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THE CONNECTED-CAR REPORT: Forecasts, competing technologies, and leading manufacturers

John Greenough | February 12, 2015

BUSINESS INSIDER

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Key Points

- **The connected-car market is growing at a five-year compound annual growth rate of 45% — 10 times as fast as the overall car market.** We expect that 75% (or 69 million) of the estimated 92 million cars shipped globally in 2020 will be built with internet-connection hardware. That's up from 10 million connected cars shipped this year. Revenue from connected-car sales will reach $2.4 trillion in 2020.
- **But only about 40% of consumers who have internet connections in their cars will actually use the services.** Of the 220 million total connected cars on the road globally in 2020, we estimate consumers will activate connected services in 88 million of these vehicles.
- **In terms of the total installed base of automobiles, connected cars are still a minuscule slice.** By the end of 2015, only 3.4% of cars — 34 million of the more than 1 billion cars on the road globally — will be able to connect to the internet.
- **Connected-car vehicle prices are out of reach for most car buyers, but they will drop significantly in the next few years.** The current average selling price of $55,000 is driven by the fact

that connected-car shipments tilt toward the luxury category. We expect ASP to decline significantly over time and hit $35,000 by 2020.

- **Connected-car technology is now split between approaches that put the internet connection in the car and those relying on a secondary device.** Embedded connections don't require a phone's data plan to operate, and consumers and carmakers gain access to a wider variety of features and data.
- **Embedded connections will win, in part, because they offer two clear advantages to carmakers.** They allow auto companies to collect data on cars' performance and send updates and patches to cars remotely, avoiding recalls related to the car's software. The average car today has about 1 million lines of computer code, creating a vulnerability to software glitches. Fifty-six million cars were recalled in the US between January and October 2014, primarily for small problems like software patches.

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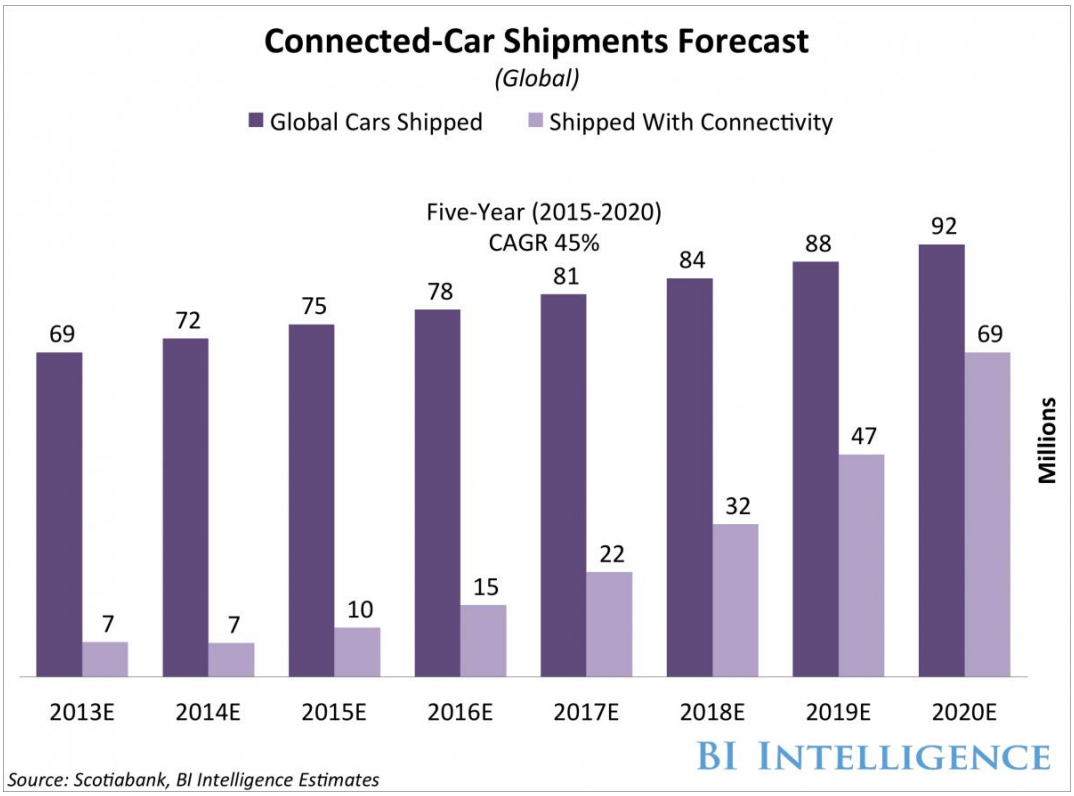
The connected-car market will be big but underused

