



IN-CAR VOICE ASSISTANT CONSUMER ADOPTION REPORT

JANUARY 2019

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DRIVETIME



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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 online during the first week of September 2018 and was completed by 1,040 U.S. adults age 18 or older that were representative of 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 Drivetime.fm

Drivetime is the world’s first (and so far only) company developing games and other interactive entertainment specifically for the driver of the car. Americans spend as much time commuting to and from work in their cars as they do playing mobile games – why not play games while you drive?

[Drivetime.fm](#)

About Voice of the Car Summit

The Voice of the Car Summit is a one-day event, taking place Tuesday, April 9, in Mountain View, California’s Computer History Museum, which will examine the rapidly-growing intersection of voice-first technology and the modern connected car. Keynoted by Katie McMahon of SoundHound Inc. whose technology is being used in cars ranging from Hyundai to Mercedes-Benz, The Voice of the Car Summit will feature a wide variety of market-leading speakers and companies sharing best practices on deploying voice in vehicles.

[Voiceofthecar.com](#)

Voice Assistant Use In-Car is Higher Than Smart Speakers

Smart speakers had another big holiday season as the top selling consumer electronics items in many channels. However, few people realize that voice use in the car is far more prevalent.

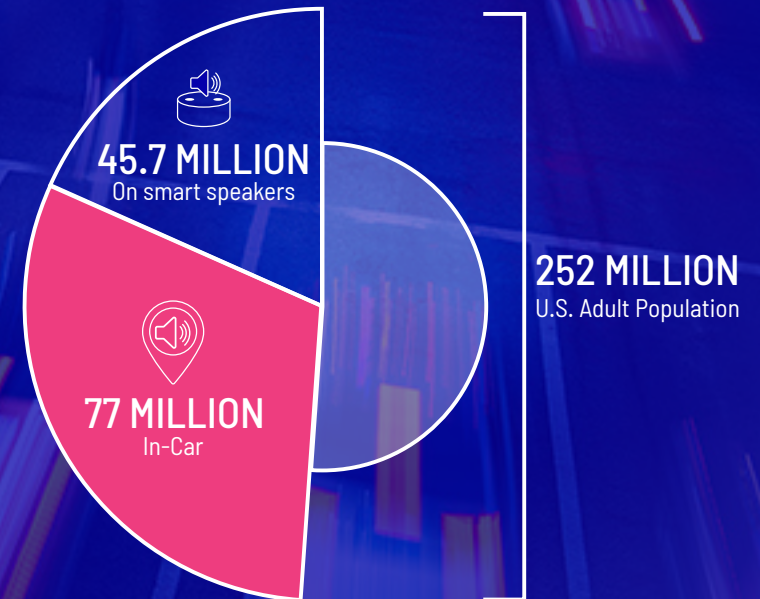
Nearly twice as many U.S. adults have used voice assistants in the car (114 million) as through a smart speaker (57.8 million). The car also claims far more monthly active voice users at 77 million compared to 45.7 million. The monthly active voice assistant usage rate is actually higher for car owners than for smartphone users. Despite the numbers, the car is often overlooked when it comes to voice.

These findings are unsurprising if you take a moment to consider three facts.

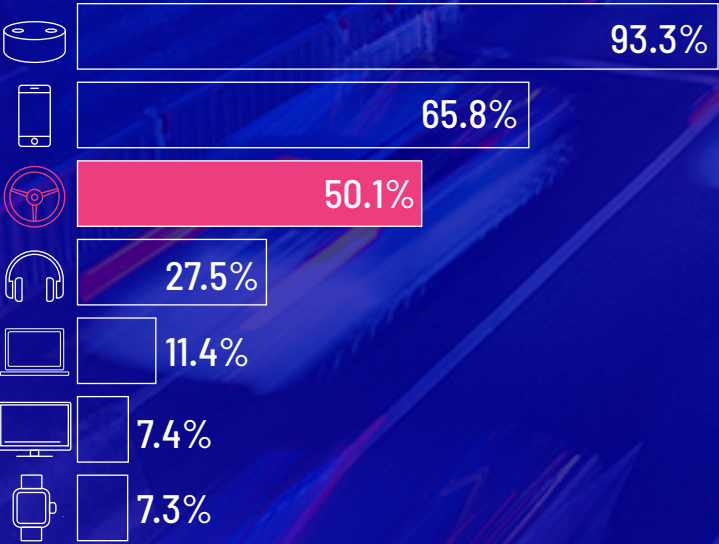
- Speech recognition arrived in cars in 2004 so it has had a long time to build up a user base.
- There are many more car owners than smart speaker owners
- A driver's hands and eyes are occupied with a task so there is a greater premium on voice's hands free interaction capabilities.

However, voice usage in-car to date has focused primarily on three tasks: controlling in-car features, accessing navigation information, and initiating phone calls. Voice assistants can perform a far greater number of functions today for communicating, answering questions, and accessing entertainment. The segment is ripe for the introduction of new applications that can improve consumers' in-car experience.

Monthly Active Voice Assistant U.S. Adult Users



Own Device and Have Used Voice Assistant



Half of Car Owners Have Used a Voice Assistant While Driving

Not only is in-car voice assistant usage high, there is also room for growth. Half of car owners claim to have used a voice assistant in the car and 67.5% of those use them monthly. Both factors show a significant opportunity to grow the user base and frequency of use. Some of this growth will occur naturally as consumers become more accustomed to using voice on smart speakers and smartphones and those habits transition to the car. However, the bigger impact could be voice apps that are tailored to the in-car context.

One example is quick service restaurants (QSR) providing tools for voice ordering while on-the-go. This is a natural extension of mobile app ordering but allows drivers to keep their eyes on the road and hands on the wheel. This could be implemented with voice capabilities inside a mobile app or through a dashboard-accessible voice assistant. Other app ideas are locating items that a driver needs and navigating them automatically to a store with the product in stock or a service opening. And, there is entertainment like the interactive voice quiz offered by report co-sponsor Drivetime.fm or pulling up a Spotify playlist with a simple spoken request.

Few app publishers have thought much about tailoring their user experiences for the driving context. This is a clear opportunity as consumers are using voice in the car despite a lack of apps targeting the driving experience. Voice is moving across surfaces quickly and the car will be one of the top three access points for several years to come.

The report is divided into two sections: consumers and automakers/platforms/app publishers. The first segment brings the demand and the other supplies new capabilities. In automotive, it definitely takes two to tango.



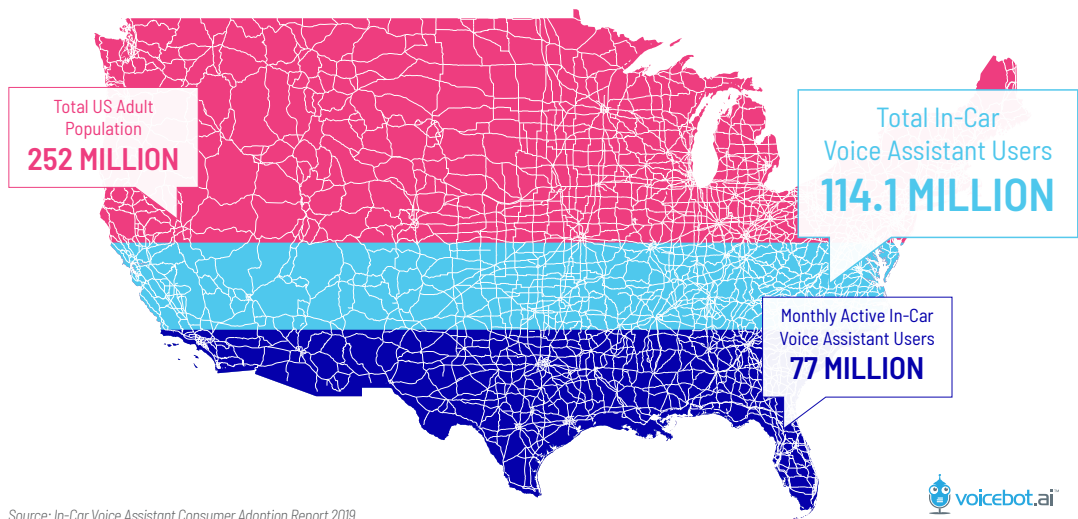
CONSUMERS, VOICE & CARS

Cars Are One of the Big Three Voice Access Points

The U.S. Census Bureau estimates that average commute time in the U.S. is just about 27 minutes each way. All car travel exceeds 80 billion hours annually. Americans spend a lot of time in the car. At the same time, Americans have also become accustomed to constant connectivity. Since your hands and eyes are fully occupied while driving (or should be), connectivity that we take for granted becomes inconveniently inaccessible. In-car voice assistants make connectivity accessible in the car. You can stay in touch by voice dialing and voice texting. You can request directions and ask questions by speaking. You can open apps and select specific entertainment options while maintaining focus on the road..

