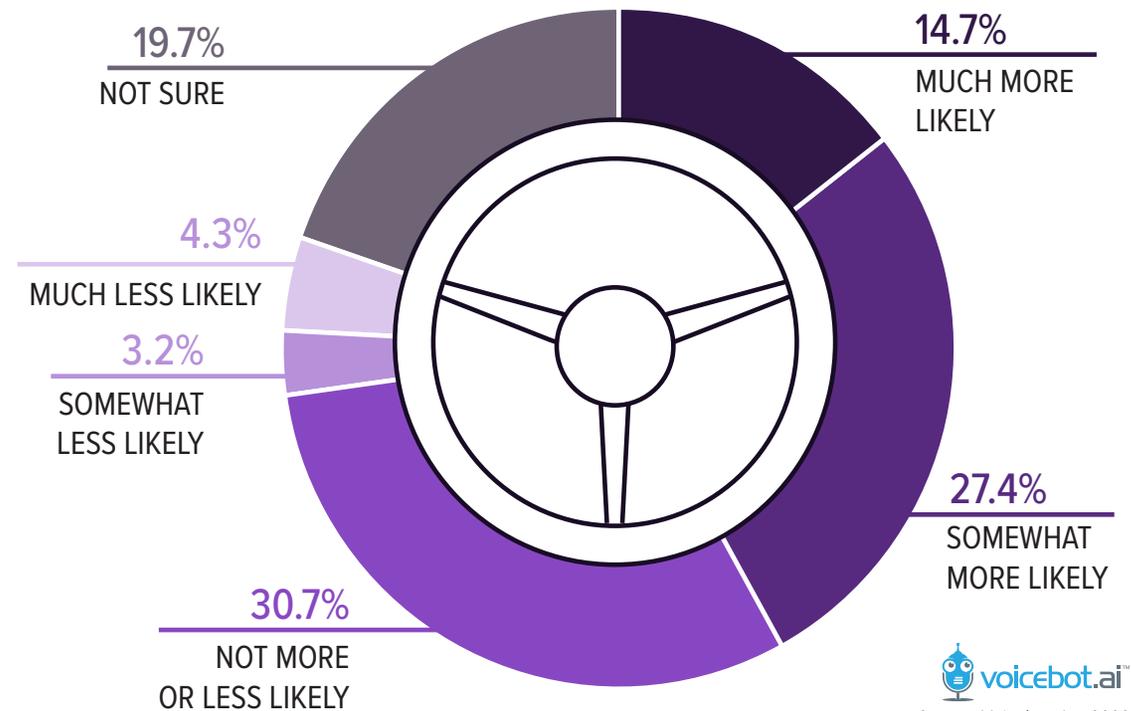
Interest in Access to Multiple Assistants

Automakers could simply offer solutions from Amazon or Google (or both) to align with consumer preferences for in-home voice assistant use. However, most auto brands do not want to cede so much of the in-car driving experience to a third party. To address this need they are providing increasingly sophisticated voice interactive experiences with embedded white label solutions provided by companies such as Cerence (formerly Nuance Automotive) and newcomer SoundHound.

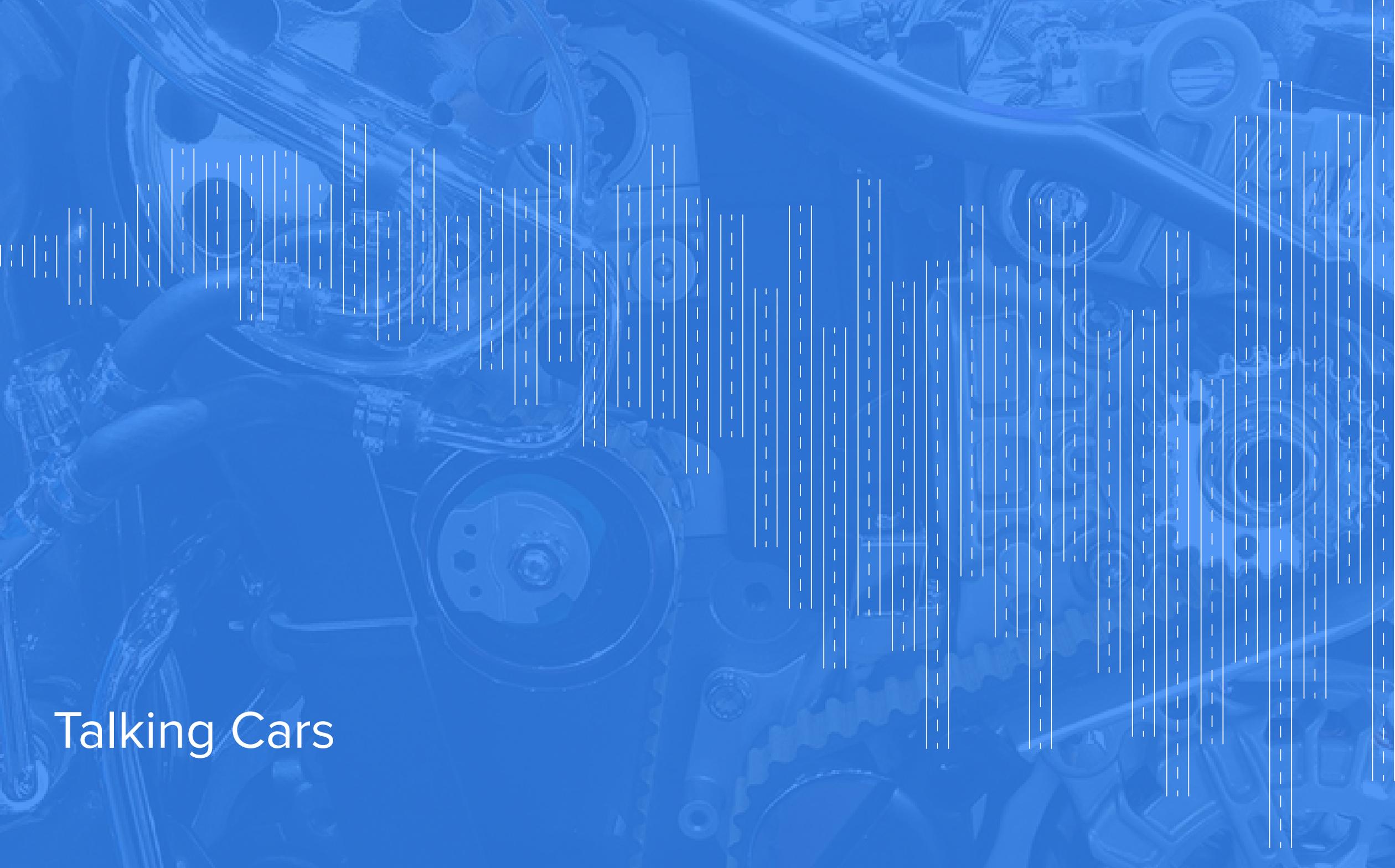
Many automakers are also now providing either parallel or hybrid options. Parallel systems include the ability to run either Apple CarPlay or an embedded assistant but not simultaneously. Hybrid solutions typically have a voice recognition arbitrator that determines the user's intent and which of multiple assistants can best fulfill the request that it then lets take over responsibility for the response.