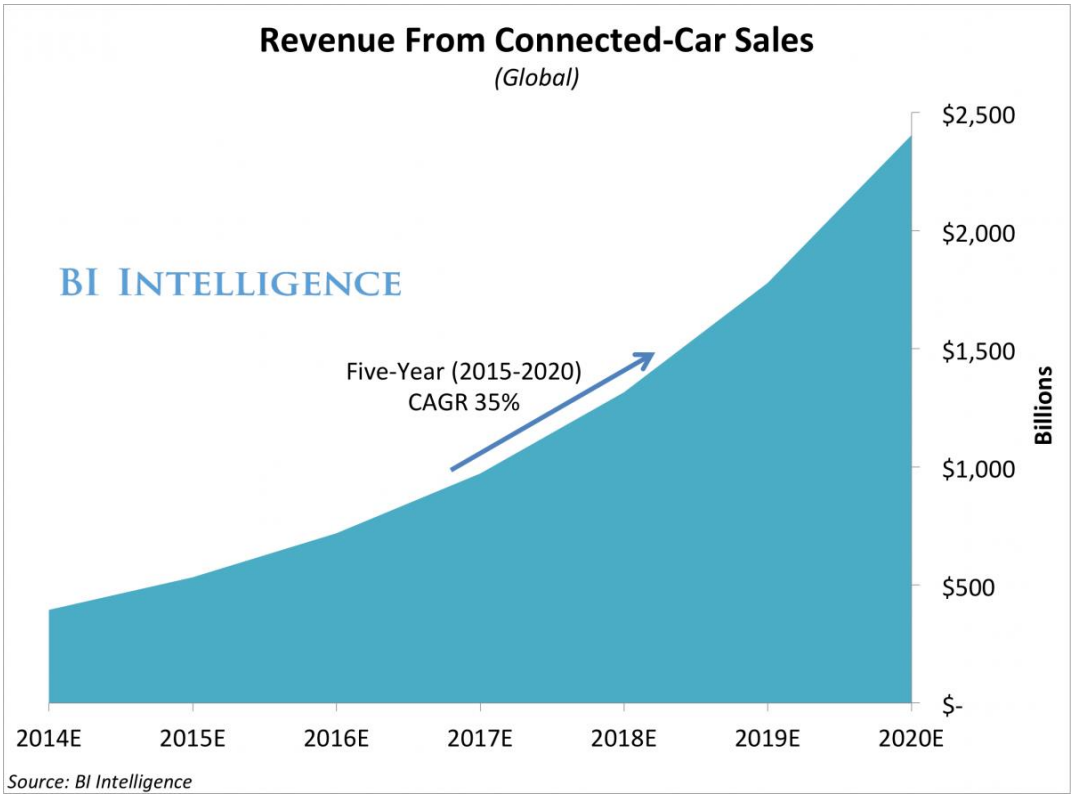


The connected-car market is in its infancy, but is set to take off over the next five years; automakers and tech companies have begun to partner to put features into our cars that we would normally use on smartphones.

Early connected-car users are being equipped with technology to stream music, look up movie times, be alerted of traffic and weather conditions, and even offer driving-assistance services such as self-parking. Effectively, car companies and tech companies are together beginning to turn the car into an extension of the mobile experience.

By 2020, we estimate that 75% of cars shipped globally will be built with the necessary hardware to connect to the internet.

- Using historical car-shipment data and a steady growth rate, which assumes a steadily growing economy, we estimate that about 92 million cars will be shipped globally in 2020.
- **By 2020, 69 million (75%) of cars shipped will be built with internet-connection hardware.** Some firms estimate that as many as 90% of cars shipped in 2020 will have internet connectivity. However, industry executives we have spoken with see a much slower progression because of significant technology barriers; it is simply not that easy to integrate connected-car technology with existing car technology. Further, the costs of installing connected-car systems are high, but these prices will begin to drop as data and SIM chips drop in price.



Our estimates show that revenue gained from selling cars equipped with connectivity will equate to $2.4 trillion globally in 2020.

We have calculated that the average selling price (ASP) in 2015 of a connected car is about $55,000, compared with the nonconnected car's ASP of $31,000.

The higher price point for connected cars is due to the added cost of providing connection capability, as well as carmakers' focus on connecting their luxury lineups first. The customer base for luxury cars is more willing to pay for connected services, whether through an up-front cost or a different pricing model, and thus is where manufacturers will focus their connected-car efforts, especially over the next few years.

