

THE AUTONOMOUS MOBILITY ECOSYSTEM

HOW AUTOMAKERS CAN COMPETE IN THE
FUTURE OF MOBILITY

March 2018

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KEY POINTS

- **New methods of transportation — like on-demand rides and car rental services — are posing a serious threat to the traditional car ownership model.** Uber and China's Didi Chuxing are the world's two most highly valued startups, each boasting a valuation of about \$50 billion, while younger ride-hailing startups Lyft and Grab have already achieved valuations of \$11 billion and \$6 billion, respectively. Altogether, global investments in alternative on-demand rides services since 2010 have topped \$36 billion, McKinsey [estimated](#) late last year.
- **Automakers have started to respond to the shift in consumer transportation habits by monetizing mobility services, either through partnerships or by launching their own services.** Several of the largest global automakers now have entire divisions focused solely on mobility services, such as GM's Maven car-sharing unit, Ford's Smart Mobility Group, and Daimler's Moovel subsidiary, which includes Car2Go and its fast-growing MyTaxi ride-hailing service.
- **But competing in the mobility services market won't be an easy feat for legacy automakers.** Operating autonomous ride-hailing services at scale will require automakers to shift their operations, and quickly gain new skills that Uber and other mobility startups have already spent years mastering. Automakers will certainly be able to supply the vehicles for autonomous ride-hailing fleets, but they will also need to lure customers.
- **Mobility fleets should be a priority for automakers looking to compete in the space.** Automakers are already outfitting their car-sharing services' fleets with updated vehicle models stacked with new features. GM's Maven, for instance, equipped all the vehicles in its fleet with the automaker's latest infotainment options — including Android Auto and Apple CarPlay — as well as its OnStar concierge service.

- **But operating fleets of self-driving cars will be a new challenge for automakers.** Maintaining those fleets and maximizing their uptime will be central to making them profitable. Companies looking to launch autonomous mobility services are starting to form partnerships for this purpose.
- **Besides maximizing uptime of their self-driving fleets, automakers will need to ensure that their fleets are actually being used by customers and generating revenue.** That will likely be a challenge at first, given public mistrust of self-driving cars. To compensate for that — and to account for periods when ride-hailing demand declines — automakers will look to perform deliveries with their autonomous mobility fleets.
- **While most automakers are banking on self-driving cars to help them take a share of the mobility market, alternative mobility services could also prove lucrative.** On-demand bus or shuttle services that can ferry more passengers per vehicle could prove successful in certain markets, where growing concerns about traffic congestion and resulting air quality issues have led cities to [consider](#) restricting the number of for-hire cars on the road. Other cities have also started implementing measures like car-free [zones](#) in recent years.
- **Nevertheless, making the transition from product-centric businesses to service-centric ones will be difficult and painful for traditional automakers.** This will be compounded by competitive, regulatory, and consumer acceptance challenges. Not every automaker will succeed in making that transition, and some of them won't have to make it as quickly as others — or at all.

[Download the charts and associated data in Excel »](#)

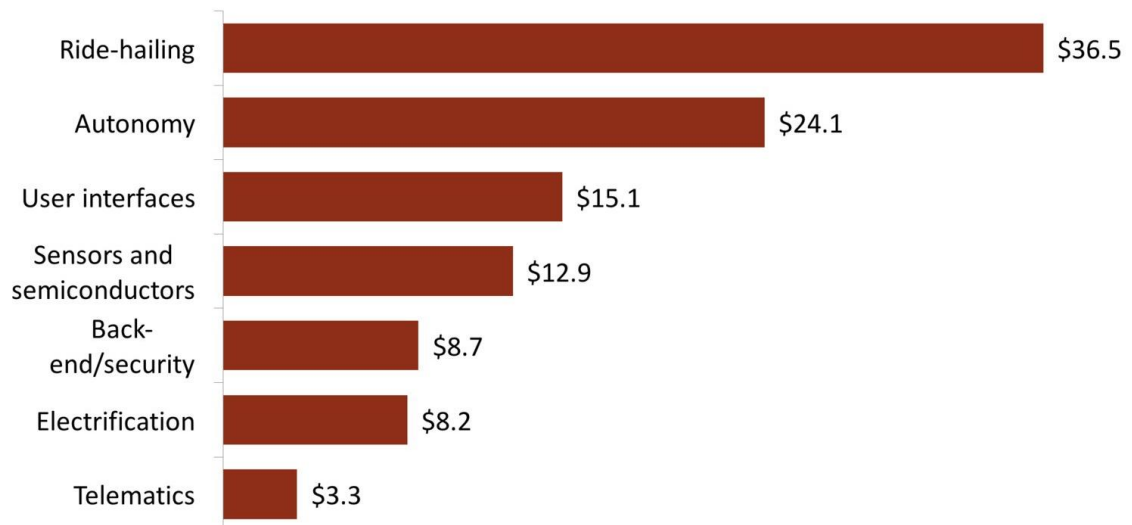
INTRODUCTION

The traditional car ownership model is in the very early stages of a fundamental disruption. New methods of transportation — like on-demand rides and car rental services — are presenting consumers with alternatives to using personally owned vehicles. Those alternatives have caught on in many markets, as evidenced by the enormous valuations that ride-hailing startups have achieved in recent years — valuations largely based on the expectation that these startups will disrupt the consumer transportation space.

Uber and China's Didi Chuxing are the world's two most highly valued startups, each boasting a valuation of about \$50 billion, while younger ride-hailing startups Lyft and Grab have already achieved valuations of \$11 billion and \$6 billion, respectively. Altogether, global investments in alternative on-demand rides services since 2010 have topped \$36 billion, McKinsey [estimated](#) late last year.

Global Investment In Different Types Of Mobility Technologies Since 2010

Billions (\$)



Source: McKinsey, 2017

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These new players have been able to scale their services rapidly thanks to their low capital investments and reliance on mobile devices, as well as the ubiquity of personally owned vehicles. This has driven the rapid development of new types of services that fall within the category of mobility, including the following:

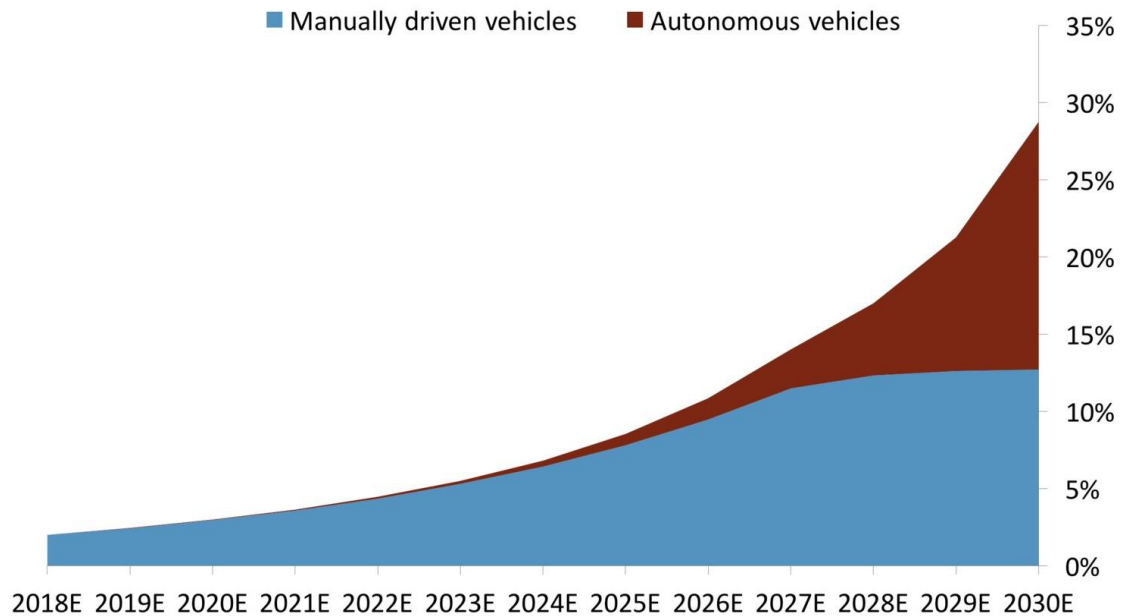
- **Ride-hailing:** This service allows users to order an on-demand ride through a mobile app, and has been popularized by the startups mentioned above.
- **Ride-sharing:** This is a shared, carpooling version of ride-hailing that allows users to book seats on shared cars. Ride-hailing companies, like Uber and Lyft, and companies that focus solely on affordable on-demand rides, like startup Via, offer such services.
- **Car-sharing:** This service moves the traditional car rental model online, allowing users to rent a vehicle for a period of time through a mobile app. Daimler's Car2Go and Zipcar both offer car-sharing services to millions of users. Newer startups like Turo are bringing the peer-to-peer model to car-sharing, allowing everyday car owners to rent their cars to other consumers when they aren't using them.