It is no surprise given the driving numbers and consumer expectations that in-car voice assistant use is second only to smartphones. The number of U.S. adults that have tried a voice assistants in the car (114 million) is double those with access to smart speakers (57.8 million). Monthly users are also over 60% higher in the car (77 million) than on smart speakers (47 million). Smart speaker adoption may be growing quickly, but voice is already a habit for a far greater number of drivers today. Anyone publishing a voice assistant app should have have a plan for the car or they are missing a lot of potential users.

In-Car Voice Assistant Total Audience Reach



Source: In-Car Voice Assistant Consumer Adoption Report 2019



Total Monthly Voice Assistant User Conversion Rate by Auto Brand

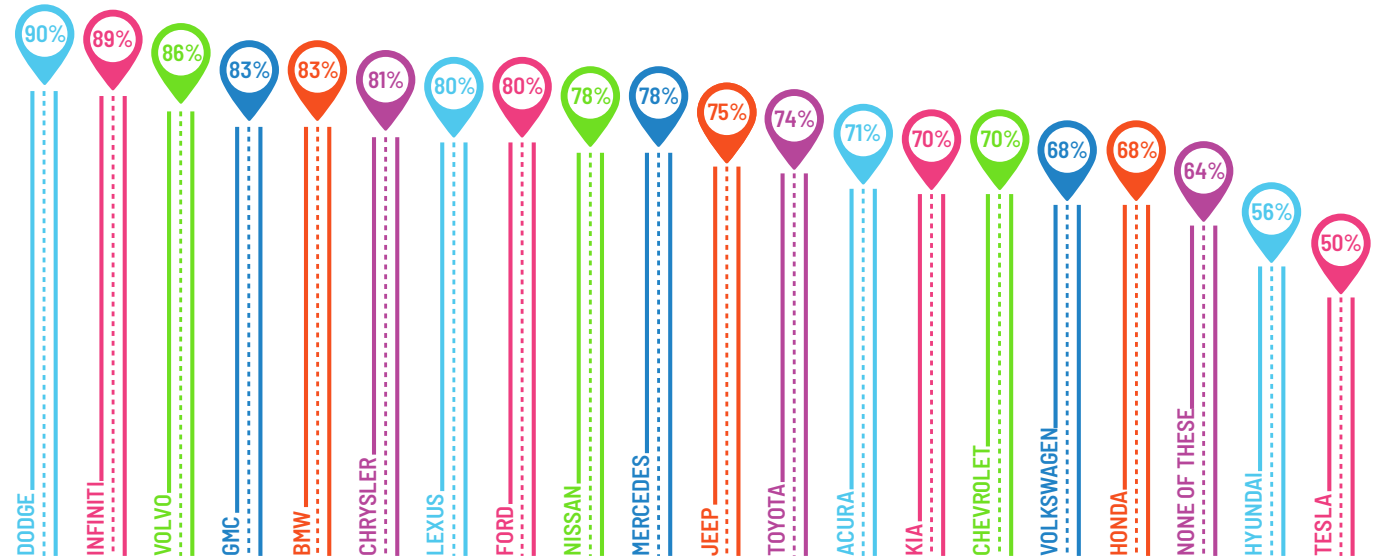
In the introduction, we pointed out that 114 million U.S. auto owners had tried using a voice assistant in the car and 77 million reported being monthly users. Dodge, Infiniti, and Volvo car owners were the most likely to convert initial use of a voice assistant while driving into a monthly habit. Owners of all three brands did so at a rate of more than 85%.

The lowest conversion to regular voice usage were Tesla and Hyundai. Every other major brand was able to convert at least two-thirds of drivers that tried the voice assistant into regular users. It may be that

Tesla's manual controls are so easy to use and the presence of auto-pilot which takes over some of the driving responsibility makes voice a less potent utility. It may also be related to Tesla's refusal to support Apple CarPlay and Android Auto as options.

Over half of the brands show a 75% or higher conversion rate to monthly use after car owners try a voice assistant while driving. It's not clear that specific auto brands have an advantage in voice assistants today, but the high conversion rates speak directly to the utility of voice in the car.

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



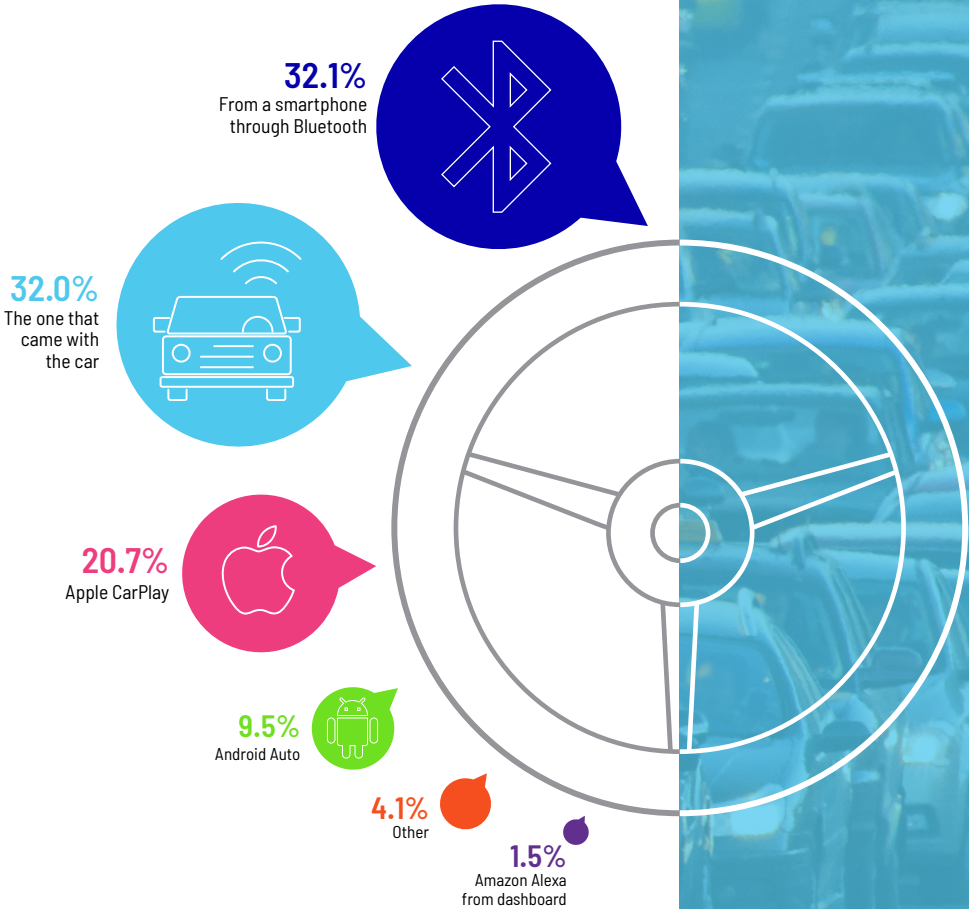
In-Car Voice Assistant Preferences and Use

There are many voice assistant options available to most drivers. Consumers say that they are equally likely to have used voice through a smartphone connected to the car via Bluetooth and the voice assistant native to the car. Both were used by about one-third of car owners that have used a voice assistant.