The idea of a multi-assistant in-car experience appears to be attractive to consumers. Nearly 15% say they would be "much more likely" to use voice assistants in the car if multiple options were available and just over 27% say they would be "somewhat more likely." That amounts to more than 40% of consumers that find this approach appealing with about 31% ambivalent and 20% unsure. The "less likely" segment amounts to only 7.5%.

Preference for Multiple Voice Assistants



Source: Voicebot Jan 2020

The background is a blue-tinted image of a car engine, showing various mechanical parts like gears, belts, and pistons. Overlaid on this image are numerous vertical white lines of varying lengths and thicknesses, creating a digital or data-like aesthetic.

Talking Cars

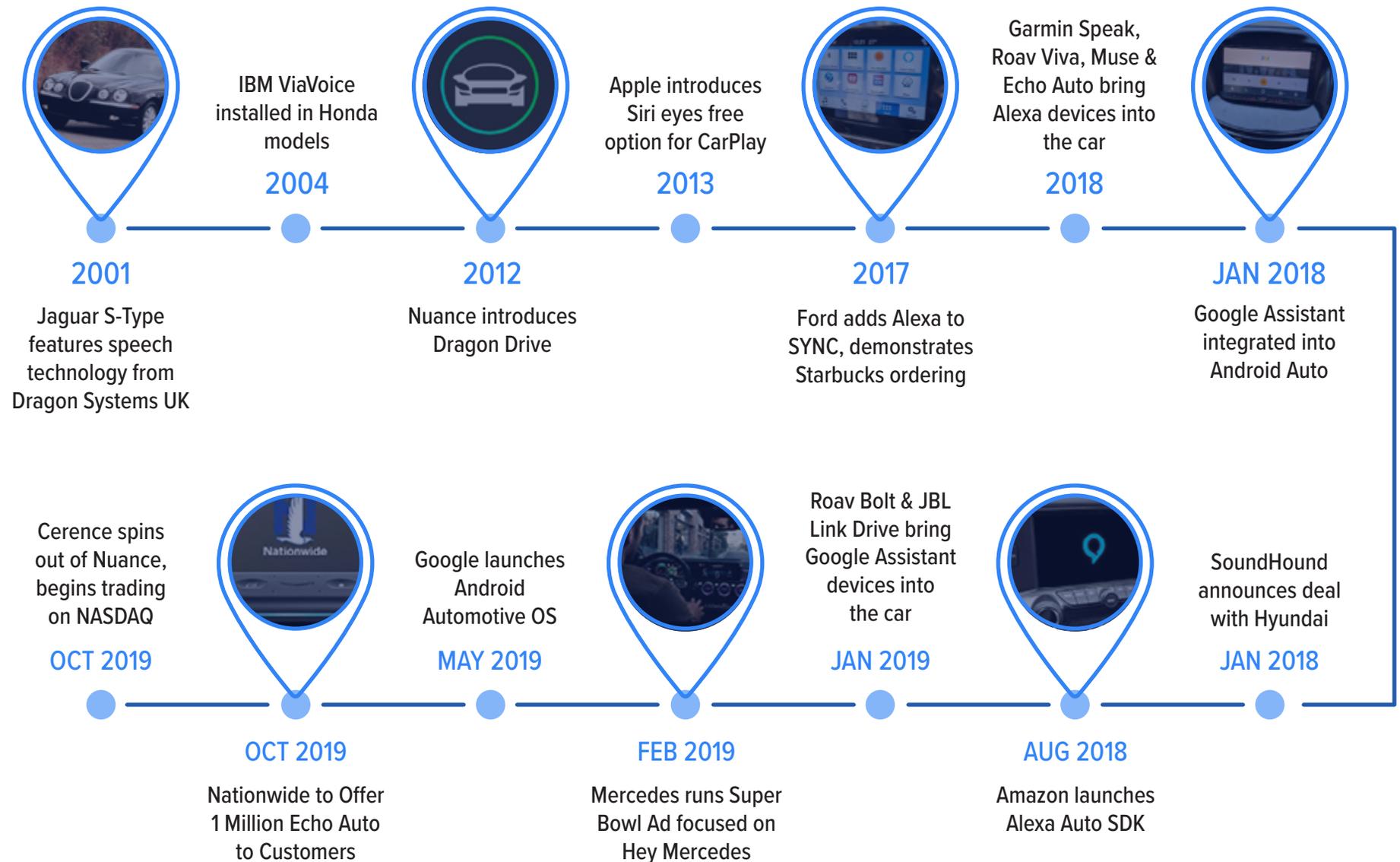
Talk to Me Herbie

Drivers have been able to talk to their cars since at least the 2000 Jaguar S-type. Talking to your car was one of the first voice interactive solutions offered to consumers and it arrived more than a decade before Siri or Alexa. Because drivers must use their eyes and hands to operate the vehicle, it has always been an obvious use case for voice technologies.

Early in-car speech recognition systems are best characterized as enabling voice control. The systems only recognized a limited vocabulary and that meant consumers needed to learn a rigid syntax to successfully use their voice to control car features. Problems were compounded when some automakers substituted lower cost microphones that were less effective at capturing what drivers said in a noisy car cabin. This led to a lot of frustrated consumers that found the systems difficult to use and unreliable. In-car voice assistants and their customer call center cousins were the solutions that established consumer expectations around automated speech recognition and that often resulted in negative sentiment. Siri, Google Assistant, and Alexa have each had their detractors, but have generally been regarded as offering a new level of voice user experience and access to a broader set of services. Consumers have also increasingly sought voice assistant access to their favorite digital services in more areas of daily life. As a consequence, it was natural for these popular consumer assistants to migrate into the car.

That shift created a crowd of voice assistants in automobiles. Bluetooth was the first route into the car cabin for the general purpose voice assistants followed by projection technologies such as Apple CarPlay and Android Auto. Those were then followed by aftermarket devices and software development kits that sought to replace or work alongside the embedded assistants. These developments have spurred rapid innovation in the segment as well as a pitched battle to become the voice assistant of choice for drivers.