Major Ride-Hailing/Car-Sharing Startups										
Company:	Uber	Lyft	Grab	Didi Chuxing	Via	Gett	Getaround	Ola	Turo	Careem
Services:	Ride-hailing, sharing	Ride-hailing, sharing	Ride-hailing, sharing	Ride-hailing, sharing	Ride-sharing	Ride-hailing, sharing	P2P car-sharing	Ride-hailing, sharing	P2P car-sharing	Ride-hailing, sharing
Founded:	2009	2012	2012	2012	2012	2010	2009	2010	2009	2012
Most recent valuation:	~\$50 billion (2018)	\$11 billion (2017)	\$6 billion (2017)	\$56 billion (2017)	\$500 million (2017)	~\$1 billion (2016)	\$131 million (2017)	\$7 billion (2017)	Not disclosed (2017)	\$1 billion (2017)
Markets:	700+ global cities	300+ N American cities	~150 cities in SE Asia	400+ cities in China	4 US cities	100+ global cities	13 US cities	110 Indian cities	4,500 US towns and cities	50+ cities in Asia & Africa
Source: BI Intelligence, Crunchbase , company sources, 2018										
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The growth of these services shows no signs of abating, presenting traditional automakers with both opportunities and challenges. Sixty-seven percent of consumer respondents said they plan to increase their use of mobility services over the next two years, according to McKinsey's report from last year. The proliferation of new mobility players and services will only lead to greater price competition, giving consumers more options to get to a given destination without using their own car. Automakers have started to respond to this shift in consumer transportation habits by monetizing mobility services, either through partnerships or by launching their own services. Several of the largest global automakers now have entire divisions focused solely on mobility services, such as GM's Maven car-sharing unit, Ford's Smart Mobility Group, and Daimler's Moovel subsidiary, which includes Car2Go and its fast-growing MyTaxi ride-hailing service.

However, the introduction of self-driving cars, which legacy automakers are spending billions on developing, will cause mobility services to skyrocket in terms of adoption and usage, presenting a dangerous threat to traditional automakers. By 2030, Business Insider Intelligence expects autonomous vehicles operated by on-demand mobility services to make up 16% of the ~4 trillion miles driven in the US, up from ~3.5 trillion today. That will outstrip the total share of miles driven by human drivers for such services, which we estimate will be just under 13% of all US miles driven, up from approximately 2% of US miles driven in 2018.

On-Demand Mobility Services' Share Of Total Miles Driven In US



Source: BI Intelligence estimates, 2018

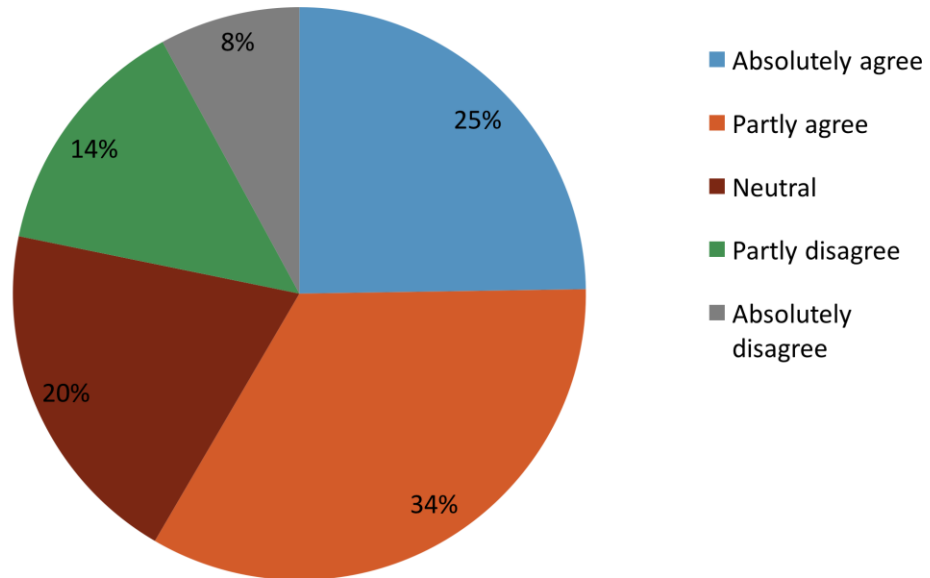
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In this report, Business Insider Intelligence delves into the future of the on-demand mobility space, focusing on how automakers will use fleets of self-driving vehicles to break into an emerging industry that's been dominated thus far by startups like Uber and Lyft. We examine how the advent of autonomous vehicles will reshape urban transportation, and the impact it will have on traditional automakers. We then detail how automakers can leverage their core strengths to create new revenue sources with autonomous mobility services, and explore the key areas they'll need to gain new skills and capabilities to compete with mobility startups and tech giants that are also eyeing this opportunity.

THE DISRUPTION OF CAR OWNERSHIP

Share Of Auto Industry Executives Expecting Major Car Ownership Disruptions

Q: Do you agree that half of today's car owners will no longer want to own a car in 2025?

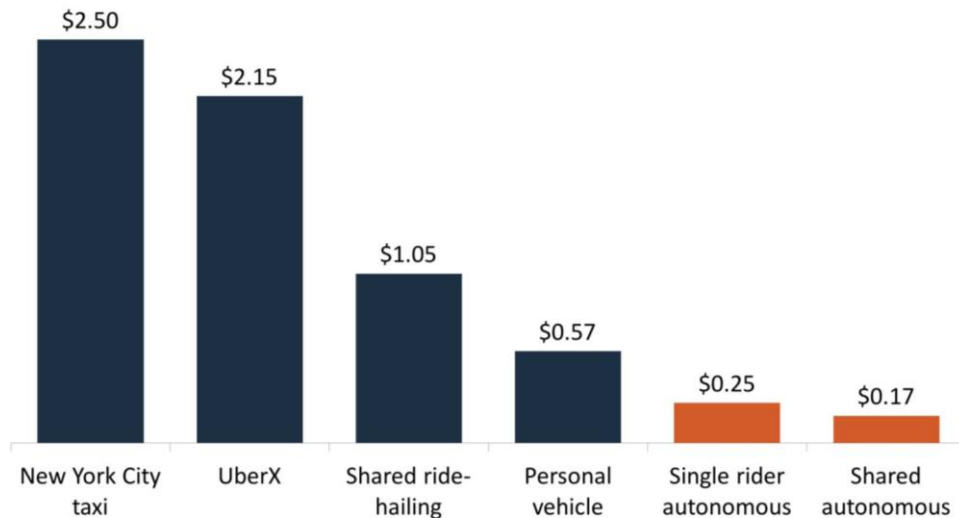


Source: KPMG, n= 953 auto execs, 2017

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The imminent arrival of self-driving cars will significantly cut costs for on-demand mobility services and, consequently, upend the way automakers have traditionally done business. Business Insider Intelligence has previously estimated that a ride in a driverless on-demand taxi would cost as little as \$.25 per mile, which is roughly in line with other firms' estimates. In contrast, a ride with UberX, Uber's lower-cost peer-to-peer (P2P) ride-hailing service, costs \$2.15 per mile on average, and a New York City cab ride costs \$2.50 per mile.