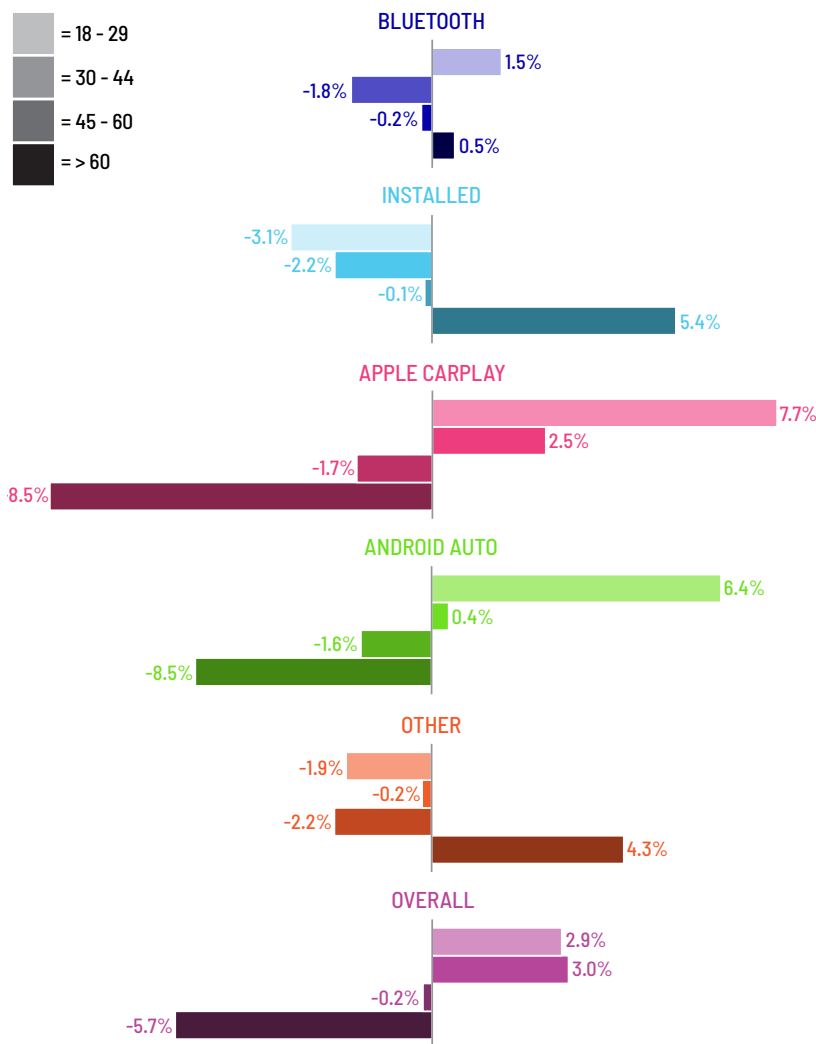
Apple CarPlay with Siri was third with about one in five in-car voice assistant users having used it. However, many of the Bluetooth users also likely used Siri adding to Apple's total. Android Auto with Google Assistant was a distant fourth with only about 1 in 10 consumers having tried it. Keep in mind that this is of consumers that have used a voice assistant in the car. When including consumers that have not tried an in-car voice assistant, only about 1 in 20 consumers have tried an Android Auto voice interaction despite availability in over 400 auto brands.

The auto brands with the most in-car voice assistant users largely reflects their market share in the U.S. However, Toyota and Ford slightly over-index their nominal market share in terms of in-car voice users while GM and Chrysler slightly under-index.

Voice Assistant Used In Car by U.S. Adults



Relative Use of Voice Assistants In-Car by Age Group

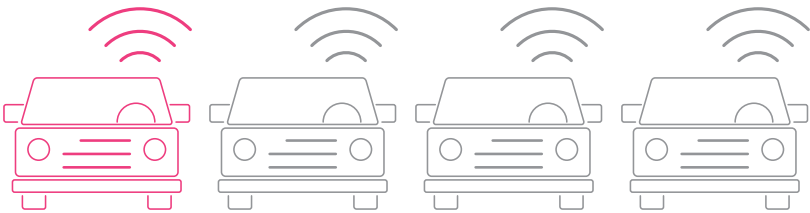


Where Android Auto did overperform was with 18-29 year-olds. This is the same age cohort that also over-indexed for Apple CarPlay use. These younger drivers significantly under-indexed for use of the factory installed voice assistant offered by the automaker.

By contrast, drivers over 60 over-indexed for use of the installed voice assistant and severely under-indexed for use of CarPlay or Android Auto. This group also under-indexed for voice assistant use overall which was balanced out by a higher likelihood of 18-29 and 30-44 year-olds using voice assistants in the car. The 45-60 age group showed the least variability.

One in four car owners that have tried a voice assistant while driving say they have used more than one connectivity option. The auto brand owners most likely to have tried multiple assistant options were Acura, Mercedes, and Tesla.

1 in 4 Have Tried More Than One In-Car Voice Assistant

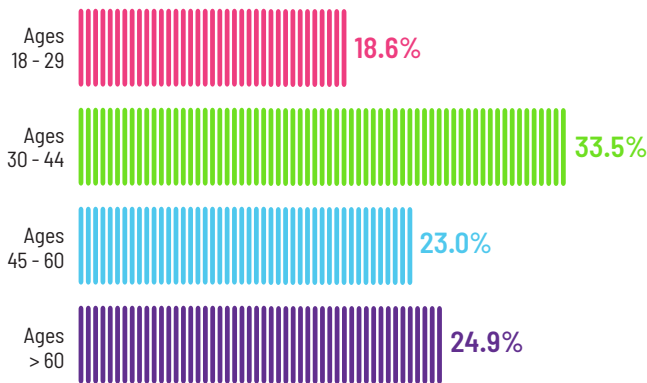


In-Car Voice Assistant Demographics

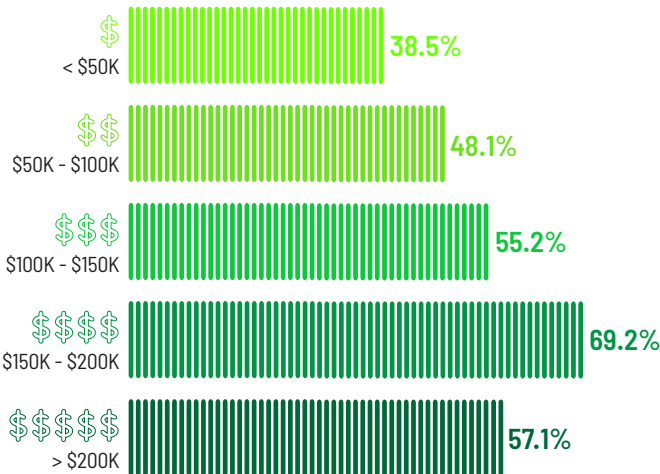
The largest concentration of in-car voice assistant users by age is the 30-44 group. The over 60 and 45-60 groups are roughly equivalent at 23–25% with the smallest group being 18-29. This is influenced by the age group only accounting for a 12-year versus a 15 or more year cohort size. In reality, we have over-indexing in the 30-44 age group and in-car voice assistant users roughly equivalent in the other cohorts when also adjusting for population size. Voice is a feature that interests all generations of drivers.

In-car voice assistant users skew toward upper income drivers. Less than half of car owners earning less than \$100,000 annually have used a voice assistant in the car while at least 55% of those over that income have done so. The use is most prevalent in the \$150,000 - \$200,000 income range where 69% report having used a voice assistant with the least likely users falling in the under \$50,000 annual earnings group.

Use Voice Assistant In-car by Age Group



Use Voice Assistant In-car by Income Group



A close-up, slightly blurred image of a car's interior dashboard. A smartphone is mounted on the right side, displaying a navigation app with a blue line and a red location pin. The dashboard features several circular air vents and control knobs. The entire image is overlaid with a semi-transparent magenta filter. Numerous vertical white lines of varying lengths are scattered across the upper half of the image, resembling a digital signal or data stream.