Lineups of economy cars are increasingly becoming connected, however, and this should drive down the ASP over time. **Our estimates show that by 2020, the ASP of a car built with connectivity will be $35,000.**

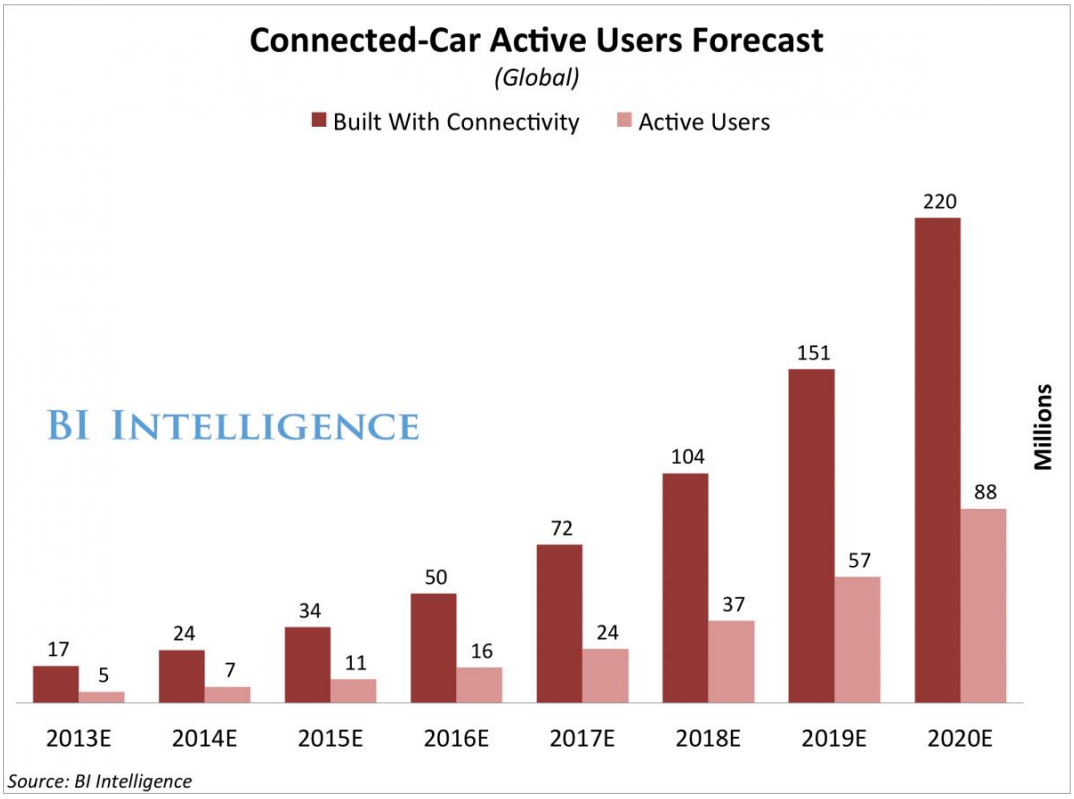
It is important to note, though, that the fact a car is built with connectivity does not mean consumers will actually use these services.

While buyers of new connected cars can typically use such services free for a short trial period, buyers often must then sign up for a data plan to continue accessing the features. For now, this is the most popular pricing model for connected services. We'll discuss other types of connected-car payment models later in this report.

- **In 2015, we expect consumers in just less than one-third of connected cars on the road to use the connected services available.**
- **In total, we estimate there will be 88 million active connected-car users by the end of 2020, out of 220 million connected cars that will be on the road by 2020.**

Executives we have spoken to tell us the conversion rate from free trials to active users is between 30% and 35%. Over time, we expect the conversion rate to rise as the data required to run connected-car apps becomes less expensive and consumer awareness — particularly in the American, European, and Asian markets — goes up.

By the end of this year, **we estimate that about 34 million cars will be on the road globally with the ability to connect to the internet.** This represents 3.4% of the more than 1 billion cars in use.



How we define the connected car

BI Intelligence's definition of a connected car is narrower than that of some other research firms. We consider a connected car to be a car that allows access and control of the internet through one of two means:

- **Tethered.** In this case, the internet connection is provided by tethering to one of the user's external internet devices, such as a smartphone. Typically, this is accomplished through Bluetooth or a USB plug that

connects with the phone or other external device. Apps with which the carmaker has a partnership are then called up on the vehicle's display console. To control the apps, drivers use the steering wheel or the vehicle's display, rather than the mobile device. The phone's real function is simply to serve as the internet-connection point. Data used by the car to power these apps draws off of a user's mobile data plan. Components within the car also rely on network technologies to relay information and data to one another.