Estimated* Cost Per Mile Of Vehicle Services For US Consumers



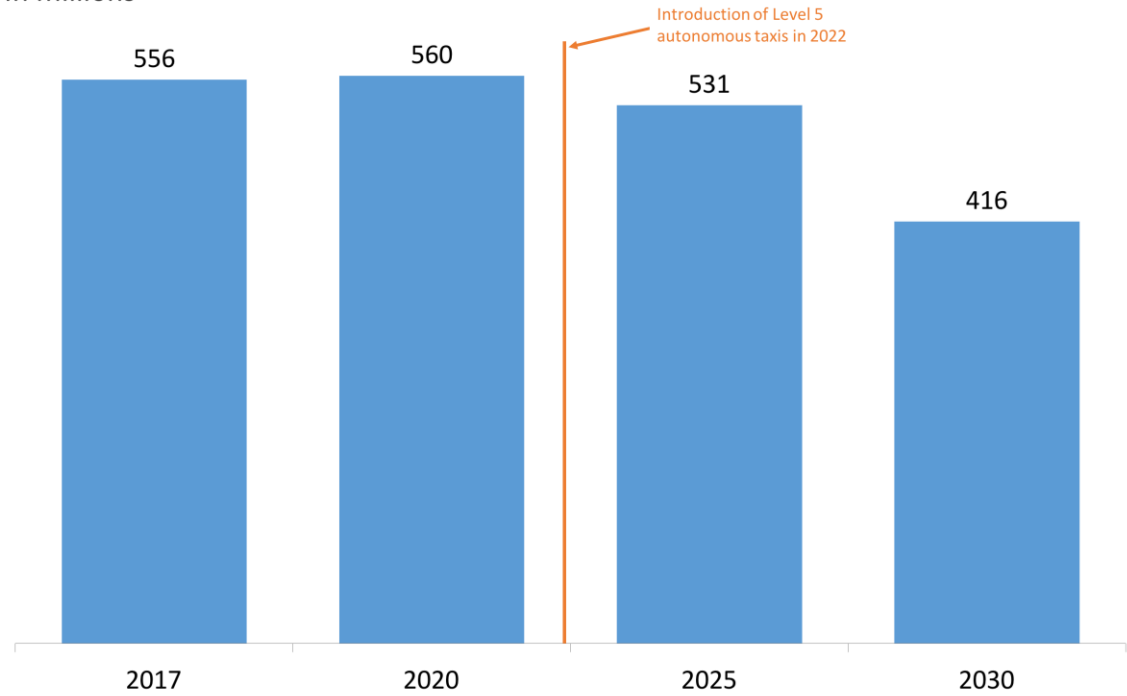
*Data is from 2015-2016
Source: BI Intelligence estimates, Taxi Fare Finder; Uber; Lyft; Via; Gett; AAA; Goldman Sachs; Morgan Stanley

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That cost per mile for driverless taxis would also be lower than the average cost per mile of vehicle ownership in the US. AAA [estimates](#) that the average cost of owning a mid-size sedan that traveled 15,000 miles per year was \$8,171 in 2017, or 54 cents per mile driven. The lower cost of autonomous mobility services is likely to lead to gradual but significant declines in car ownership in urban areas, in particular, where parking fees, insurance, and other costs tend to be higher. Additionally, the value proposition of owning a car in major metropolitan areas is already defrayed by the availability of public transportation, which allows urbanites to use their personal vehicles less often. As urban consumers opt to use cheap autonomous mobility services over personally owned vehicles, new car sales for automakers, and overall number of cars on the road, will decline. The total number of cars on the road in the US and EU will peak around 2020 at 560 million, according to PwC predictions in a report released last year, and then decline to 531 million in 2025 before hitting 416 million in 2030 as autonomous mobility services spread throughout these geographies.

Total Projected Vehicle Base Of EU And US

In millions



Source: PwC, 2017

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BREAKING INTO MOBILITY

Automakers are looking to harness their own investments in developing autonomous vehicles to replace revenue lost from lower car sales. Some automakers already operate mobility services with millions of users, and could leverage their investments in self-driving car technologies to offer their own low-cost, on-demand mobility options. These existing ride-hailing and car-sharing services both help automakers gain a foothold in the mobility space and understand how they can compete in that space with companies like Uber and Lyft. That will help automakers find ways to monetize their investments in self-driving technologies through autonomous mobility services once self-driving cars are ready for market. The earliest iterations of those autonomous mobility services will come to market soon.

- Google spinoff Waymo is already [testing](#) autonomous vehicles without a driver behind the wheel in the Phoenix area, where the company also has an Early Rider [program](#) that allows consumers to order rides from the company's self-driving vehicles. These are preliminary steps to a commercial autonomous ride-hailing service that Waymo may launch in the area by the end of this year.
- Additionally, both [GM](#) and [Uber](#) have publicly stated that they expect to launch self-driving vehicles in ride-hailing fleets in 2019.

At first, these vehicles will feature Level 4 autonomy — meaning they can only drive themselves in certain scenarios, such as in pre-mapped areas. As more parts of cities around the world are mapped, and self-driving technology improves to handle inclement weather and other challenging road conditions, it will give way to Level 5 autonomous taxis that can drive themselves in any scenario, allowing self-driving cars to service more areas and rides.

While no automaker today has a mobility service that rivals the largest startups in this space, like Uber or Didi Chuxing, in terms of revenue or customers, several of them boast growing services with a significant following. Some of those services compete with Uber and other mobility startups, while others have helped traditional automakers monetize the popularity of those startups. Daimler, for instance, owns MyTaxi, a ride-hailing app that competes with Uber in several European markets and counted 11.1 million users as of the end of 2017. Additionally, the German auto giant owns Car2Go, the world's largest car-sharing service, which had 3 million users at the end of last year. Meanwhile, Maven, GM's car-sharing unit, which operates a fleet of more than 10,000 vehicles for rental, has leased its vehicles out to ride-hailing companies, as well as to individual Uber and Lyft drivers, through its Gig program. Altogether, Maven's fleet of 10,000 car-sharing vehicles has driven more than 170 million miles and provided more than 17.5 million rides for Uber and Lyft customers.

Major Automakers' Mobility Services						
Service (Automaker)	Chariot (Ford)	MyTaxi (Daimler)	Car2Go (Daimler)	Maven (GM)	ReachNow/ DriveNow (BMW)	Sunfleet (Volvo)
Type of service:	On-demand shuttle bus	On-demand taxi	Car-sharing	Car-sharing	Car-sharing	Car-sharing
Fleet capacity:	112 routes globally	More than 125,000 drivers	14,000 vehicles	10,000 vehicles	More than 7,000 vehicles	More than 1,200 vehicles
User base:	More than 100,000 monthly users	11 million	3 million	75,000	More than 1 million	More than 50,000
Geographical footprint:	San Francisco, NYC, Austin, Seattle, London	70 cities worldwide	26 cities worldwide	17 North American cities	ReachNow: 3 US cities, DriveNow: 13 European cities	50 cities in Sweden
Source: BI Intelligence, company sources, 2018				BI INTELLIGENCE		

Providing vehicles for ride-hailing companies will become an even bigger opportunity for automakers once self-driving cars hit the road, and ride-hailing companies start looking to purchase self-driving cars for their networks.