Short History of Voice in the Car



The Multi Assistant Car

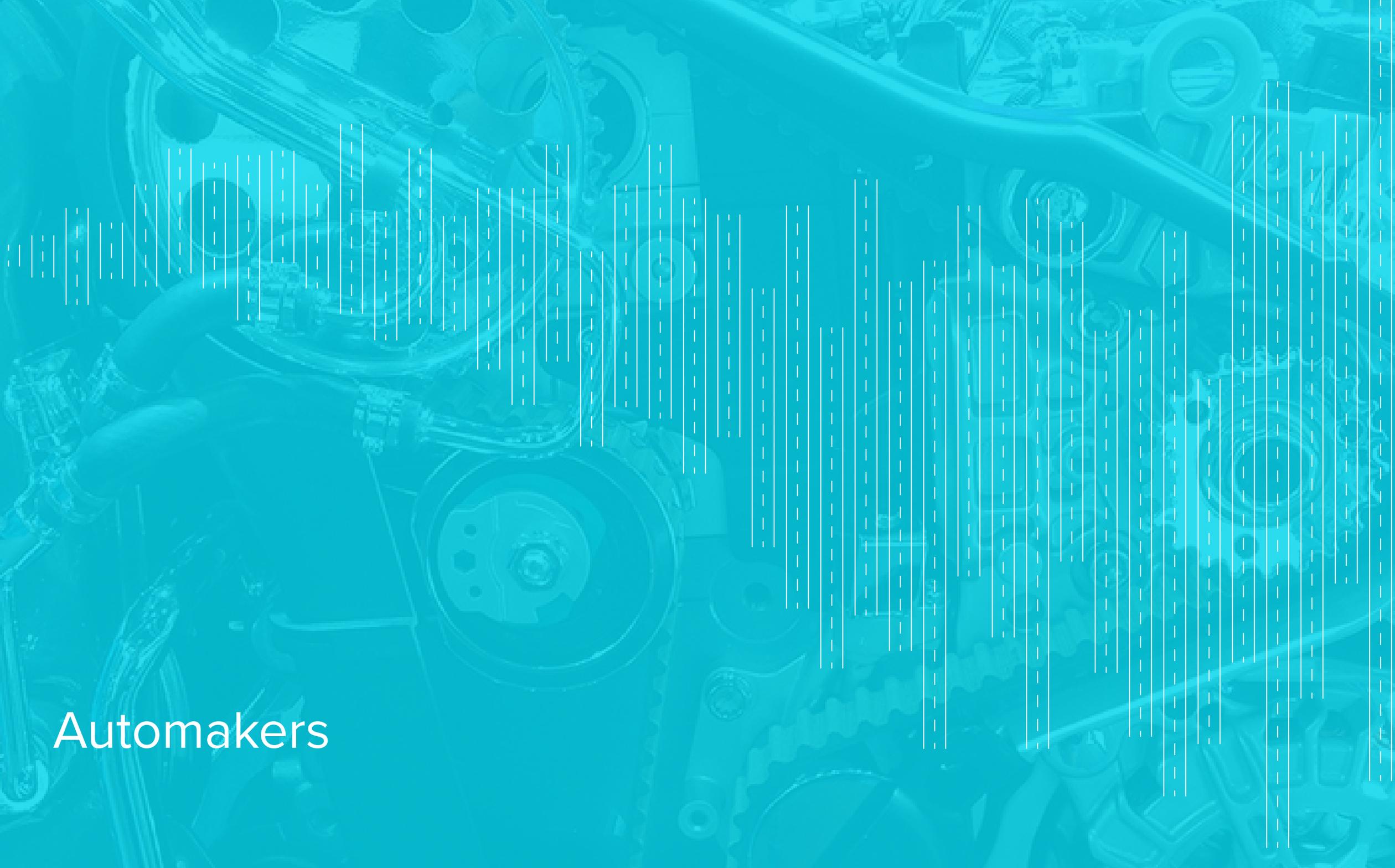
Voice assistant availability in cars is expanding rapidly. Just a few years ago, voice interactive features for drivers were almost exclusively available to luxury car owners. Embedded voice assistants from the automakers are now offered across hundreds of car models and many also include support for Apple CarPlay and Android Auto. Amazon is also making a big push to get Alexa into many of these same vehicles. The result is increasingly plentiful consumer choice.

In the Car vs Outside the Car

As we pointed in our in 2019 research, these developments have led to a bifurcated consumer experience. Embedded solutions typically focus on controlling in-car features and a few other services such as navigation. The consumer assistants more commonly found on smartphones and smart speakers tend to fulfill digital services requests that are not specific to driving with some overlap in navigation and entertainment. However, this is also changing. Embedded assistants are now enabling connectivity to dining information, smart home controls and other services while assistants from Alexa Auto and Google Android Auto OS are extending voice control to car features. The question today is less about which voice assistants will be available in the car and more about which will be chosen to fulfill the variety of consumer preferences.

Voice Assistant Options by Automaker 2020

Brand	Alexa Auto	Apple CarPlay	Android Auto	Proprietary
Acura		✓	✓	✓
BMW	✓	✓	✓	✓
Chevrolet	✓	✓	✓	✓
Chrysler	✓ (Fiat)	✓	✓	✓
Dodge		✓	✓	✓
Ford	✓	✓	✓	✓
GMC	✓	✓	✓	✓
Honda		✓	✓	✓
Hyundai		✓	✓	✓
Infiniti		✓		✓
Jeep		✓	✓	✓
Kia		✓	✓	✓
Lexus	✓	✓	✓	✓
Mercedes		✓	✓	✓
Nissan		✓	✓	✓
Tesla				✓
Toyota	✓	✓	✓	✓
Volkswagen	✓ (Announced)	✓	✓	
Volvo		✓	✓	✓



Automakers

Mercedes-Benz

The “Hey Mercedes” voice assistant made news in early 2019 as the focus of a Super Bowl ad. In fact, the car wasn’t present until over two-thirds of the ad was complete. Automakers have typically promoted physical characteristics of their cars such as styling, horsepower, and safety features. Some have highlighted special characteristics of their interiors and electronics packages but Mercedes took this a step further to show people the unmatched convenience of voice.

Maybe Mercedes marketers were familiar with Voicebot data showing three-in-five consumers now consider voice assistants in their purchase criteria. Mercedes-Benz User Experience (MBUX) is an AI-enabled infotainment system that supports multiple voice assistants, learns user behavior and preferences, and is designed to more seamlessly weave digital services into the driving experience.