HOW VOICE IS USED IN CAR TODAY



In-Car Voice Assistant Frequency of Use

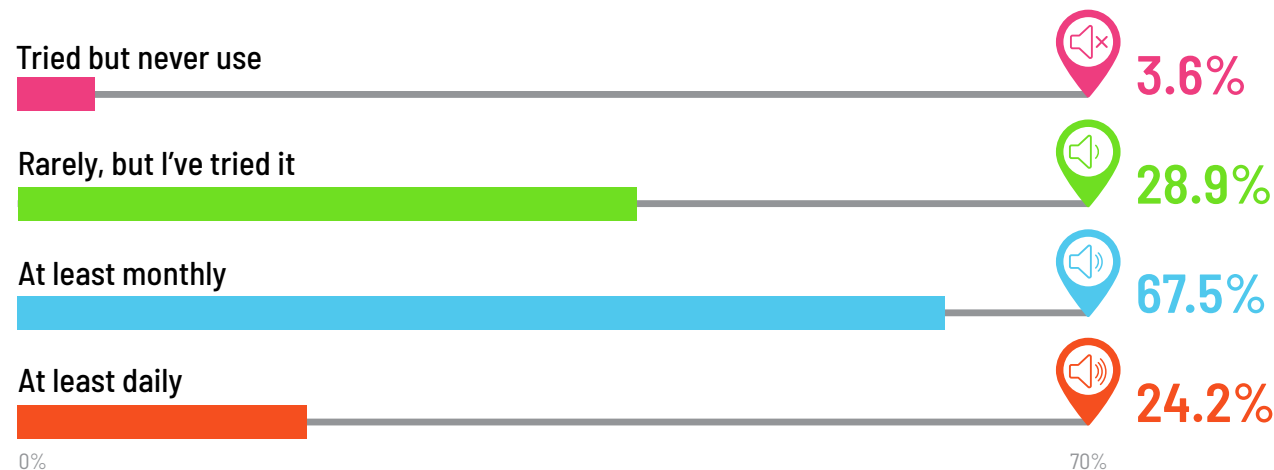
Two-thirds of consumers that have used in-car voice assistants convert to monthly active users and 24% become daily users. This conversion to daily active use is roughly equivalent to smartphone voice assistant users and about half of that for smart speaker owners.

There is a high correlation between smart speaker ownership and the likelihood to be a voice assistant user in-car. For the total population, about 45% claim to have used a voice assistants in the car, but that figure rises to 61% for smart speaker owners and is only 39% for

consumers without the devices. Monthly and daily in-car voice assistant user ratios are also higher for consumers that also own a smart speaker.

Similarly, 71% of smart speaker owners claim to be monthly voice users on smartphones compared to 61.5% of all smartphone owners. We also see that voice usage in the car closely parallels voice assistant usage on smartphones. Data suggests this relationship is causal. Voice assistant use on one surface begets voice assistant use on other surfaces

Voice Assistant Use Frequency in the Car



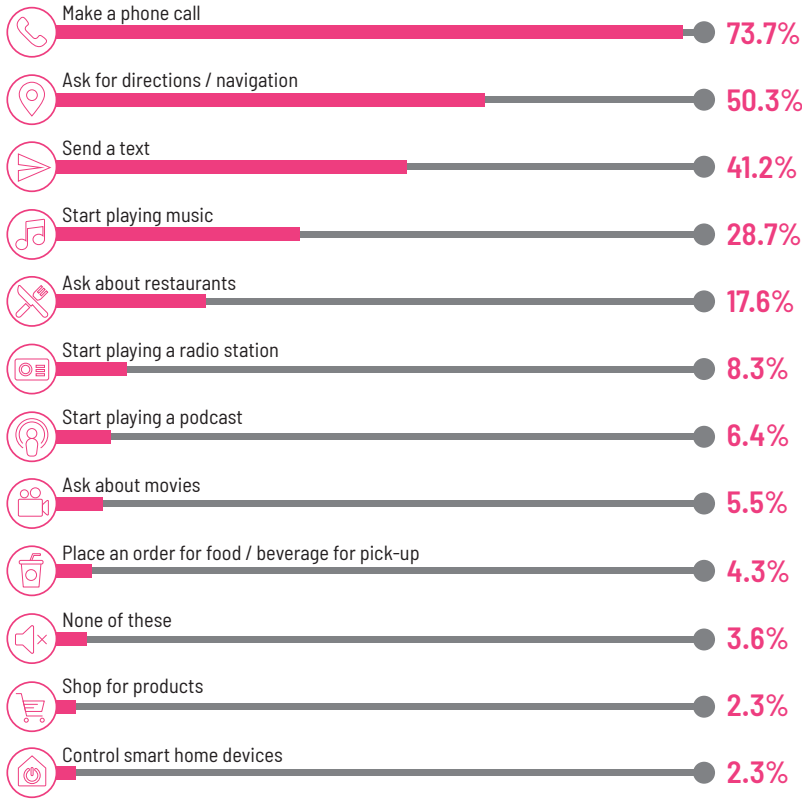
In-Car Voice Assistant Use Cases

In-car use cases are heavily influenced by context. Placing a phone call is a fairly simple task if your hands and eyes are free. The same is true of text messages. Of course, both of these tasks are problematic when driving. Using a voice assistant to make phone calls is the top use case reported by consumers and texting by voice is third.

Second on the list is asking for directions or navigation. Using voice for navigation is a tertiary feature when using a smart speaker in the home, but it is a primary use case for drivers. The fifth most cited use case was asking about restaurants which is a common need while driving. Voice makes this task easier and immediate.

After communications and navigation, accessing entertainment dominates consumer use cases. Start playing music, a radio station, or a podcast came in at fourth, sixth, and seventh respectively. However, entertainment is not a core in-car voice assistant use case today like it is in the home with smart speakers. The second most common tried use case on smart speakers and most frequent on a monthly and daily basis is listening to music. About one-third as many people look at voice assistants for these features in the car. And, radio and podcast access by voice has been tried by fewer than 1 in 12 in-car voice assistant users. This presents an opportunity for automakers, entertainment properties, and voice assistant providers to promote these use cases for use in the car.

In-Car Voice Assistant Use Cases

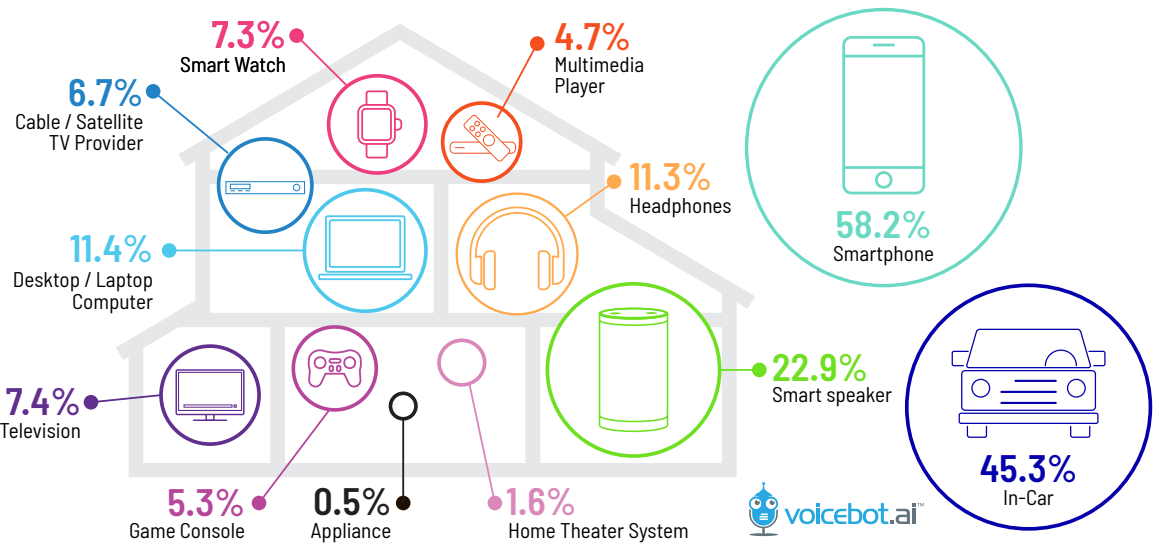


Differences from Other Surfaces

Autos are one of a dozen access points consumers are using for voice assistants today. However, it is also one of the big three in terms of usage along with smartphones and smart speakers. In addition, it is one of the few access points for on-the-go consumers.

A key difference for voice in the car is the presupposition of a voice-only experience. While other access points can more freely offer multimodal experiences, the only native in-car voice assistant experience that includes a screen is navigation. This will lead to simpler interactions in the car and often require more robust testing as there are limited fallback options if errors arise.

U.S. Adult Voice Assistant Use by Surface - September 2018



A man and a woman are standing in a car dealership, looking at a silver car. The image is overlaid with a green tint and numerous white vertical lines of varying heights, creating a digital or data-like aesthetic. The text "CAR OWNER & BUYER SENTIMENT" is written in white, bold, sans-serif capital letters at the bottom.