This was illustrated last November when Uber [agreed](#) to purchase up to 24,000 XC90 sport utility vehicles (SUVs) from Volvo that will be equipped with Uber's self-driving sensor and software package, in a deal that could be worth up to \$1 billion for Volvo. Waymo similarly [agreed](#) to purchase "thousands" of vehicles from Chrysler for its coming autonomous ride-hailing service.

These types of deals will certainly prove lucrative for automakers, but many of them, including [Ford](#) and [GM](#), have also voiced their intention to provide their own on-demand ride-hailing services with autonomous vehicles. GM, for instance, is already testing autonomous vehicles in San Francisco in a ride-hailing service exclusively available to employees of its Cruise autonomous division.

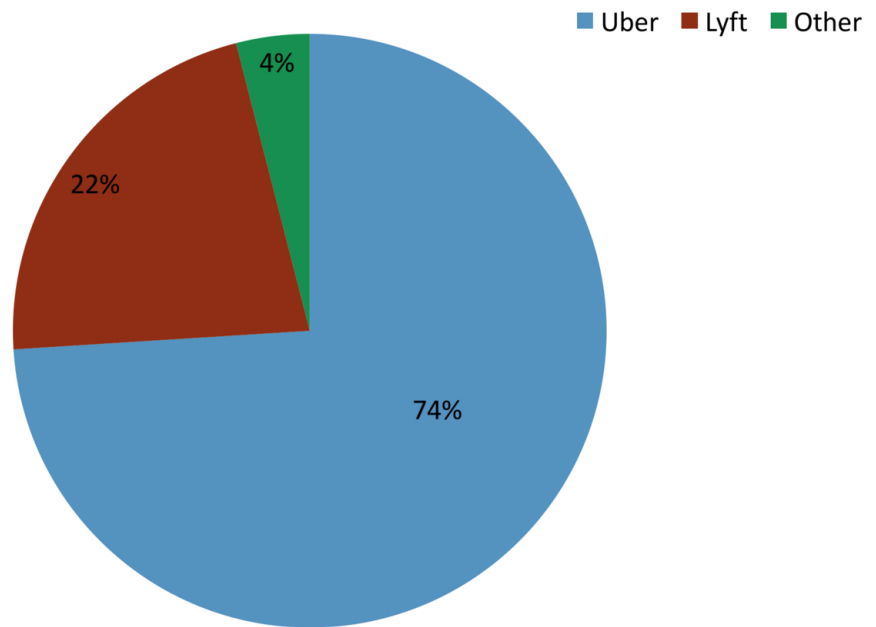
The introduction of fleets of self-driving taxis will allow automakers to break into the mobility market by leveraging their core vehicle manufacturing competencies to build those fleets and potentially take market share from the likes of Uber and Lyft. In comparison, newer upstarts have no means to manufacture their own self-driving cars, and must partner with automakers that can supply those vehicles. This will give major automakers a clear path to quickly scale up fleets of autonomous cars for rides by doing what they've always done: manufacture cars at scale.

New Challenges

Automakers will still face enormous challenges in competing in the mobility services market. Operating autonomous ride-hailing services at scale will require these organizations to shift their operations and quickly gain new skills that Uber and other mobility startups have already spent years mastering. Automakers will certainly be able to supply the vehicles for autonomous ride-hailing fleets, but they will also need to lure customers.

US Ride-Hailing Market Share

**As of September 2017*



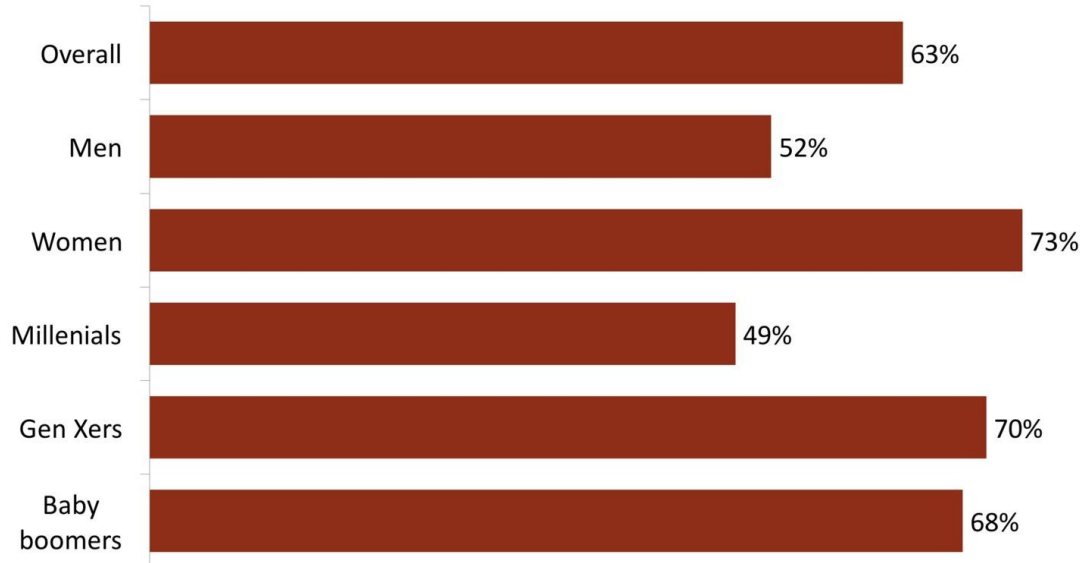
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Source: Second Measure, 2017

Automakers will need to convince consumers that autonomous vehicles are safe. While the expected low costs of autonomous on-demand rides will provide a monetary incentive for consumers, a recent [survey](#) of US consumers by AAA found that 63% of the respondents would be afraid to ride in a self-driving car, and only 28% would feel safe enough to ride in one. All players in the autonomous mobility space will need to overcome that negative perception of self-driving vehicles' safety.

Many US Drivers Wouldn't Trust Fully Autonomous Vehicles

Percentage of US Drivers who would be afraid to ride in a fully self-driving vehicle.



Source: AAA, n=1,004, 2018

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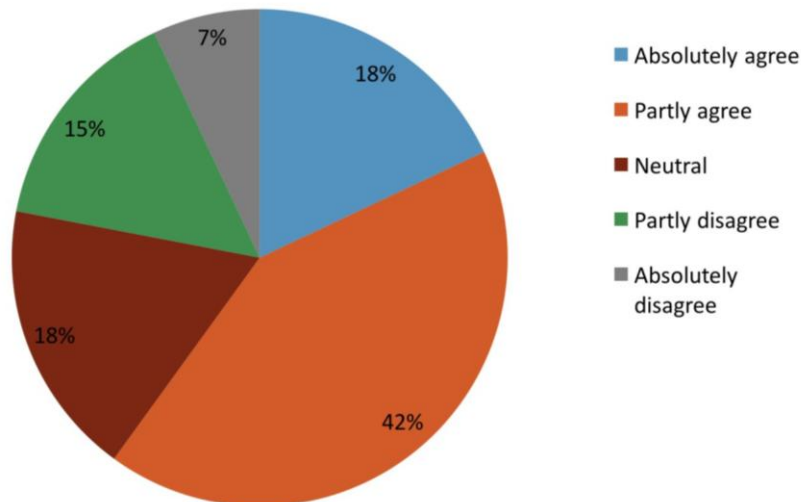
Automakers will have to learn how to digitally acquire customers and keep them engaged. Uber and other ride-hailing apps have now spent years fostering loyal user bases numbering in the millions that primarily interact with these brands through smartphone apps. This is something automakers are just starting to learn how to do. Traditionally, automakers have relied on networks of independent auto dealerships to handle the customer relationship. To compete in the mobility services space, they'll need to manage that relationship on their own by first convincing users to download their apps, and then getting them to frequently use those services.