BMW

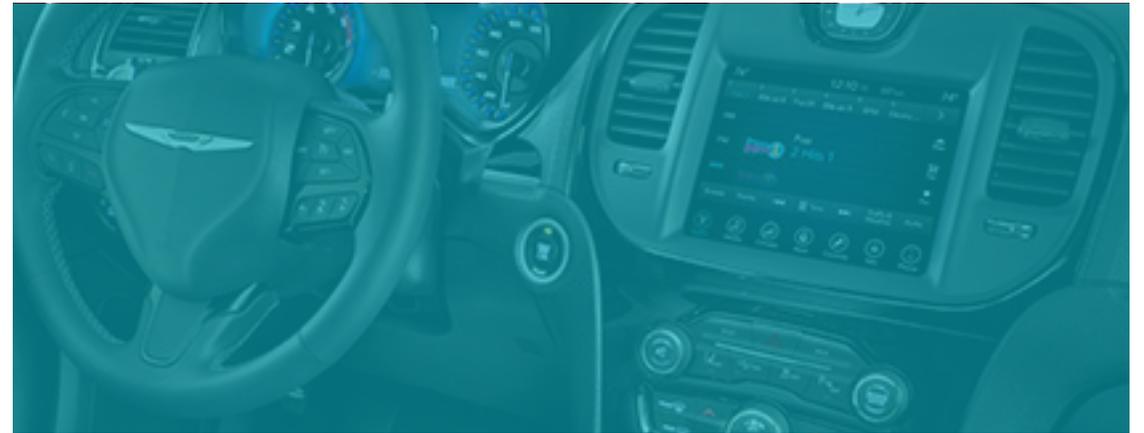
BMW has an equally ambitious voice strategy for the car. “Hey BMW” is the embedded assistant which co-exists with options for Apple CarPlay, Android Auto, and Alexa Auto. BMW worked with Microsoft’s Bot Framework, Azure Bot Services, and Cognitive Services solutions to develop the multi-assistant platform. You can even access your Microsoft Office apps through the embedded assistant.

BMW also has an Alexa skill called BMW Connected and had a Google Assistant action called BMW in 2019 but it has disappeared from the Action store as of February 2020. The remaining Alexa skill offers engine and door lock control, fuel or battery level updates, scheduling, climate control, and vehicle range updates. BMW has been clear about its intent to assert control over the user experience. However, given its permissive access to multiple consumer assistants, it is fair to say BMW has an all-of-the-above voice strategy.

Ford

The Ford SYNC platform was first introduced in 2007 and debuted with Bluetooth connectivity for mobile devices and voice commands. That has evolved to the current SYNC 3 platform which includes integration with Apple CarPlay, Android Auto, and Amazon Alexa as projection experiences. Access to third-party apps is also offered through SYNC. Ford has two Alexa skills and a Google Action that users can pair with their vehicles. The Ford-Pass voice app allows users to remotely start/stop, lock/unlock their vehicles in addition to informing the user of the remaining fuel range and tire pressure. The company also has a Google Action that provides information about Ford vehicles.

The next-generation SYNC 4 platform will include several updates, notably a system that learns driver behavior to offer a more personalized experience. Ford announced SYNC 4 in October 2019 and said it would arrive in yet-to-be-named models in 2020.



Fiat Chrysler

Fiat Chrysler's Uconnect 4 solution provides many integrations for third-party apps and voice assistant projection technologies such as Apple CarPlay and Android Auto. Although the automaker was initially behind its peers in these integrations it has been catching up in recent years and the 2020 debut of Uconnect 5 will be another step forward. Uconnect 5 will support in-car Alexa integration for the first time as well as new wireless connectivity for CarPlay and Android Auto and over-the-air software updates. Fiat Chrysler cars also offer an embedded voice assistant.

The automaker's Uconnect Alexa skill supports a variety of older car models that enable remote start, horn activation, fuel level and tire pressure status, and lock/unlock. For 2018 and newer models, the company offers Alexa skills by brand for Chrysler, Dodge, Jeep, and Ram vehicles with similar features. There are no comparable Google Actions for controlling these features.

General Motors

General Motors delivered a popular in-car experience innovation with OnStar in 1996 which put it the automaker ahead of the competition. In the voice assistant revolution GM has largely trailed its peers but made a significant leap forward in 2019 by becoming the first automaker to fully integrated Alexa Auto. However, GM's moves are far different than the approaches taken by Mercedes and BMW. GM drivers can select from an embedded solution provided by Cerence or Alexa Auto but not both. The voice assistants cannot operate simultaneously today. It was a notable win for the Alexa Auto team which previously only had one other car model from Audi offering its products to control in-car features.

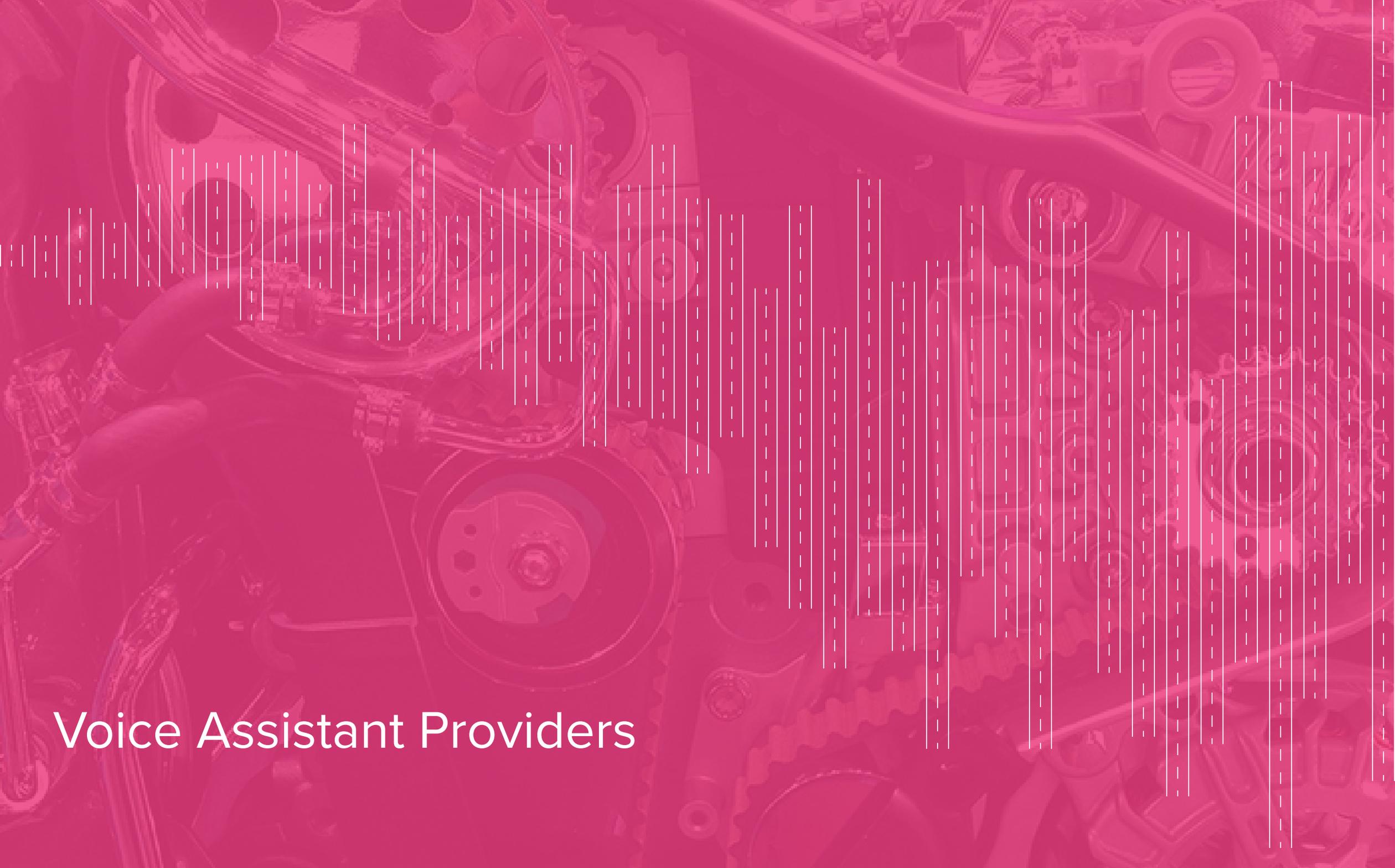
Several GM brands also offer Alexa skills and Google Actions. These enable access to car statuses such as fuel level and can control car features like temperature settings and door locks. GM also announced in the fall of 2019 that a variety of new Google services and Google Assistant integration will be coming to many of its brands in 2021. These changes are coming as a result of GM transitioning from a custom Android OS for its infotainment systems to one based on Google Android Auto OS.