Source: flickr/khelvan

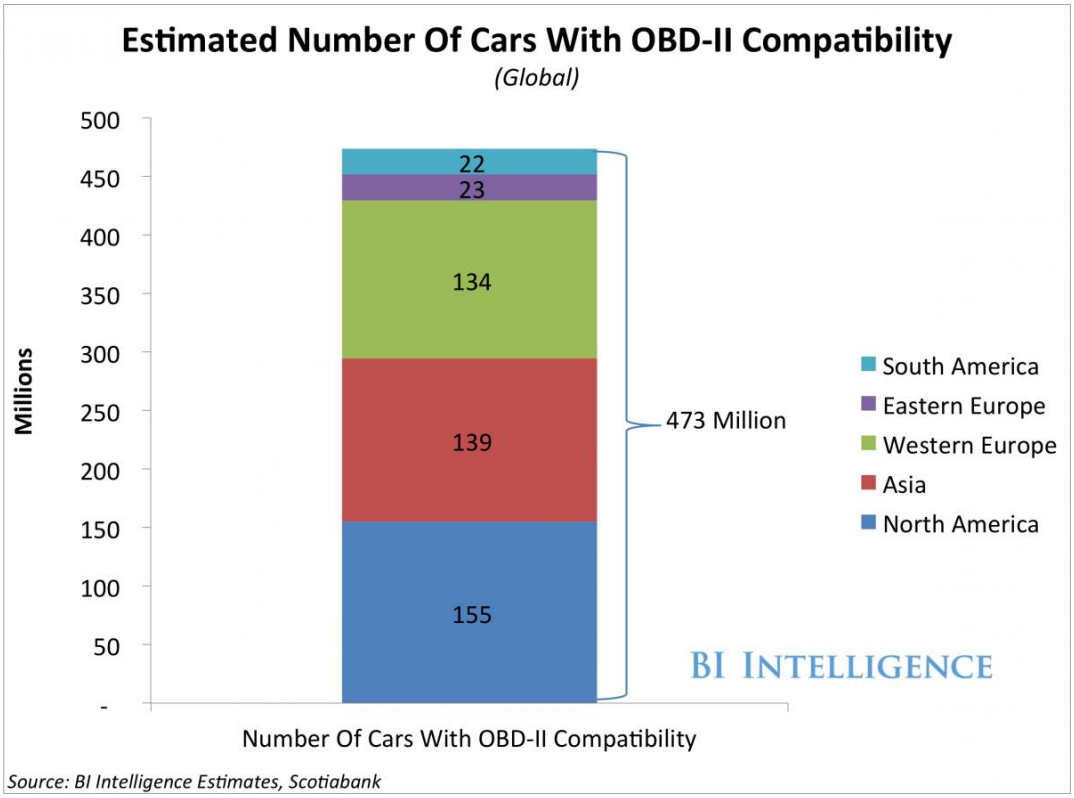
- **Embedded.** With an embedded connection, the internet connection is built into the car and powers everything from the applications to the user interface. It requires no external connection to another device and is powered by telephone companies, such as AT&T or Verizon. In this type of connected car, consumers can have a separate data plan specifically for the car or the cost of data can be included in an up-front price. We'll discuss data pricing models in more detail further on.

We do not include the following types of connection points in our definition of connected cars.

- **Integrated.** This is similar to tethering but the apps are controlled by the smartphone. The smartphone still uses the vehicle's speakers to project any in-app audio — such as to play music or provide directions. In addition, the entertainment console might display information such as what song is playing. But this type of connection is most similar to connecting a smartphone to a Bluetooth speaker and playing songs through it — a user would need the smartphone to interact with the associated music app to skip, pause, or play songs.
- **OBD-II Connected.** The OBD-II (On Board Diagnostic) port has been installed in all US cars manufactured since 1996, as well as many cars globally. When a diagnostic monitoring device (or "plug") is connected to the port it allows either the driver or an outside source to monitor the vehicle's activity — think Fitbit for your car. The plug, which looks like a large USB drive, once connected to the port does connect to the internet, but it does not offer additional services such as entertainment or directional assistance that we consider important connected-car services.

OBD-II plugs are most commonly associated with insurance companies, which offer the devices to consumers to monitor their driving habits over the course of a few months. Those who show through the device's data collection that they are safe drivers will, theoretically, be given better insurance rates.

Phone companies are also beginning to sell these devices to allow consumers to turn their car into a wireless hotspot.



But we do not include cars that are acting as Wi-Fi hotspots in our connected-car forecast, because no computing power is routed through the car. The car is simply used as a hotspot to connect one's laptop or phone to Wi-Fi.

We believe most OBD-II plugs still fall within the insurance category. We don't foresee OBD-II plugs that are provided by phone companies and retroactively installed in cars to be a large market primarily because of the associated cost and lack of perceived value. There does not seem to be wide demand for turning the car into a wireless hotspot, given that a phone can play the same role.