This will likely be a tall task given that these services will operate in urban areas, where ride-hailing startups already have significant followings. An analysis of credit card data [released](#) by Second Measure last year found that only 10% of ride-hailing users in the US use both Lyft and Uber, meaning riders generally use one ride-hailing service exclusively. While that will likely change over time as more mobility options proliferate, it indicates that automakers will need to break that habit to gain many mobility customers.

That means automakers will need to create unique value propositions for mobility customers, which they can do in a number of ways. Since they'll be manufacturing the vehicles themselves, automakers will have the ability to innovate on the in-car experience to differentiate themselves from existing ride-hailing and car-sharing services. Sixty percent of consumer respondents to a KPMG [survey](#) last year partly or absolutely agreed that they would only be interested in what they could do with their time inside a self-driving car when buying one. Creating a desirable and differentiated in-car experience could therefore provide a potential edge for automakers' autonomous rides services as well.

Global Consumers' Interest In Self-Driving Cars' In-Car Experience

Q: Do you agree that when buying a self-driving car you'd only be interested in what can be done with time in the car?



Source: KPMG, n= 2,418 consumers, 2017

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Emerging Strategies

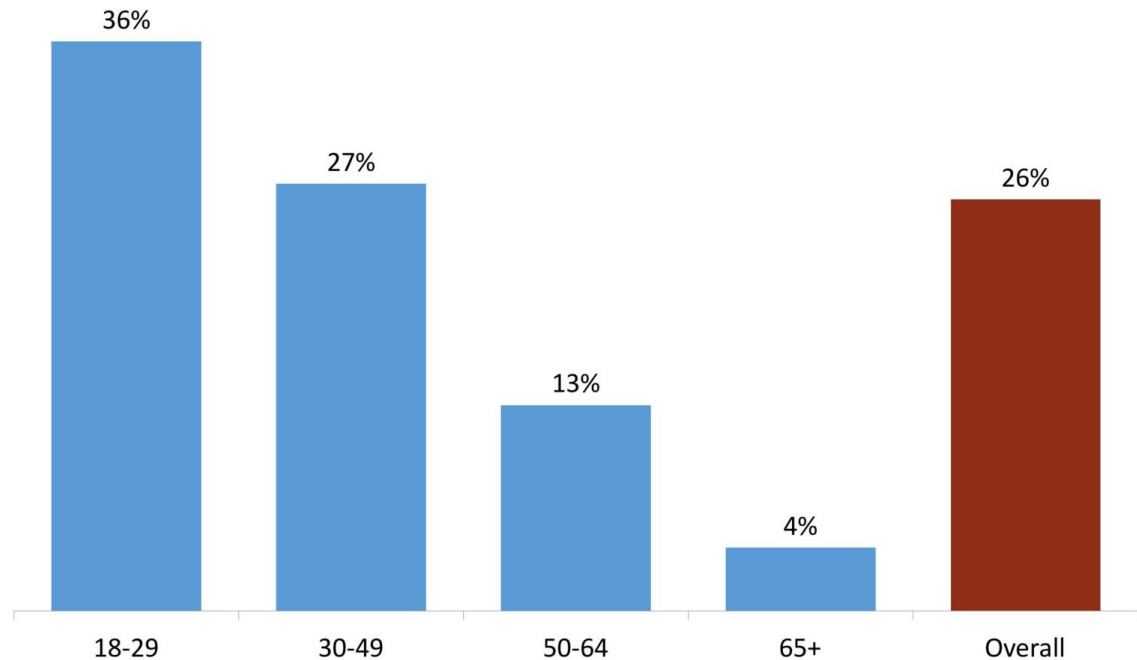
Rethinking the in-car experience for autonomous connected cars destined for mobility fleets should be a priority for automakers looking to compete in that space. Automakers are already outfitting their car-sharing services' fleets with updated vehicle models stacked with new features. GM's Maven, for instance, equipped all of the vehicles in its fleet with the automaker's latest infotainment options — including Android Auto and Apple CarPlay — as well as its OnStar concierge service.

In the future, riders in autonomous taxis could spend their rides surfing the internet, streaming music and video, or shopping online through screens and platforms that automakers build into their vehicle fleets. GM [launched](#) a new e-commerce platform last year that allows passengers to browse and purchase items through their in-car dashboards. Such services will provide passengers in autonomous taxis with new ways to entertain themselves during rides, and can give automakers' ride-hailing services a distinguishing customer experience. It could also potentially create new revenue opportunities; GM said it would take a share of revenue from purchases made through its e-commerce platform.

Over time, the introduction of more connected and autonomous technologies to vehicles will open up opportunities for further differentiation through new vehicle designs. Design firm IDEO [unveiled](#) a concept for a four-pod autonomous electric taxi made specifically for ride-sharing last March, for example. The concept design featured personal screens for each individual passenger, swiveling chairs, and noise canceling technology to help passengers nap.

Competing in the mobility space will also force automakers to learn new strategies for acquiring and engaging with customers strictly through smartphone apps, an area where they have little experience. This will be imperative to keep customers coming back and frequently using their services. Uber, Lyft, and other ride-hailing startups have been building expertise in this area for years, learning how to market to consumers through app stores, improving app usability, and using data and analytics to improve app engagement. Automakers will need to develop mobile app strategies that provide differentiated user experiences to give users an incentive to download and use their apps.

US Ride-Hailing Adoption, By Age Group



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Source: UC Davis, n=4,094, 2017

One such example is Daimler's Moovel app, which allows users to search for and book trips across a number of different transportation options, including public transportation, ride-hailing, bike-sharing, and car-sharing services. Daimler includes some of its own mobility services, like MyTaxi and Car2Go, in the app, and also white labels the app to city transportation authorities to use as a one-stop app for residents' transportation needs.

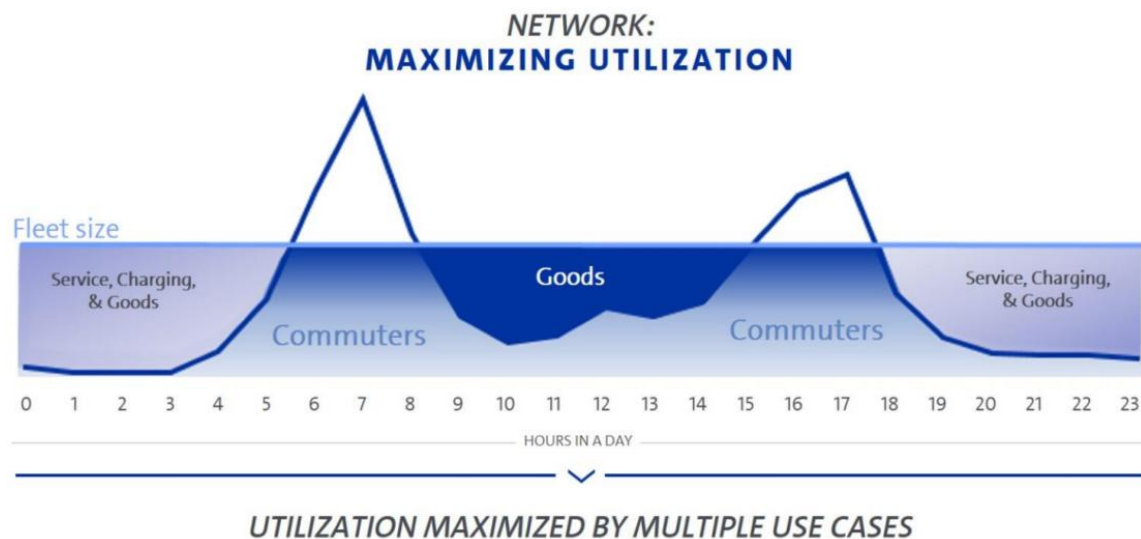
This sets the app apart from those offered by other companies by providing a far greater array of services that can be booked together with a single payment mechanism. Data collected through the app can also inform Daimler's launches and expansions of various services. It used search data from the app to plan routes for its recent test pilot of an on-demand shuttle service, dubbed Moovel Flex, in Stuttgart, Jörg Lamparter, head of Daimler's Mobility Services division, recently told Business Insider Intelligence. Managing and analyzing user information to understand behaviors and demand patterns in this fashion will be a critical skill set to compete in the mobility space, and one that automakers are still developing.