Tesla

Tesla has typically been known for its technical leadership in driving technologies and a clear focus on the in-car experience. However, even as a luxury brand, it was late to offer robust voice interactivity. The voice control vocabulary and features were limited up through last year and, at best, similar to the early voice assistants offered by other automakers.

This changed in December 2019. A software update for Tesla vehicles added a long list of new features. Most of the voice interactive updates are for controlling car features but there are also new options around texting, YouTube access, and app interactions. Tesla is notably a holdout in providing Apple CarPlay and Android Auto access. While most auto brands have succumbed to customer pressure to extend the smartphone experience into the car, Tesla still does not offer these services. Analysts suggest Elon Musk doesn't want a tech intermediary to come between his drivers and the Tesla experience. For now, it means that Tesla is a laggard for in-car voice capabilities.



Voice Assistant Providers

PLATFORMS FOR EMBEDDED VOICE ASSISTANTS

Cerence

Cerence was established as a separate company in October 2019 as a spin-out of what was Nuance's automotive division. It has by far the largest voice assistant automotive customer base with over 60 auto brands and 325 million cars on the road. As a result, it is something of a de facto standard for embedded voice assistants in cars but is seeing increasing competition for driver share of voice as Apple, Google, and Amazon extend their services into automobiles.

The company has focused on launching a series of AI-based innovations since last fall that improve personalization both for voice interactions and other driving services. In February 2020, Cerence announced a new Cognitive Arbitrator product that can interpret intents behind spoken requests and determine which of multiple voice assistants in the car is best positioned to fulfill the user need. This has surprised some industry observers that instead of trying to keep rivals out of the car, Cerence is developing tools to help make it easier for drivers to use multiple voice assistants simultaneously.

SoundHound

SoundHound is in some ways the most surprising of the companies getting traction with automakers for voice services. The tech giants have consumers loyal to their other products and Cerence has a 20-year history in the market. SoundHound is often thought of as a well-funded startup, but its billion dollar valuation and progress signing leading auto brands makes it a player to watch.

Hyundai, Honda, Kia, Groupe PSA, and Mercedes all include SoundHound's Houndify in their voice offerings. Some offer it alongside other assistants while others have made it the default embedded solution. Like Cerence, SoundHound stresses that automakers can have a robust voice assistant without ceding their user experience or data to Amazon, Apple or Google. It currently offers a cloud-based AI service which is expected to include more in-car processing options for low connectivity environments in 2020. Houndify also serves other consumer applications making it similar to a white label version of Alexa with added features for in-car use cases.

Microsoft

Microsoft's Bot Framework is a giant among chatbot platforms, but many people don't realize that it is one component of many services that support conversational and AI services. A number of companies are using it today to marry their chat and voice initiatives. Microsoft also offers additional services through Azure and its Cognitive Services portfolio that make it an interesting option for anyone building a custom voice assistant. BMW was lured by Microsoft's broad array of services and built its "Hey BMW" solution on top of Bot Framework.

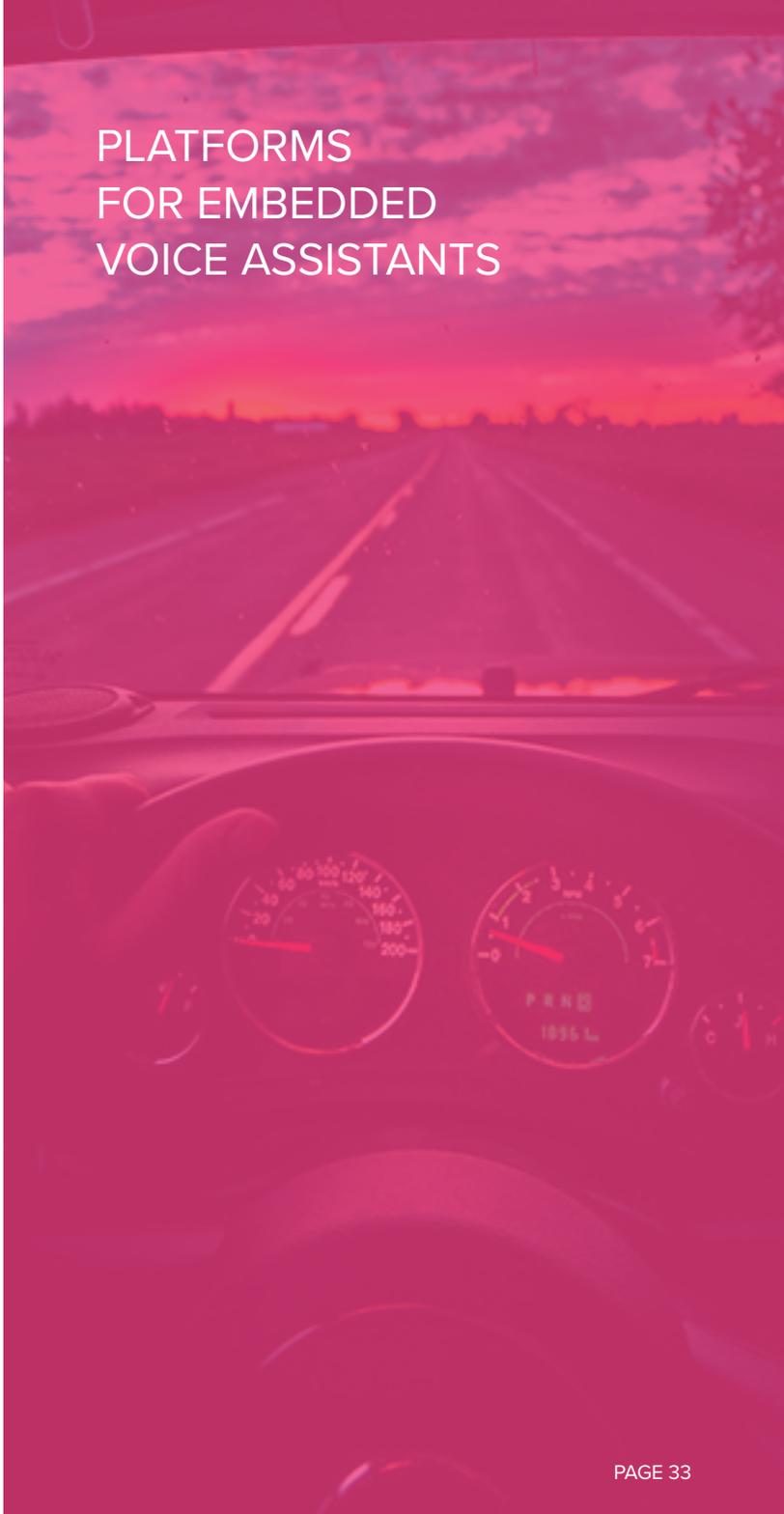
The new Microsoft Connected Vehicle Platform (MCVP) announced in September 2019 is even more intriguing. MCVP is designed to offer a variety of in-vehicle, autonomous driving, and connectivity services. Microsoft stresses similar themes to Cerence and SoundHound such as the ability of automakers to retain control over the user experience and data. MCVP is new, but its breadth and depth of automaker services and ecosystem partners may make it an attractive one-stop-shop for a variety of AI-based products.