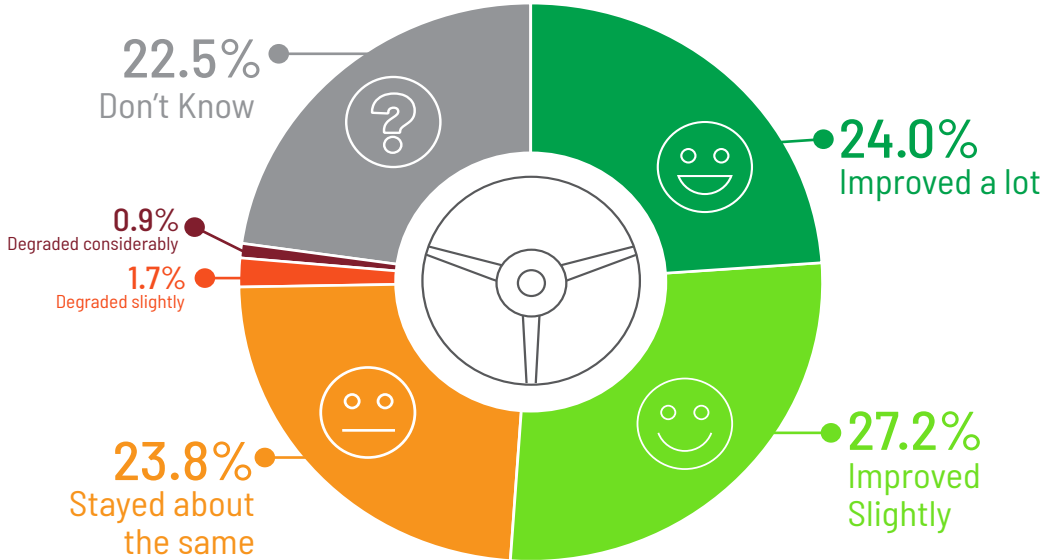
CAR OWNER & BUYER SENTIMENT

State of Voice Assistant Technology Improvement

One factor that is likely to drive more in-car voice assistant usage is sentiment around the state of the technology. More than half of car owners believe voice assistants in cars have improved over the past two years and 24% think the answer is a lot. By contrast, only 2.8% believe that voice assistant performance has degraded over that time. About 45% either don't know or believe it has stayed the same.

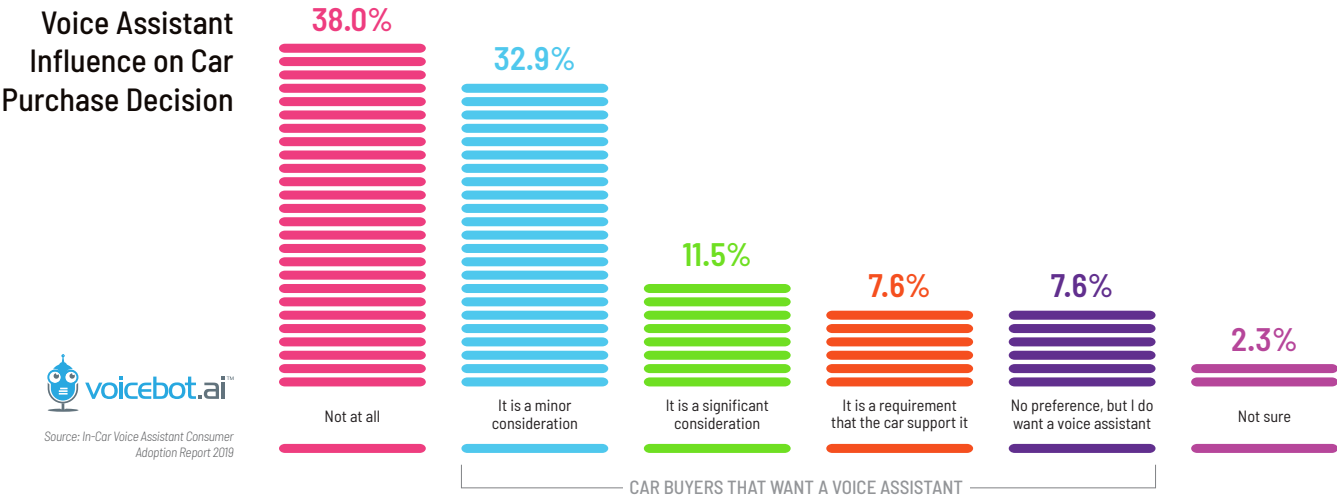
These results skew heavily toward the “getting better” sentiment and of those that do have an opinion, two-thirds are positive. Automakers recognize this and are investing heavily in their own customized voice experiences while also bringing Alexa, Google Assistant, and Siri into the car in response to consumer demand.

Consumer Sentiment on In-Car Voice Assistant Improvement



Importance of Voice Assistants to Car Purchase Decisions

About 60% of car buyers suggest the presence of a voice assistant is important. Even more significant is that about one-in-five car buyers say the presence of a preferred voice assistant is a significant consideration or a requirement. Automakers would prefer to provide a native voice assistant to drivers, but consumer habit formation around Alexa, Google Assistant, and Siri is creating a situation where integrating each of these services is the safe thing to do. This is leading to more cars having multiple voice assistant options available to drivers.

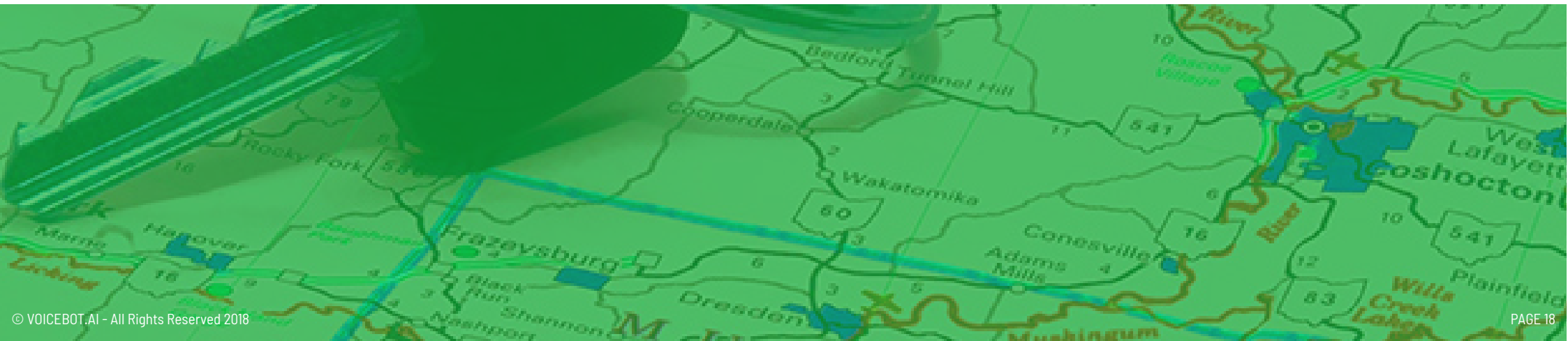
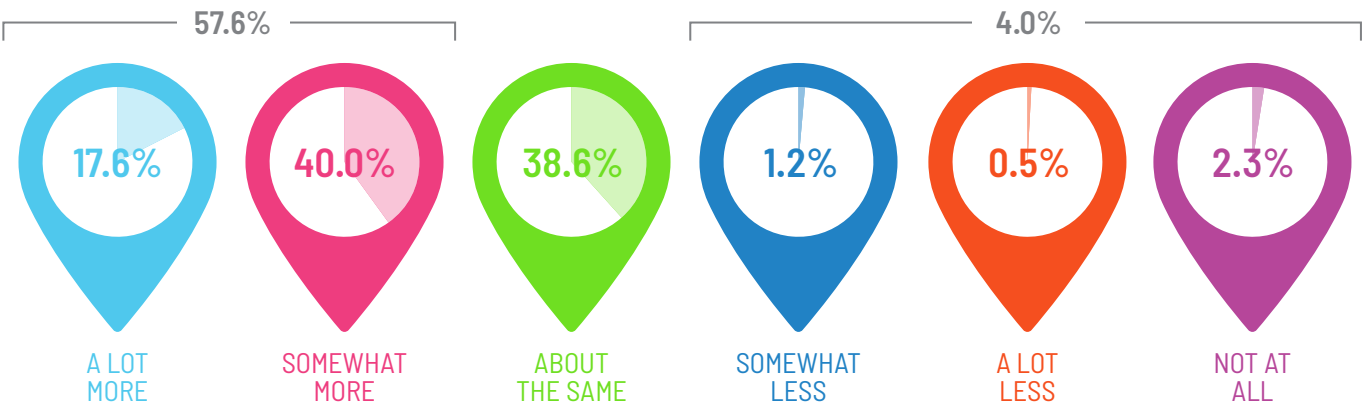


Expectations for In-Car Voice Assistant Use in 2019

An indicator that voice assistant use is likely to expand in the car is underscored by 57.6% of current users expecting to increase their usage in 2019. In fact, consumers using voice assistants in cars were 14 times more likely to say they expected to use them more in 2019 as opposed to decrease.