Additionally, operating fleets of self-driving cars will be a new challenge for automakers. Maintaining those fleets and maximizing their uptime will be central to making them profitable. Companies looking to launch autonomous mobility services are starting to form partnerships for this purpose. Waymo [formed](#) a multi-year service agreement late last year with car repair chain AutoNation to provide maintenance for its self-driving cars once they hit the road. Former startup STRATIM, which was acquired this past month by KAR Auction Services, has also partnered with a number of mobility services, including GM's Maven and Ford's Chariot on-demand shuttle bus service, to provide maintenance alerts for their vehicles and connect them with local car repair businesses through an online marketplace.

Ensuring proper maintenance and uptime of vehicles will grow exponentially harder as companies scale their autonomous ride-hailing fleets, Sean Behr, STRATIM's co-founder, told Business Insider Intelligence last month. Large-scale autonomous ride-hailing fleets, like those that Uber and Waymo are seeking to deploy, will likely have to maintain upwards of 500,000 vehicles across dozens of markets, according to STRATIM's projections. Every vehicle sitting idle in the repair shop will represent lost revenue opportunities, which will be particularly painful in huge urban markets where there will likely be intense price competition among a bevy of providers, leading to low margins. Using vehicle data and predictive maintenance algorithms to avoid major repair issues will therefore be important for the bottom line.

Banking On Delivery

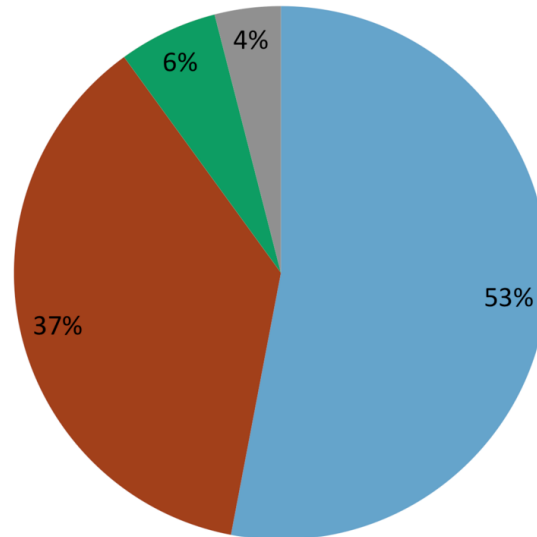
Besides maximizing uptime of their self-driving fleets, automakers will need to ensure that their fleets are actually being used by customers and generating revenue. That will likely be a challenge at first, given public mistrust of self-driving cars. To compensate for that — and to account for periods when ride-hailing demand declines — automakers will look to perform deliveries with their autonomous mobility fleets. GM recently outlined this vision in an investor presentation (see image below), predicting that its autonomous cars would focus on rides during rush hours, and then deliver packages when demand slows. Ford has also said it would use its autonomous fleets for deliveries, and [tested](#) pizza deliveries using self-driving cars with Domino's last year.



Accelerating e-commerce growth has created a growing need to cut costs in last-mile deliveries. McKinsey [estimated](#) that global spending on last-mile deliveries totaled \$86 billion in 2016, with annual growth rates in mature European and North American markets of 7-10%. Automakers' autonomous vehicles could help address those fast-growing delivery costs, as McKinsey estimated that automating last-mile deliveries with self-driving vehicles would reduce costs by 40%.

Share Of Delivery Costs, By Part Of Journey

■ Last-mile delivery ■ Line haul ■ Sorting ■ Collection



Source: Honeywell, 2016

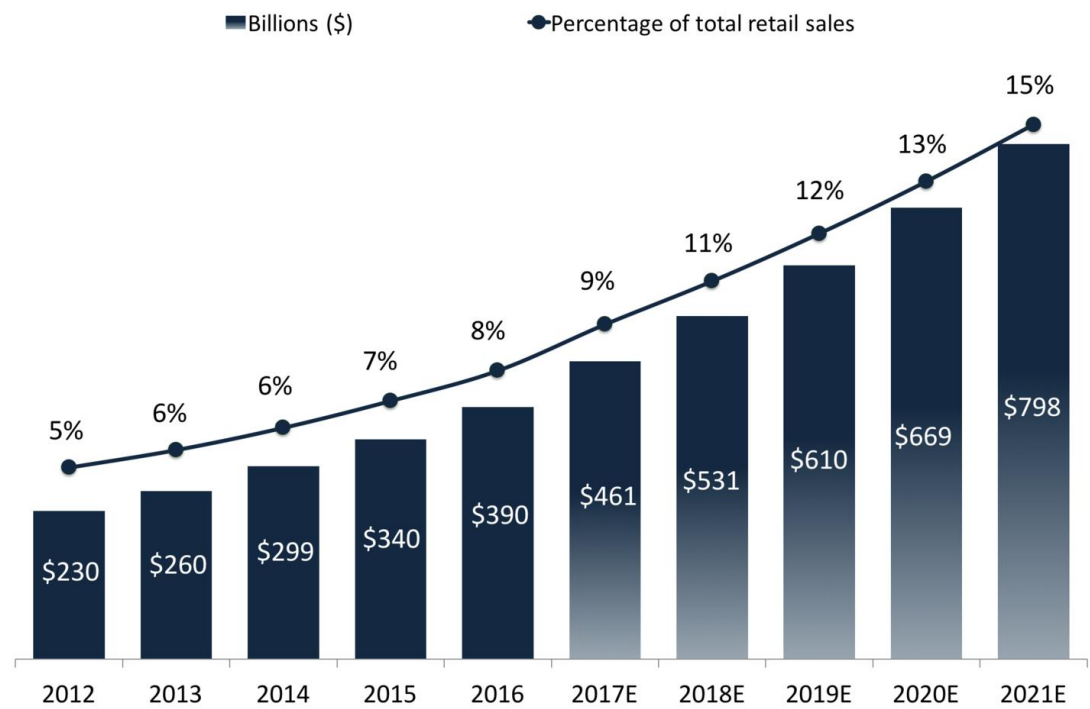
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However, automakers are likely to face intense competition around automating urban last-mile deliveries from a combination of traditional delivery providers and startups. DHL, one of the world's largest logistics providers, is [planning](#) to test self-driving delivery vehicles this year in partnership with AI chipmaker Nvidia, for example. Startups [Nuro](#) and [Udelv](#) unveiled their own purpose-built autonomous delivery trucks earlier this year as well. Last-mile deliveries are a major growth opportunity that these incumbents and startups will pursue fiercely. Automakers will need to leverage partnerships to compete effectively.

Those partners could potentially include traditional logistics providers, which could use automakers' self-driving vehicles as an auxiliary delivery fleet to help handle certain deliveries based on package size or shape, delivery time, or location. Automakers could also pursue relationships directly with retailers or e-commerce marketplaces to increase their delivery business. Many crowdsourced [delivery startups](#), such as Postmates and Instacart, operate their own marketplaces for customers to order goods for same-day delivery from local businesses. These startups then contract those deliveries out to local gig economy workers. However, they face high per-delivery costs that automakers could help solve by providing autonomous deliveries for such marketplaces, which already have expanding customer bases in major cities that expect fast deliveries.