Aiqudo

Aiqudo is a startup offering a different approach for an embedded assistant. From the start it assumes the driver experience will be a mix of interactions with embedded car technologies and smartphone apps. The voice assistant interprets spoken requests and then determines which service can best fulfill the objective. Instead of deciding between multiple assistants, it looks at mobile apps as well as embedded apps as the primary fulfillment services. A request related to a friend may automatically route to a Facebook app on the driver's smartphone while a navigation task is directed toward an embedded Google Maps app.

This offering is new and has not yet available in production vehicles. However, Chinese electric car maker BYTON demonstrated the solution at CES 2020. Aiqudo's Voice to Action platform is not an automotive specific solution and it doesn't appear likely to take over in-car feature controls. However, it does offer another option for voice-interactive services that maintain automaker control over user experience and data.

PLATFORMS FOR EMBEDDED VOICE ASSISTANTS



EXTENDING CONSUMER VOICE ASSISTANTS IN THE CAR

Alexa Auto

Amazon works with automakers in three different ways. There is a projection technology based on a mobile app that routes Alexa requests through a smartphone to the cloud. That is how Toyota, Lexus, Ford, Lincoln, and SEAT work with Alexa. There are also the numerous Alexa skills which typically allow some remote access to vehicle fuel status, tire pressure lock and climate control, and remote start.

Then there is the full-featured Alexa Auto SDK. This solution is available in some GM and Audi cars and essentially replaces the automaker's embedded voice assistant. In fact, in GM cars, drivers can only choose the Alexa or embedded solution from Cerence and not both. Alexa is popular enough that many brands want to ensure they offer access because it is increasingly a criterion for new car buyers. For older cars and brands that don't support Alexa Auto integration, consumers can also choose Echo Auto, Anker's ROAV Viva, or Garmin Speak to add Bluetooth-connected device access to Alexa and its 100,000+ skills.

Google Android Auto OS

Google Android Auto OS (aka GAAS) is a new embedded car infotainment system offering. Google also offers a projection technology (see next page for Android Auto), voice apps (i.e. Actions) that remotely control car features, and aftermarket devices such as Anker's ROAV Bolt for drivers that want in-car access to the Assistant. However, GAAS is the embedded solution designed as a replacement for other infotainment OS and voice assistants automakers use today.

Many automakers have built their infotainment systems on Android OS, but they were forced to customize it themselves to support common driving use cases. GAAS relieves much of that effort and provides easy access to a variety of Google services as well as the Assistant. Volvo was the first to jump onboard with GAAS and has demonstrated the solution in its all-electric Polestar 2 model. GM announced in September 2019 that it would switch to GAAS in 2021 from today's custom instance of Android OS. GAAS will also support the use of projection technologies such as CarPlay and Android Auto.

Apple CarPlay

Apple's CarPlay is the original in-car projection technology that transforms the infotainment system into a projection of the smartphone. While many cars today are starting to resemble smartphones on wheels, in the recent past they were the feature phone equivalent of technology on-the-go. As a result, the far richer smartphone experience was preferred by consumers and projection technology enabled them to utilize the car's microphones and large screen displays to access a limited number of iOS apps while driving.

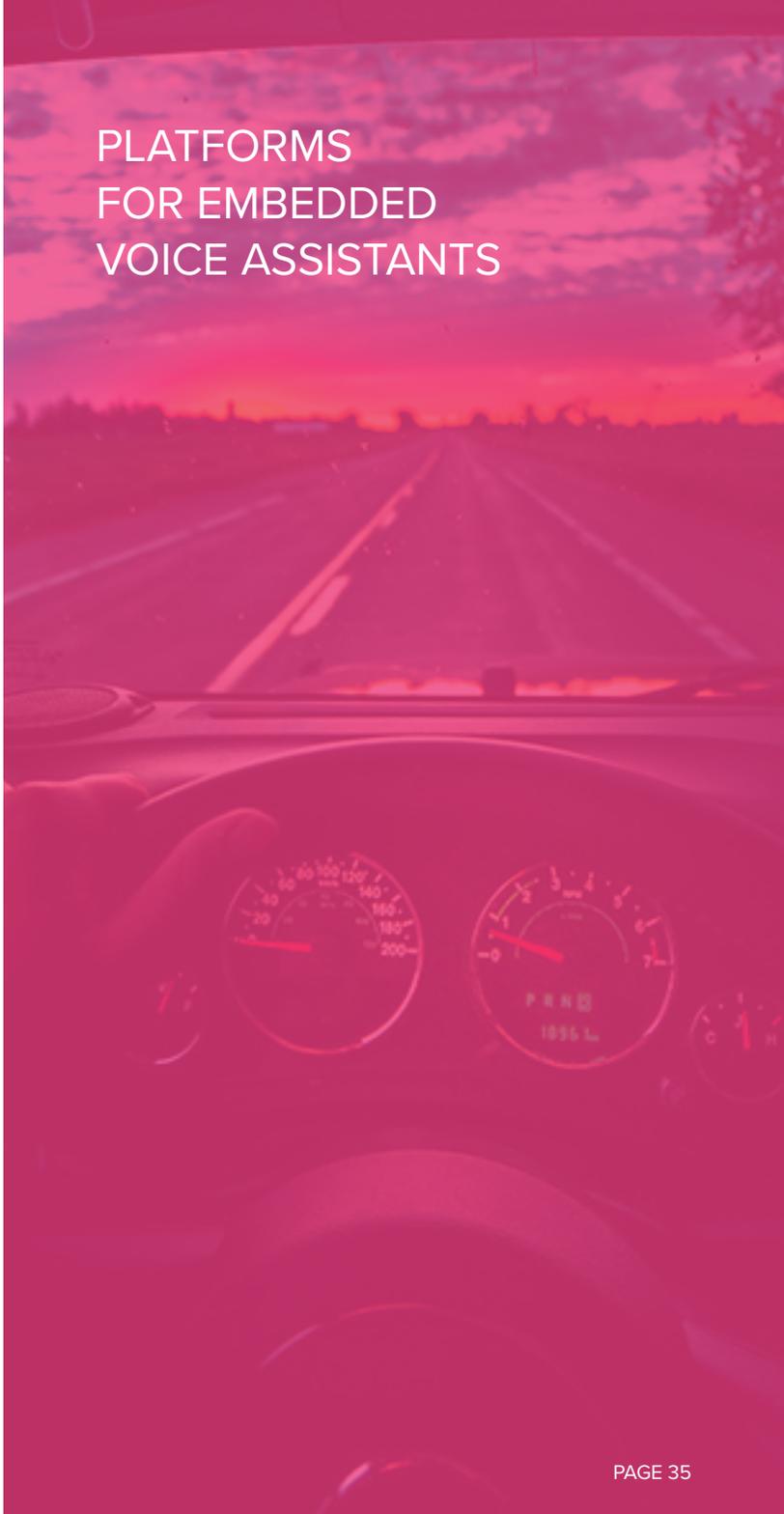
The popularity of iPhones in general and CarPlay in particular has led automakers to support it in over 500 models. However, CarPlay has been slow to add approved iOS apps and has no approach to controlling in-car features. Rival smartphone projection solutions from Amazon and Google offer that deeper integration and access to many more apps. Apple's pure neutrality stands out but as embedded solutions improve it may struggle to maintain users.