Nearly 40% of current voice assistant users simply expect to continue their use going forward. However, more than 50% expect to employ voice assistants with greater frequency in the coming year and a very small amount expect to decrease use. It should be obvious now that voice assistants have a bright future in the car.

A year from now, do you expect to use a voice assistant while in the car...



A photograph of a car body on an assembly line, overlaid with a solid purple color. Numerous vertical white lines of varying lengths are scattered across the image, creating a digital or data-like aesthetic. The car is positioned on a yellow-painted floor, and its rear hatch is open.

AUTOMAKERS / PLATFORMS / APPS

A Short History of Voice in the Car



2004

IBM ViaVoice installed in Honda models



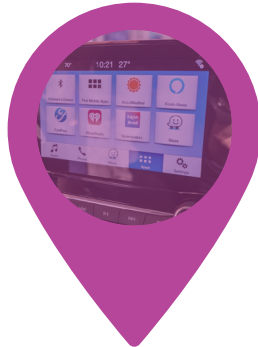
2012

Nuance introduces Dragon Drive



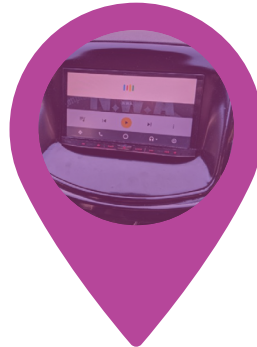
2013

Apple introduces Siri eyes free option for CarPlay



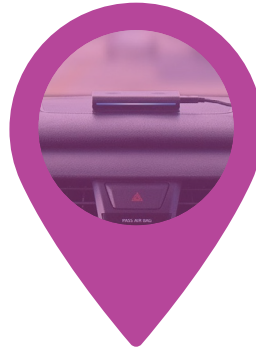
2017

Ford adds Alexa to SYNC, demonstrates Starbucks ordering



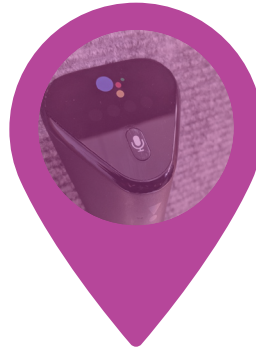
JAN 2018

Google Assistant integrated into Android Auto



2018

Garmin Speak, Roav Viva, Muse & Echo Auto bring Alexa devices into the car



2019

Roav Bolt & JBL Link Drive bring Google Assistant devices into the car



Objectives and Priorities of Car Brands Face Conflicts Over Voice

Sell More Cars and Control the Customer Experience

The number one objective of car companies is to sell more cars. That incentive has led many automakers to add Apple CarPlay and Android Auto despite their reservations about ceding control of the in-car user experience. Both of these solutions take over the infotainment system and place the user experience, for better or worse, in the hands of smartphone makers.

If you think about the in-car use cases other than driving that revolve around cabin control, navigation, entertainment, and communication, offering CarPlay or Android Auto essentially gives up three of four use cases to other companies. This is in direct conflict with a second objective of car companies: control the driver experience. And, it's not just the driver experience that is lost. The data also goes to another company.

These objectives have meant that even as Apple CarPlay and Android Auto became more capable of fulfilling positive in-car use cases, automakers strove to improve their own systems and reserve certain functionality. Voice control of car functions is one area where the in-car solution is superior to what is on offer from the smartphone platforms.

Consumer Voice Assistants Create a New Point of Friction

The arrival of consumer voice assistants on smartphones and smart speakers raised this conflict once again. There is an expectation by consumers for Google Assistant and Amazon Alexa or at least for the features they can provide. However, the car makers don't want all of their user experience and data solely controlled by Google's and Amazon's cloud services. Many automakers are integrating these solutions into their car models, but almost every one has doubled down on their own voice assistant solutions so as not to cede too much to an outside company.

Those initiatives have also led to deeper relationships with Nuance and SoundHound Inc. Both companies allow for complete control of the user experience and data while also offering some features common to Google Assistant and Amazon Alexa. The situation has led to some interesting scenarios where there may be up to four voice assistants available for use in a single car. This offers maximum flexibility to meet consumer preferences, but also runs the risk of delivering customer confusion regarding what service to use for each use case.

It is clear that voice has several important roles to play in the car. The issue is just which voice assistant will perform which roles.



Car Environment Compared to Other Surfaces

When it comes the car environment there are obvious differences from other surfaces. Two examples are cabin noise and microphone positioning. These physical constraints create a challenge for any voice assistant that must be addressed. Beyond technical challenges, there are also use case considerations. Some use cases are best characterized as inside-the-car and others as outside-the-car. For example, cabin control is a car-specific use case. Navigation is another use case common to cars that has less utility for a home-based user. These were some of the first features offered by embedded voice assistants in cars.

Consumer desire for always-on connectivity has led to a variety of new feature expectations such as search, smart home control, point of interest information, weather and other features typically only available through apps. These use cases are obvious candidates to be fulfilled by consumer voice assistants such as Alexa, Google Assistant, and Siri. There is a logical division of labor between the embedded and the external voice assistants. However, accessing entertainment and communications such as phone and messaging creates a conflict. Most in-car embedded voice assistants have some capabilities around these use cases as do the general-purpose consumer voice assistants. This has led to hybrid solutions where embedded voice assistants are assigned certain use cases and others are fulfilled by third parties outside the control of automakers.

AUTOMAKERS



FORD

In 2013, Ford began developing SmartDeviceLink (SDL), an application for in-vehicle control using voice, manual buttons, and capacitive touchscreen controls. SDL provides developers with open source Android and iOS libraries that have features like voice integration and enabled FordDev to create SYNC which offers drivers the option of voice control in the car. With SYNC, voice commands can be used to manage communication with a paired phone, music and media systems, climate control, an optional navigation system, in addition to navigation of the infotainment screen itself. Ford vehicles with SYNC 3 allow for Apple CarPlay and Android Auto support. Ford also has two Alexa skills and one Google Assistant action users can pair with their vehicle. FordPass is available on both platforms, and allows users to remotely start/stop, lock/unlock their vehicle in addition to informing the user of the remaining fuel range. MyFord Mobile is Ford's EV Alexa skill, and allows users the same functionality as FordPass, but with their Ford EV.



TOYOTA

TOYOTA

Toyota launched Toyota AI Ventures in 2017, dedicating \$100 million to the fund. Toyota used Ford's SmartDeviceLink to integrate in-car voice commands up until January 2018, when the integration of Apple CarPlay was announced. At CES 2018, Toyota also announced a partnership with Amazon Auto, saying it would be added to select models in 2018. Toyota spokespeople said the integration would not be through SDL, and instead it would be similar to the Alexa home system. There was no sign of that integration for the rest of 2018, but in September 2018 Toyota announced it would be integrating Android Auto as well. Similarly to the Amazon Auto announcement, no word has been given on when that integration would launch. However, Toyota does have an Alexa skill and a Google Assistant action. Under the name 'Toyota,' both voice applications allow users to control the engine, door locks, multiple vehicles, and receive fuel/ battery level updates.