Still, automakers will face vehicle design, fleet management, and customer satisfaction issues in balancing on-demand rides and deliveries with the same self-driving vehicles. Creating multi-purpose autonomous vehicles will force automakers to consider how to balance the needs of riders and companies they deliver goods for. They'll need to figure out how to maximize both seating and storage space in their vehicle designs, for example. Additionally, automakers will need to learn how to optimize their fleets and routes to ensure they have enough capacity to handle demand for both tasks. Lastly, maximizing vehicle utilization may require handling both passengers and packages at the same time, and it's unclear if passengers may be turned off if their vehicle detours to pick up a delivery order.

FORECAST: US E-Commerce Payments Volume



Source: US Census Bureau, BI Intelligence estimates

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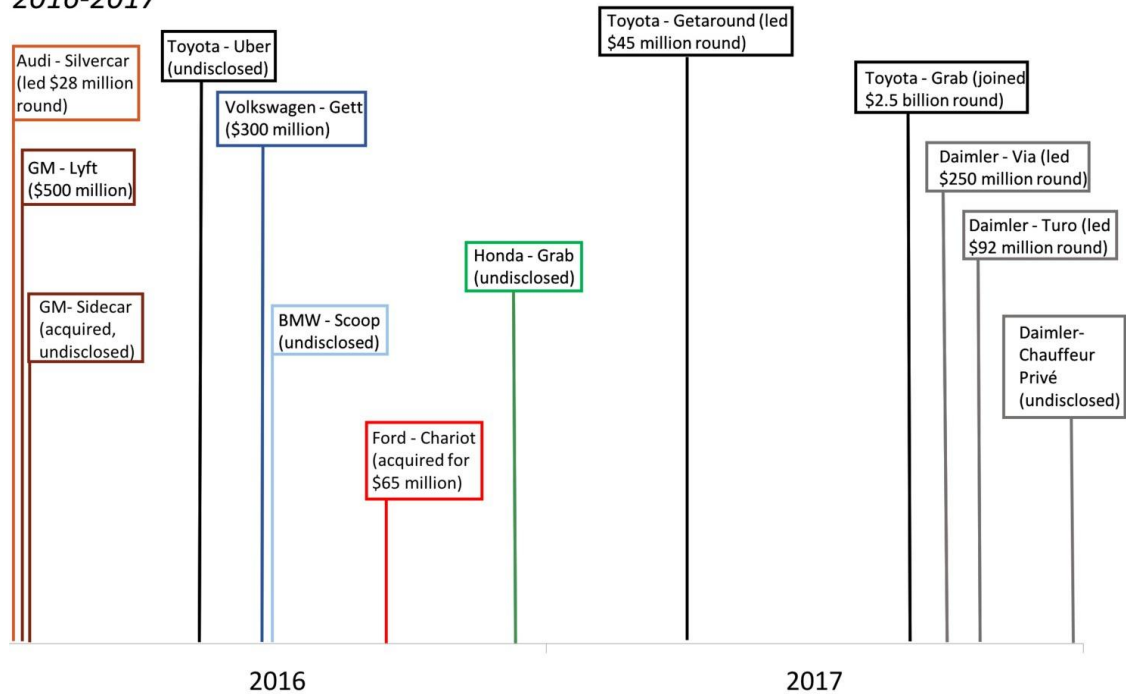
ALTERNATIVE MOBILITY SERVICES

While most automakers are banking on self-driving cars to help them take a share of the mobility market, on-demand bus or shuttle services that can ferry more passengers per vehicle could also prove lucrative in certain markets. As ride-hailing services have spread throughout the world, regulators and city governments have begun to examine the effects of these services on traffic patterns and existing transportation services. That is largely being driven by growing concerns in many cities about traffic congestion and resulting air quality issues, leading cities to [consider](#) restricting the number of for-hire cars on the road. Other cities have also started implementing measures like car-free [zones](#) in recent years. Additionally, existing ride-hailing services have earned a dubious reputation in some places for designating their drivers as independent contractors rather than full time employees, which has allowed them to undercut traditional taxi companies around the world. These services are now facing pushback, particularly in Europe, where a recent European Court of Justice [ruling](#) classified Uber as a transportation provider subject to the same local regulations throughout the EU as traditional taxi companies.

While autonomous mobility services are [expected](#) to reduce urban traffic congestion by gradually replacing personally owned vehicles, municipalities may still be wary of these services. For one, autonomous cars will replace drivers in ride-hailing networks while also further undercutting traditional taxi companies. Government agencies will have to consider the labor fallout, and may move to limit the usage of autonomous cars in ride-hailing fleets, just as they have imposed, in some cases, rules to protect professional taxi drivers from ride-hailing services. Additionally, the widespread use of autonomous mobility services could make much of the public transportation infrastructure that cities have spent billions to develop and maintain obsolete by making ride-hailing cheaper and more convenient than bus and subway options. This gives city agencies a major incentive to strictly regulate the growth of autonomous taxis to ensure that their existing public transportation services remain viable as they try to adjust or decommission those services to account for changing consumer habits.

This also opens up opportunities for other types of mobility services that can complement public transportation and do more to cut traffic congestion. This was recently illustrated in London, where Ford's Chariot on-demand shuttle service launched in partnership with the city's transportation regulator soon after that regulator stripped Uber of its license in the city ([pending](#) appeal). Chariot, which provides on-demand rides on 14-seat shuttle buses driven by professional drivers, will operate four routes in the city in areas underserved by traditional public transportation services. Once the technology matures, automakers could launch autonomous shuttles or buses in a similar on-demand scheme to navigate specially designated road lanes on pre-set routes that similarly complement existing public transportation. This could give automakers an entryway into markets where authorities restrict autonomous taxis.

Automakers' Investments In Mobility Startups 2016-2017



Source: BI Intelligence, 2018

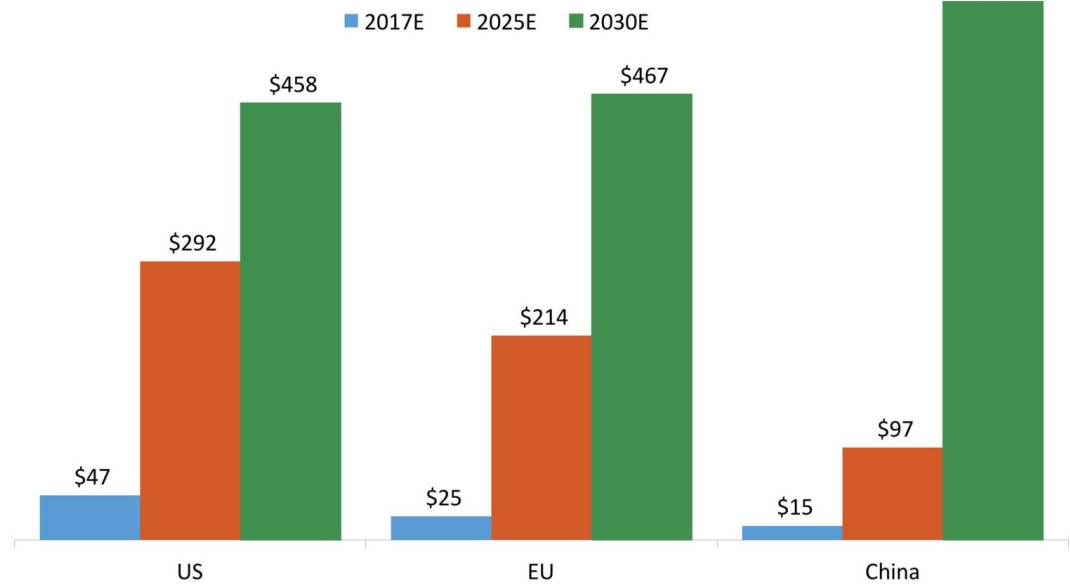
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Organizational Transformation

Making the transition from product-centric businesses to service-centric ones will be difficult and painful for traditional automakers. This will be compounded by the competitive, regulatory, and consumer acceptance challenges we've detailed above. Not every automaker will succeed in making that transition, and some of them won't have to make it as quickly as others — or at all. There will still be a market for personally owned vehicles for decades to come, as many consumers will likely still enjoy the experience of driving and owning a vehicle. Certain vehicle models, including luxury cars, and large trucks and SUVs, will still remain popular with consumers, but others will see steep declines in sales. KPMG [predicted](#) last year that annual sedan sales to US consumers would plummet from 5.4 million to 2.1 million in 2030, as most households abandon their smaller vehicles for mobility services. And automakers will still have opportunities to supply autonomous vehicles to other companies — either through direct sales or revenue-sharing schemes — as well as to consumers. However, automakers that do successfully make this transition will be positioned to own a share of the mobility services market that is expected to be worth trillions globally by 2030.