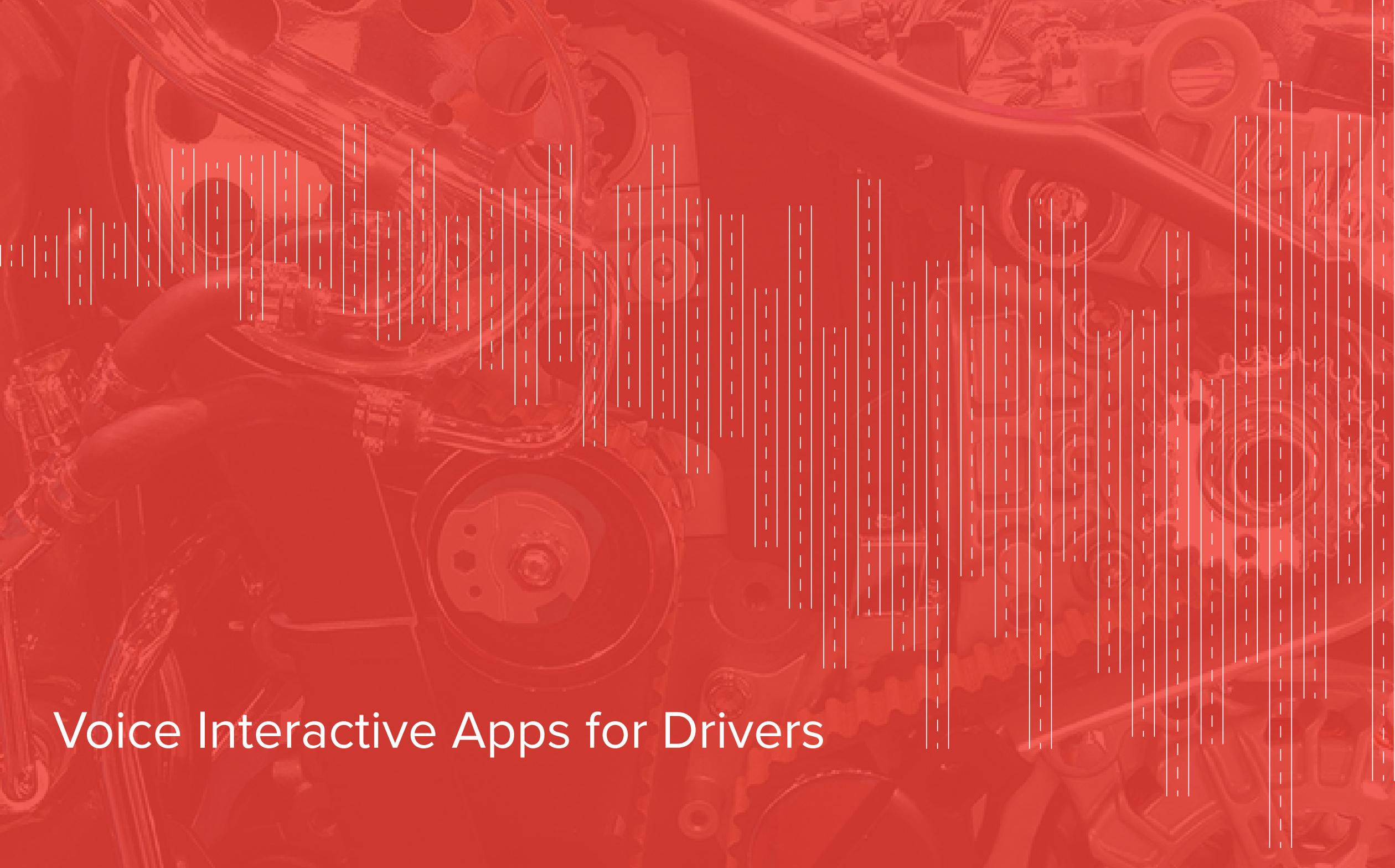
Android Auto

Android Auto came about as Google's answer to Apple CarPlay. Like its rival, Android Auto is also available in over 500 car models. It is a projection technology for Android smartphone users that makes apps available on the mobile devices visible on the car dashboard. Drivers can also access Google Assistant through the smartphone using the car's microphones. Auto brands offer a variety of connection options with some requiring a wired USB connection and others supporting wireless connectivity via Bluetooth or WiFi.

Android Auto is known for having a more permissive approval process for apps that wish to appear for drivers. As a result, there are over 250 Android apps available through the service in the U.S. The number of apps varies by country. By contrast, CarPlay has about one-fifth the number of apps available for U.S. drivers. Google also differentiates from its smartphone OS rival by offering automakers voice apps in the form of Google Actions and the GAAS embedded voice and AI solution.

PLATFORMS FOR EMBEDDED VOICE ASSISTANTS





Voice Interactive Apps for Drivers

INFORMATION, NEWS & ENTERTAINMENT

Audioburst

Audioburst has created a new way to consume audio content while driving. The company ingests, analyzes and segments thousands of radio programs and podcasts each month and creates customized news feed-style topical and personalized playlists for drivers. Audioburst's AI extracts short segments of these recordings so users can get just the information they want efficiently. Everything else is stripped away. It is a news digest in audio drawn from thousands of sources in real-time. If a user would like to listen to the full news show or podcast, they can jump to that and later return to their feed of news bursts.