We estimate that 473 million cars on the road globally are compatible with OBD-II ports. Deloitte has estimated that there will be 22 million plugs shipped this year.

The connected-car technology that will win out

At the end of 2015, we estimate that there will be about 11 million active connected-car users on the road globally.

Today, tethering and embedding evenly split the market. However, more automakers are moving toward the embedded model, in which the wireless companies provide chips and data is offered through partnerships with the wireless networks.

Tethering became popular in 2009-2010, when automakers first became interested in connecting cars to the internet. At the time the allure to tethering, rather than embedding, was that embedding was costly and manufacturers assumed consumers would not be willing to pay for an extra data plan. However, tethering is being phased out for two primary reasons:

1. The cost of the wireless chips needed to embed cars with a mobile connection is dropping. The cost of data plans has also dropped, making embedded solutions the more viable option, because they do not drain a user's smartphone data plan, as tethering does.
2. More important, having a direct connection to the user's car (rather than running off of a plugged-in phone) means the carmaker can update software and collect data about the car's driving habits.

Although media reports and research firms have focused on the services consumers will gain through the connected car, car manufacturers actually stand to gain key internal benefits from increased embedded car connectivity, beyond upselling consumers.

1. **With internet connection built into the car's infrastructure, a car's software can be updated once it leaves the lot.** This is extremely important when there is a recall. For example, last year Toyota recalled 1.9 million Prius units because of a software glitch that could cause the warning lights to go on or off or tell the car to stop. The

firm needed to install a software patch manually on all cars. If all those cars had been connected, they would have been able to push that software patch to each of the cars remotely. This would have been a huge money saver for Toyota and would have resulted in less consumer frustration. Today's average car has about 1 million lines of code, creating a higher vulnerability to glitches requiring software patches. Between January and October 2014, about 56 million cars were recalled in the US alone, primarily for small problems including software patches, according to the Detroit Free Press.

2. **Carmakers can use data generated from monitoring the car's performance to understand how efficiently the car is operating and how the driver uses the car.** Connected cars will generate a huge amount of data on what is happening during the six and a half hours the average consumer spends on the road each week (just under one hour daily). That data can be used by carmakers to track performance and user behavior to make improvements to future models. If the carmaker notices that most of its cars are weighted poorly and consuming too much gas, it can make adjustments so that the next generation is more fuel-efficient. Carmakers currently do this through extensive testing of their vehicles.

Although a large number of consumers will not necessarily opt in to connected-car services, this will not necessarily limit car companies' ability to reach these cars when sending out a software update or seeking car-monitoring data. Executives at wireless companies have told us that carmakers will be able switch these data connections on and off to allow them to feed software updates to their cars as necessary. (Tesla bundles car monitoring and updates into its connected-car services, which are included in the up-front price of the car.)

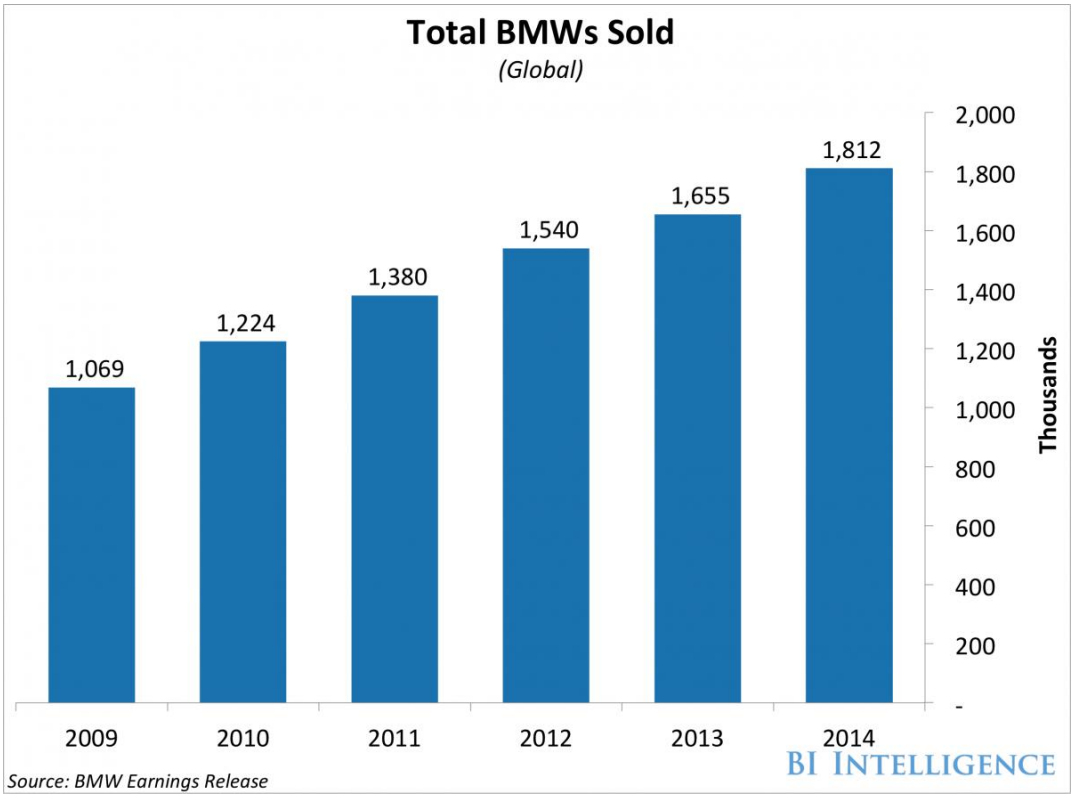
We do not expect tethering to be phased out altogether, but we do expect the method to increasingly lose a share of connections.