AUTOMAKERS



BMW

Although a bit slower to announce and launch voice assistant partnerships, BMW has been called a model for modern tech partnerships because of its ability to maintain control over the brand experience. BMW models produced after March 2018 feature Alexa in a visual display on the BMW Connected Drive system. BMW has also been able to integrate Cortana into their existing platform, again with a visual display. Lots of negotiation went into those partnerships, because in order to get that kind of continuous brand experience voice queries must be sent to BMW servers before Amazon or Microsoft servers. BMW also has an Alexa skill called BMW Connected and a Google Assistant action called BMW. Both offer engine and door lock control, fuel or battery level updates, scheduling, climate control, and vehicle range updates. The Google Assistant action only differs in that it provides car location too. BMW recently began supporting Apple CarPlay in its newer models, but has not yet integrated Android Auto.



CHEVROLET

Chevrolet joined the Open Automotive Alliance (OAA) in 2014, a group of automakers and technology companies aimed at using Android in automobiles. In 2015 when Android Auto was first released, it showed up with integrated voice commands in all of the company's core divisions: Buick, Cadillac, Chevrolet, and GMC. All of the brands also have an Alexa skill with common functionality. Engine and door lock controls, and the ability to list multiple vehicles can be managed with Alexa. Chevrolet's MyLink, and Buick, GMC, and Cadillac's infotainment systems offer integration with both Apple CarPlay and Android Auto. Chevrolet began offering both software options in 2016. Cadillac's infotainment system allows users to search for nearby points of interest, take calls, and play music with its own natural voice recognition. As of January 2019, Chevrolet also holds the distinction of the automaker Alexa skill with the most user reviews.

AUTOMAKERS

A front-facing view of a silver Mercedes-Benz car, with the Mercedes-Benz logo prominently displayed on the hood and grille.

Mercedes-Benz

MERCEDES-BENZ

Mercedes-Benz MBUX is an infotainment system designed to rival Alexa and Google Assistant in the car. Allowing offline voice assistant use with no cloud access required, MBUX is an in-house voice assistant. In September 2018, it was announced that Houndify would be integrated into MBUX, bringing features such as local search intent/provider integration, sports, stock market news, conversations, calculations, general query support, in addition to time zone support. This complements a solution by Nuance's Dragon Drive which is used for most in-car voice controls such as climate control, lighting, and the vehicle's owner manual. Mercedes has said MBUX will be included in all upcoming cars. Mercedes also has support for Siri through Apple CarPlay and Google Assistant through Android Auto. Mercedes also has an Alexa Skill and a Google Action, both offer remote telematics control, car location, and vehicle maintenance status information via voice command. Think about this: a Mercedes owner could interact with five different voice assistants

A front-facing view of a silver Hyundai car, with the Hyundai logo prominently displayed on the hood and grille.

HYUNDAI

HYUNDAI

Hyundai was the first car manufacturer in the world to offer Android Auto, integrating the software in 2015. Hyundai was also one of the first automakers to integrate Amazon Alexa, announcing its Alexa skill in April of 2016. The skill allows Genesis owners to start their car, adjust the climate control, lock or unlock their car, and even use horn lights. In May of 2016 Hyundai offered Android Auto and Apple CarPlay integrations as an upgrade to eight models. In 2017 Hyundai announced Google Assistant support of the same feature set, accessible through Google Home or an enabled smartphone. A similar Google Assistant action was created for their luxury line, Genesis. A strategic investor in a \$100 million round of funding for SoundHound Inc., Houndify is also providing the voice technology behind the in-car "Intelligent Personal Assistant." Demonstrated at CES last year and said to be rolling out this year, Houndify integration enables users to control features of the car such as climate control, door locks, and sunroof positioning.

APPLE CARPLAY

CarPlay is Apple's software that allows an automotive head unit to be used as an iPhone controller in addition to a display much like Android Auto. It was initially released in 2014, and Apple's website states that as of today, all major vehicle manufacturers have a partnership with CarPlay. CarPlay extends Siri, allowing users to employ voice commands as a primary input. Development of CarPlay extends back to the Apple Worldwide Developer Conference of 2010, when the software CarPlay would later be based on was introduced as an iOS feature called "iPod Out." BMW hosted the feature in early 2011 as a part of their infrastructure in BMW Group vehicles. iPod Out enabled certain vehicles to receive inputs from car hardware while hosting analog video and audio from an iOS device. The first vehicle to implement a full version of CarPlay was the Ferrari FF in September 2014.

ANDROID AUTO

Android Auto was initially released in the Spring of 2015. It is a mobile app for Android devices that acts as the master to an automotive head unit. The head unit can act as an external display for the Android device. In November 2016 it became possible to run Android Auto on Android devices as a regular app - allowing users to make their phones and tablets their car infotainment system rather than the head unit. At CES 2018 it was announced that Android Auto would be capable of operating without the need for a wired connection and later that month it was also announced that Google Assistant would be available on Android Auto. Android Auto requires an internet connection and is available through Bluetooth with devices running Android Oreo or higher. Otherwise it requires USB cable connection. Vehicle settings aren't part of Android Auto, so when using a third party app on an Android Auto dashboard integration the driver has to exit the application to adjust climate controls, browse radio stations, or select a different driving mode.

-- SOFTWARE PLATFORMS --

NUANCE: DRAGON DRIVE

Dragon Drive is Nuance's AI powered voice assistant and was first introduced in May of 2012. Dragon Drive initially provided messaging functionality, the feature was first seen in the summer of 2012 in BMW's 3 and 7 series models, offered as a subscription based service. It is now offered as both an embedded and cloud-based solution and positioned as adaptable to a brand's needs. The embedded option that does not require cloud access to operate is a key differentiator for Dragon Drive today because cars do not have reliable internet connectivity. Currently Dragon Drive can be found in select models of Audi, Daimler, Ford, Hyundai, Toyota and dozens of other auto brands. Features included are the ability to control car telematics while outside of the car, such as locks, climate and ignition. Traditional in-car features are included as well: climate, windows, navigation, and entertainment. Dragon Drive is able to access and create personal information like calendar entries, messages and contacts. General knowledge of weather, news, or general inquiry is also included. Some smart home devices are able to be controlled while driving in addition to voice purchases. At CES 2018, Nuance debuted Just Talk voice interaction which enables users to ask questions and issue commands without saying a wake word. During CES 2019, Nuance demonstrated Emotion AI, which adjusts the virtual assistant's interaction style based on the recognized mood of the driver.

SOUNDHOUND INC.: HOUNDIFY

In 2014, SoundHound Inc. became the first music recognition service to be natively included into a vehicle dashboard, through a partnership with Hyundai in the 2015 Genesis. However, SoundHound's position in automotive has changed significantly since that time. Today automakers have the opportunity to use the company's Houndify Voice AI Platform to implement their own customized voice interface designed to rival Alexa and Google Assistant. SoundHound Inc. has since signed Houndify agreements with Honda, Groupe PSA, Hyundai and Mercedes to incorporate voice Interactive voice capabilities into the driving experience. Houndify, supports voice commands to make calls and send messages, location based services such as finding the nearest gas station, as well as check weather, manage schedules, and answer general queries. SoundHound Inc. stresses that Houndify enables automakers to control both the consumer experience and the data associated with user sessions.

GOOGLE ASSISTANT

Google Assistant can be accessed in-car through Connected Car actions. Launched in December 2016, “Actions on Google” is a developer platform for Google Assistant, allowing 3rd party developers to build applications for Google Assistant. In April 2017, Google released an SDK giving 3rd party developers the opportunity to build their own Assistant-enabled hardware. Google Assistant actions are distinct from Android Auto, and several have been created by partnerships with car manufacturers. The connected car actions allow for the remote control of car telematics such as engine and door lock control, fuel level, car location and more depending on the partnership. Users can enable a connected car action on their Google Assistant-enabled device if their car model is updated accordingly. For example, the BMW Google Action, titled BMW, allows users to ask Assistant to lock/unlock doors, start/stop the engine, check fuel/battery level, control the car climate, give the vehicle range, ask for the car location, and send their next trip to their car.