Estimated US, EU, And China Shared Mobility Market Size

Billions (\$)



Source: PwC and Strategy&, 2017

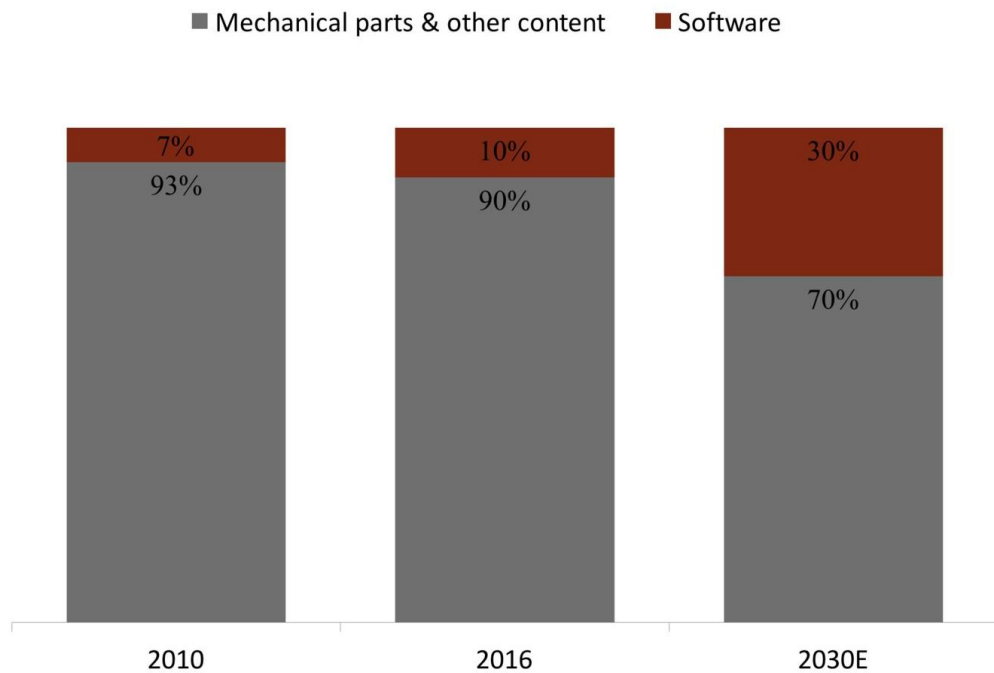
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To make that transition, legacy automakers will need to transform their organizations to compete on digital skills and services against companies well versed in them. To do that, they'll need to ramp up expertise in data analysis and software development, and accelerate innovation cycles:

- **The ability to rapidly process and analyze large volumes of data will be crucial to competing in mobility services.** Analysis of vehicle and user data will inform marketing and partnership strategies, fleet routing and management, new app and vehicle features, and new service launches and expansions. It will also allow automakers to personalize the passenger experience, so when a customer gets into a vehicle, the seat automatically adjusts to their preferred position, and brings their favorite apps to the top of their touchscreen. Without the ability to make data-driven decisions, automakers will fall behind Waymo, Uber, and other more digitally mature competitors. Automakers are already building experience managing data from their connected vehicles, but will need to leverage external data sources to compile a wider view of market trends in mobility and transportation more broadly, according to Gary Halgren, CEO of Arity, a spinoff of insurer Allstate that provides a variety of services for mobility fleets. This will help automakers learn quickly about the mobility space to catch up to startups that have been working in it for years.

- **Automakers will need to develop new strategies to compete for software development and data science talent with tech giants that want to disrupt the transportation space**, according to Aamer Baig, a senior partner who leads McKinsey's digital service lines for the automotive and industrial sectors. McKinsey estimated that automakers' needs for software development talent will triple by 2030. Filling those needs will force them to adopt recruiting strategies already prevalent in the tech and startup world, such as having team leaders manage the recruitment process instead of human resources departments, and using mini projects to test applicants rather than traditional interview questions. Automakers will also need to heavily market their technology innovations to prove that they are on the cutting edge of one of the most exciting areas in tech. Lastly, given how fierce competition for this talent will be, automakers should look for opportunities to use AI to [automate](#) routine tasks in the development lifecycle — like testing — as much as possible.
- **Lastly, automakers will need to split up their hardware and software research and development efforts to be more agile and innovate at the same pace as their tech rivals**, Baig suggested. Traditional research and development cycles for carmakers have been centered around building new car models, and therefore take multiple years to deliver innovations. Automakers must implement a separate research and development track for quickly iterating software innovations, allowing them to release new software updates to their vehicles and apps every three to six months. However, it will be critical that any vehicle software updates go through intense validation processes, especially as software grows to control more of the mechanical and driving functions of the vehicle.

Software As A Percentage Of The Total Content Of An Average Vehicle



Source: McKinsey, 2017

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Succeeding with their own autonomous mobility services will also require a nuanced approach from automakers that accounts for local market needs and regulations. Self-driving car regulations will not develop in a uniform fashion around the world, and, as previously mentioned, some local governments might restrict autonomous mobility services. Additionally, populations in different cities around the world will have different needs based on existing road infrastructure and transportation options, adoption and usage rates of existing on-demand mobility services, labor laws that protect taxi and delivery drivers, public perceptions of self-driving vehicles, and other factors.

Automakers will have to understand how they can fill unmet demand for mobility in individual markets, and tailor their services and fleets accordingly.

This will likely lead them to develop an array of on-demand rides services with different vehicle models, much like Uber and others already do. Shorter, shared trips could be performed by smaller vehicles built for cost with fewer in-car accessories, while a separate service allows customer to book longer trips or time windows with a higher-end vehicle built to offer a differentiated in-car experience. Figuring out how take advantage of fast-changing consumer transportation habits at the local level will determine which automakers are successful in their push into autonomous mobility.

THE BOTTOM LINE

- The low cost of autonomous taxis will eventually lead car ownership rates among urban consumers to decline sharply, putting automakers' traditional business models at risk.
- This will lead to revenue and profits shifting to players that provide autonomous ride-hailing services.
- Many automakers plan to launch their own autonomous ride-hailing services with the self-driving cars they're developing to replace losses from declining car sales, putting them in direct competition with mobility startups and tech giants looking to launch similar services.
- Additionally, automakers plan to maximize utilization of their autonomous on-demand vehicles by performing last-mile deliveries, which will force them to compete with a variety of players in the parcel logistics industry.
- Regulatory pressures could also push automakers to consider alternative mobility services besides on-demand taxis, such as autonomous on-demand shuttle or bus services.
- Providing these types of services will force automakers to make drastic changes to their organizations to acquire new talent and skills, and not all automakers will succeed at that.

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