Wireless carriers have become major providers of data plans for embedded connections:

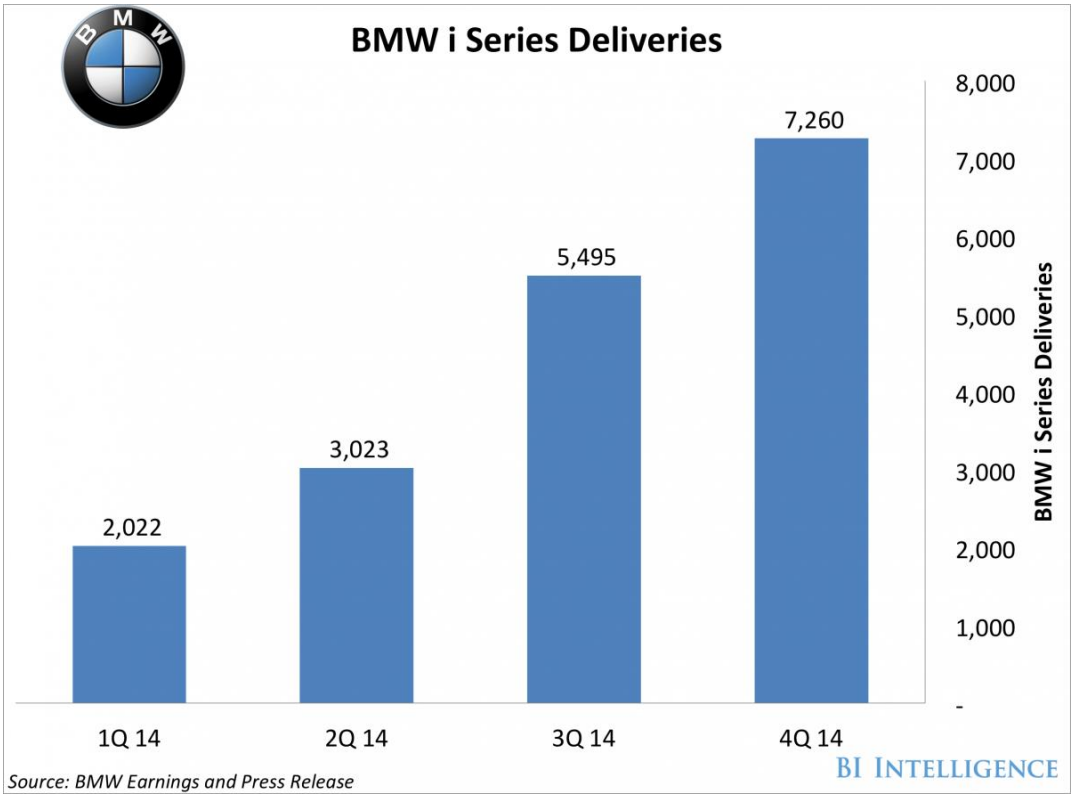
- Tesla is working with AT&T to provide remote engine diagnostics and infotainment features that include weather, internet browsing, live traffic, and navigation. The two companies have a multiyear agreement, according to a press release.
- Audi has three models (2015 Audi A3, S3, and Q3) connected to the internet through AT&T. The system acts as a Wi-Fi hotspot for up to eight devices and provides traffic information, weather, directions, Google Earth images, and other features directly through the car's internet connection.
- Honda uses Aeris Communications, a little-known wireless carrier, to power HondaLink and AcuraLink, the connected-car platforms for both of Honda's brands.

Today, carmakers are selecting only a few of their models to include embedded connections. In particular, they seem to be focusing on their high-end vehicles, as opposed to the economy car, for these services.