AMAZON ALEXA

Amazon is working with automakers in three ways to incorporate Alexa capabilities: mobile app integration, Alexa skills, and in-dash infotainment system integration. Several automakers including Audi, Ford, Lexus, Lincoln, SEAT, and Toyota all have integrated mobile applications that allow for in-dash integration. The mobile applications provide a built-in Alexa service for drivers that are separate from Alexa skills. The solution enables users to control Alexa enabled devices, access Amazon Music, routines, and skills. Several third-party applications with Alexa are not included in some of these partnerships, however. For example, The Toyota + Alexa app does not allow access to Pandora, Spotify, Drop-in, Timers, Alarms, Calls and text messaging, or audio volume control. Users are also not able to control car telematics with Alexa through these Alexa apps. To control car telematics, Alexa has created the Connected Car Alexa Skills. These skills allow users to remotely control their engine, door locks, and gain information on fuel level. The Amazon Auto SDK was released in August 2018, and allows automotive developers to integrate Alexa into in-vehicle infotainment systems. Alexa is also built-in several devices designed for the car including Roav Viva, Muse Auto, Garmin Speak, Alexa Auto, and Logitech ZeroTouch. As of CES 2019, Luxoft has announced Alexa will be into its automotive software, and Automotive Grade Linux previewed speech recognition APIs with Alexa.

ECHO AUTO

Announced in September 2018, Echo Auto has received over 1 million requests for product access through Amazon.com. Some media outlets are reporting that Amazon has confirmed shipment of the devices began in December. No official shipment date has been announced. Echo Auto is a smart speaker microphone for the car that comes with a dashboard mount and eight onboard microphones. The eight microphones are designed to allow voice detection over ambient cabin noise. It plugs into a 12-volt power outlet, making it compatible with most cars. The Echo Auto connects to the internet through smartphones, and will be compatible with car stereos through an auxiliary connection or a Bluetooth connection. Currently it is available at a 50% discount of \$24.99, but by invitation only. The full retail price is \$49.99. Echo Auto has the full capability of other Echo devices, meaning users can control smart home devices, access navigation, hear the latest news, and enable their favorite Alexa skills while in the car.

MUSE AUTO

Muse Auto is a small Alexa-enabled Bluetooth device for the car. Originally funded by an Indiegogo campaign, the Muse Auto was launched by Speak Music in Spring 2018. The device comes with a mounting kit, a charging cable, and a USB car charger for the standard 12-volt car lighter port that is in most cars. Users connect to the device with their smartphone via Bluetooth, USB, or an auxiliary connection with the Muse Auto mobile app. Muse Auto features a hardware-level mute button for privacy, and auxiliary audio output that can be connected to a car's stereo system. There are also two arrow buttons that allow users to choose either next or previous. With the Muse Auto, users have access to all voice-based Alexa services. This includes music partnerships, audiobooks, news briefings, weather, games, smart home controls, restaurant delivery, to-dos, and more. The Muse Auto is supported on Android 6.0 or higher, and iOS 10 or higher.

A close-up photograph of the Roav Viva/Bolt car charger, which is a black, rectangular device with a blue LED light ring around its front-facing microphone. It is plugged into a car's 12-volt lighter outlet. The background is a blurred view of the car's interior.

ROAV VIVA / BOLT

The Roav Viva was announced at CES 2018. It is an Alexa-enabled car charger, with two USB Type A ports, an auxiliary port, and Bluetooth connection. The Viva connects to the standard 12-volt lighter outlet in most vehicles, making it a device that has been able to connect with users of both new and old vehicles. The device has two microphones built inside, and all regular Amazon Alexa services are available via a Bluetooth connection to a smartphone. This means that the device supports Alexa communication, too. With a list price of \$50, and the device began shipping in February 2018. The Roav Viva is also compatible with Android Auto and Apple CarPlay, allowing users to use standard Alexa skills, in addition to navigation from Apple Maps or Google Maps. Anker, the company behind the Roav Viva, also announced their Google Assistant-enabled device with similar pricing and specs at CES 2019, called the Roav Bolt.

A close-up photograph of the Garmin Speak car device, which is a black, circular device with a blue LED light ring around its front-facing screen. The screen displays the text "Ready to Go!". It is mounted on a car's windshield. The background is a blurred view of the car's interior.

GARMIN SPEAK

Garmin Speak launched in October 2017 in order to bring Alexa voice assistant capabilities into the car while also showcasing the company's navigation features. At the time of its release, it was one of the few ways to get Alexa in a user's car. It is an Alexa-enabled device with a windshield mount. Although not GPS-capable, the Garmin Speak does have navigation capabilities through Alexa. A smartphone must be paired with the Garmin Speak in order for it to access an internet connection. As a result, navigation is drawn from a user's smartphone location rather than the Speak itself. There is a Garmin mobile app for iOS and Android allowing users to setup the device and access features for navigation. The Speak includes a small screen for simple navigation directions, as well as full access to Amazon Alexa skills through voice interaction. At the time of its release, the Garmin Speak was priced at \$150. As of January 2019, users can find it for \$65 on Amazon.com or \$120 at Best Buy.

-- APPS --



DRONE MOBILE

Drone Mobile is a hardware and application solution that connects a car to a user's smartphone and other smart devices, like smart speakers, for remote start, security and tracking. Voice commands for key entry, location, and vehicle status are supported by Siri, Google Assistant, and Alexa. Apple Watch and Android Wear also support common voice commands. Launched in October 2014, Drone Mobile is compatible with most cars due to its hardware. The Drone Mobile Module can be included in any vehicle to provide GPS tracking of a vehicle location and setting custom alerts for speeding or after hours driving. The Drone Mobile Remote Start System requires a kit of third-party hardware to be installed in your car, as well as a subscription plan. There is a 30-day free trial for all three plans available. The basic plan is \$5.99/month per vehicle and includes car control, alarm alerts, and vehicle status. The premium plan is \$11.99/month per vehicle and offers all basic features, GPS tracking, georeferencing, points of interest, curfew alerts, and a lifetime warranty.



GASBUDDY

GasBuddy was founded in 2000 initially as a collection of websites where users could share gas-pricing information. In 2009 GasBuddy launched its own series of apps allowing users to enter gas prices with their smartphones. In November 2018, GasBuddy partnered with the ParkWhiz Arrive Network to bring ParkWhiz's features to its applications. Soon after, GasBuddy came out with an Alexa skill. The ParkWhiz Arrive Network brings prepaid parking in lots and garages to drivers and fleets of vehicles. ParkWhiz also has an Alexa skill, so it makes sense GasBuddy would partner with ParkWhiz to advance its reach. The Alexa skill allows users to ask where the nearest gas station is and find the cheapest gas prices. Users can also add specific features to their searches. For example, users can ask to find a gas station with a bathroom. GasBuddy even included their hallmark feature: the ability to share gas pricing. Users say, "Alexa, tell Gas Buddy the price of regular is two eighty nine."

-- APPS --



AUTOMATIC

Automatic is an application for an OBD II, or on-board diagnostic, code reader. Automatic's Alexa integration launched in Spring 2015. With Automatic's adapter, users can plug the device into their dashboard to keep track of vehicle diagnostics using Automatic's Alexa skill. Users can do more than just decode their check engine light, however. The software offers users access to accident assistance from a live agent 24/7 in the US, audio warnings to remind users to drive under the speed limit, teen driver coaching tips, adult driving habit tips, cost and mile-per-gallon of every trip, in addition to car location. It does also require an internet connection. Automatic says it is also releasing an updated mobile application early in 2019. Some example queries users can ask are, "Alexa, ask Automatic where my car is," "Alexa, ask Automatic do I need gas," and "Alexa, ask Automatic how far I drove last week."



DRIVETIME.FM

Drivetime.fm develops voice-interactive games specifically for drivers. The company's first game, Drivetime, is available on iOS in the U.S. and Canada. It is a trivia game delivered as long-form entertainment with episodes lasting 25-35 minutes and changing daily. The length of the game is designed to match the average driving commute time of U.S. workers. In the game, players are challenged by trivia questions in three segments, each with an individual theme. Live game show hosts read the trivia and discuss both the answers and additional information around the thematic topic. The format is similar to a radio morning show but focused around trivia instead of music and each game is only available for a single day.

The company uses its own voice assistant and does not leverage Siri through iOS nor other voice assistants available in the car. This allows the company to tune the speech recognition system to accurately capture trivia answers from players. Drivetime.fm was founded in 2018 and launched the first game in November. The company is working on other game titles to bring to the car and is currently the only game studio focused on the driver experience.

Additional Resources



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