An Audioburst app is available through Android Auto and is an embedded option in the Google Android Auto OS (GAAS). LGE also announced a partnership in 2018 to integrate Audioburst into its infotainment system offerings. In addition to the in-car solutions, Audioburst also offers APIs for accessing its audio content catalog and mobile apps for iOS and Android smartphones.

Drivetime.fm

Drivetime is a voice-interactive gaming app available on iOS and Android focused on entertaining drivers during their daily commute. The company closed an \$11 million-dollar funding round in September of 2019 that included Amazon's Alexa Fund and Google as investors. This is particularly notable as the games are only available through Drivetime's smartphone apps and not through Alexa skills or Google Assistant Actions.

Developed specifically for the in-car experience, Drivetime claims an envious 65% retention rate for monthly active users. Since November of 2018 when its first voice trivia game launched, Drivetime has added new titles including a voice-interactive version of Jeopardy! and a subscription service. For \$9.99 per month, subscribers get full access to all episodes of Jeopardy! and all back episodes of its in-house games such as Tunetime, a quiz for identifying song clips, Blackjack, and interactive fiction and brain training.

Nationwide

Nationwide announced in September 2019 it would give away one million Amazon Echo Auto devices to qualifying new and existing auto insurance members. Members simply had to apply online to receive a redemption link to the Amazon.com store to receive the free device. The giveaway coincided with the launch of three new features to the Nationwide Alexa skill. Two of the new features are particularly notable as they are helpful while the user is actually driving. Now users can call Nationwide's Roadside Assistance through the Alexa skill without having to ask Alexa for the number or pick up their phone. The other is Road Conditions, which allow drivers to check weather and road conditions along their route.

Nationwide is also partnering with Amazon by adding a "digital insurance experience" to its listing on Amazon.com. That service allows Amazon customers to receive an online quote for Nationwide's auto insurance using their Amazon login credentials. Nationwide was one of the first insurance companies to launch an Alexa skill back in 2016.

Urgently

Urgent.ly provides members with roadside assistance from over 75,000 service providers in the U.S. Members can request service by calling a dedicated emergency hotline but does not take requests online or through a mobile app. The company followed this bias for voice interaction by launching an Alexa skill in 2019 to aid stranded motorists with a flat tire, even if they are not a member. Users answer a few questions from Alexa about the flat tire as well as their location and the skill will dispatch roadside assistance from the nearest service provider. Once the request is complete, the motorist can ask Alexa for updates on the expected arrival time and receive a link via text for real-time tracking.

A key differentiator between the Urgent.ly Alexa skill and other apps is that users do not need to link their account or enter a payment method. Instead, Urgent.ly utilizes Amazon Pay linked to the user's Amazon.com account. The company plans to expand its Alexa skill services in the future to include towing, jump starts, and lockouts.

INSURANCE AND ROADSIDE ASSISTANCE

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The State of Voice Assistants as a Marketing Channel

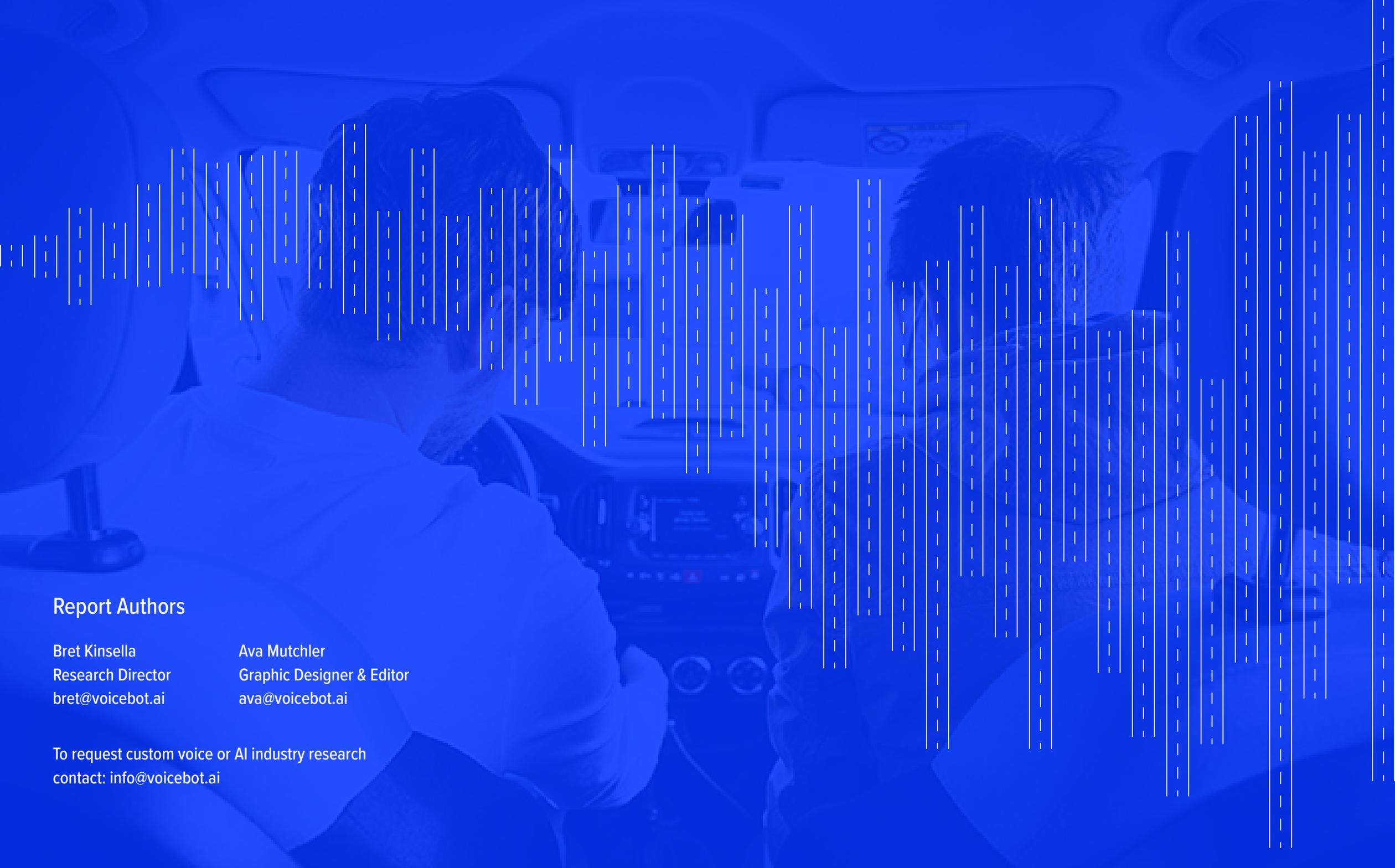
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