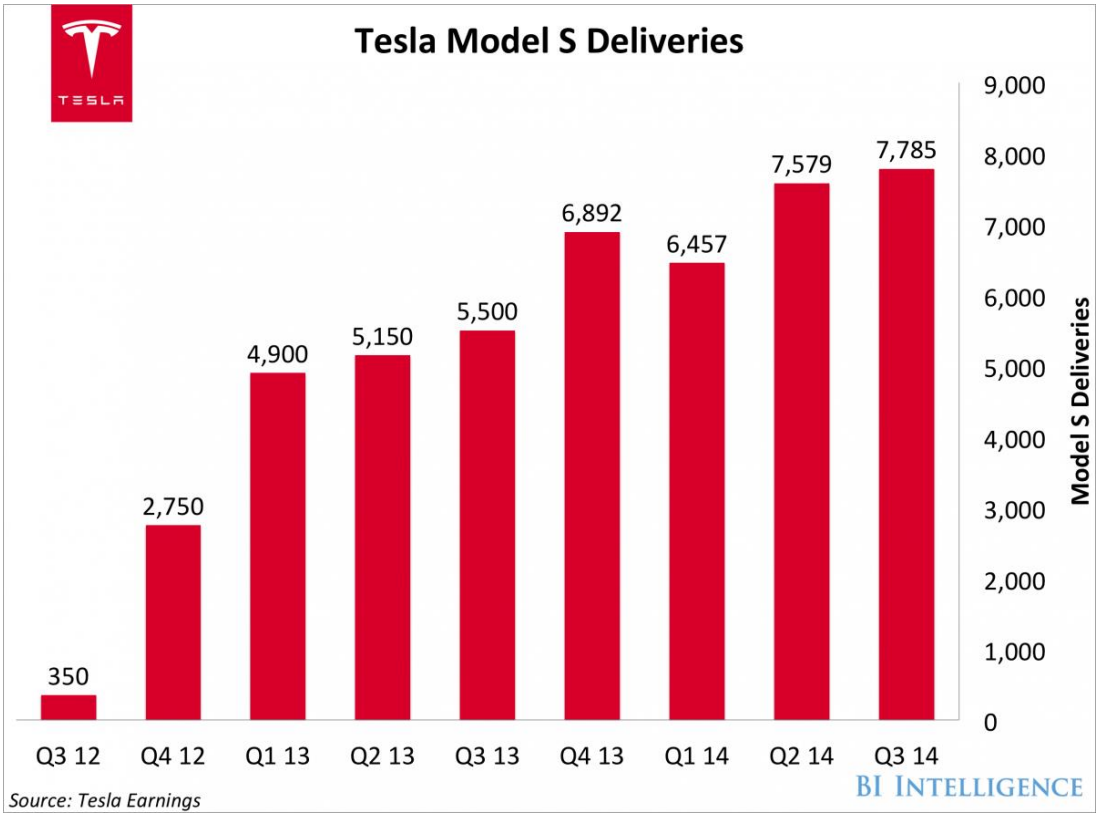
BMW has led the charge into embedding connections into cars rather than relying on tethering.



- BMW, which, like Audi, works with AT&T, has been a major player in the space and builds most of its cars throughout the world with SIM cards. One series in particular that it advertises as the connected car of the future is its "i" series, released in 2013. These cars come loaded with connected-car features, accessed through an embedded connection. This means it has all the features available through the company's ConnectedDrive platform, including remote locking and starting, BMW iNavigation (which shows traffic conditions and a topographic display of the route), as well as various music, social, and web-browsing integration, among many other features. The price of using these connected services for four years is built into the up-front cost of the car.



- The firm offers the i3 starting at $41,350 and the luxury i8 starting at $135,700. However, this series has not been successful, selling only 17,800 units last year, a fractional slice of the 1.3 million total cars BMW had sold during the same time period. By 2017, BMW expects to have about 5 million of its cars connected to its embedded ConnectedDrive platform.



- Tesla's Model S, a direct competitor to the BMW i series, is another electric car that comes fully loaded with connected-car features for four years and that has many of the same connected-car features as its competition. Despite the Model S' higher starting price of $69,000 and its difficulty selling cars because of its lack of car dealerships, Tesla was still able to deliver 28,713 Model S units globally in the first nine months of 2014, and it expected to deliver more than 35,000 by the end of the year. However, this remains a blip in the total number of the 72 million cars shipped globally in 2014.

THE BOTTOM LINE

- **The connected-car market is growing at a five-year compound annual growth rate of 45% — 10 times as fast as the overall car market.**
- **But only about 40% of consumers who have internet connections in their cars will actually use them.**
- **In terms of the total installed base of automobiles, connected cars are still a minuscule slice.** By the end of 2015, only 3.4% of cars — 34 million of the more than 1 billion cars on the road globally — will have the ability to connect to the internet.
- **Connected-car prices are out of reach for most of today's car buyers but will drop significantly in the next few years.**
- **Connected-car technology is now split between approaches that put the internet connection in the car and those relying on a secondary device.**
- **Embedded connections will win, in part, because they offer two clear advantages to carmakers.** They allow auto companies to collect data on cars' performance and send updates and patches to cars remotely, avoiding recalls related to the car's software.

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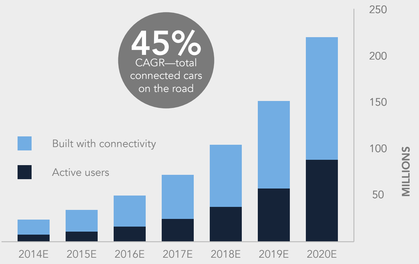
The Connected Car Market

220 MILLION

There will be 220 million connected cars on the road by 2020

But we estimate consumers will only use connected services in 88 million of those cars.



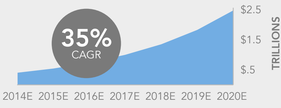
Revenue

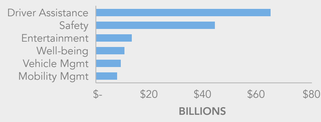
Sales of connected cars will equal $2.3T in 2020

The current average selling price of a connected car is much higher than the national average. That will drop as carmakers connect their economy lineups.

Connected car hardware and software will bring in $152B in 2020

Driver assistance systems, such as self parking features, will become more common and generate a lot of revenue for carmakers.

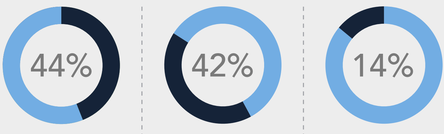




Consumer Perceptions

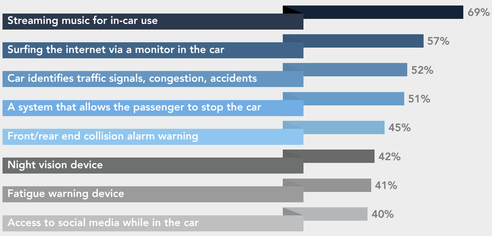
Most consumers are unaware of connected car features and services

44% of consumers have never heard of a connected car. Another 42% have heard of them but are not familiar with what they do.



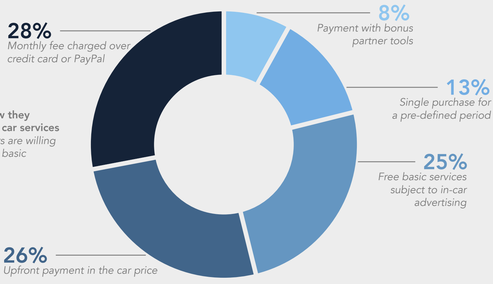
But they desire entertainment and safety features

Streaming music, like listening to Pandora or Spotify, is the most desired feature



Consumers are split on how they want to pay for connected car services

A large portion of consumers are willing to receive in car ads for free basic connected car services



Autonomous Cars

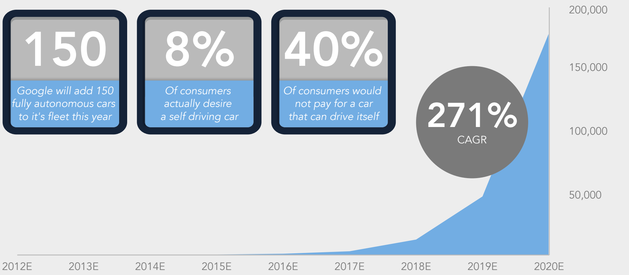
The next evolutionary phase after cars are connected

Shipments of autonomus cars are expected to top 180,000 by 2020

150
Google will add 150 fully autonomous cars to it's fleet this year

8%
Of consumers actually desire a self driving car

40%
Of consumers would not pay for a car that can drive itself



Players *(Select companies)*

Nearly all car makers and communication companies are entering the connected car market

Digital companies are aiding them by providing connected car software and apps

Car Makers

ACURA · Audi · BMW · Ford · Honda · Mercedes-Benz · TESLA · Toyota

Communications

Aeris COMMUNICATIONS · at&t · Jasper · SIERRA WIRELESS · verizon

Software

BlackBerry · Google · PANDORA · Spotify · yelp

Sources: BI Intelligence, Strategy&, Harris Poll Interactive 2014, Accenture, Deloitte, Frost & Sullivan

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