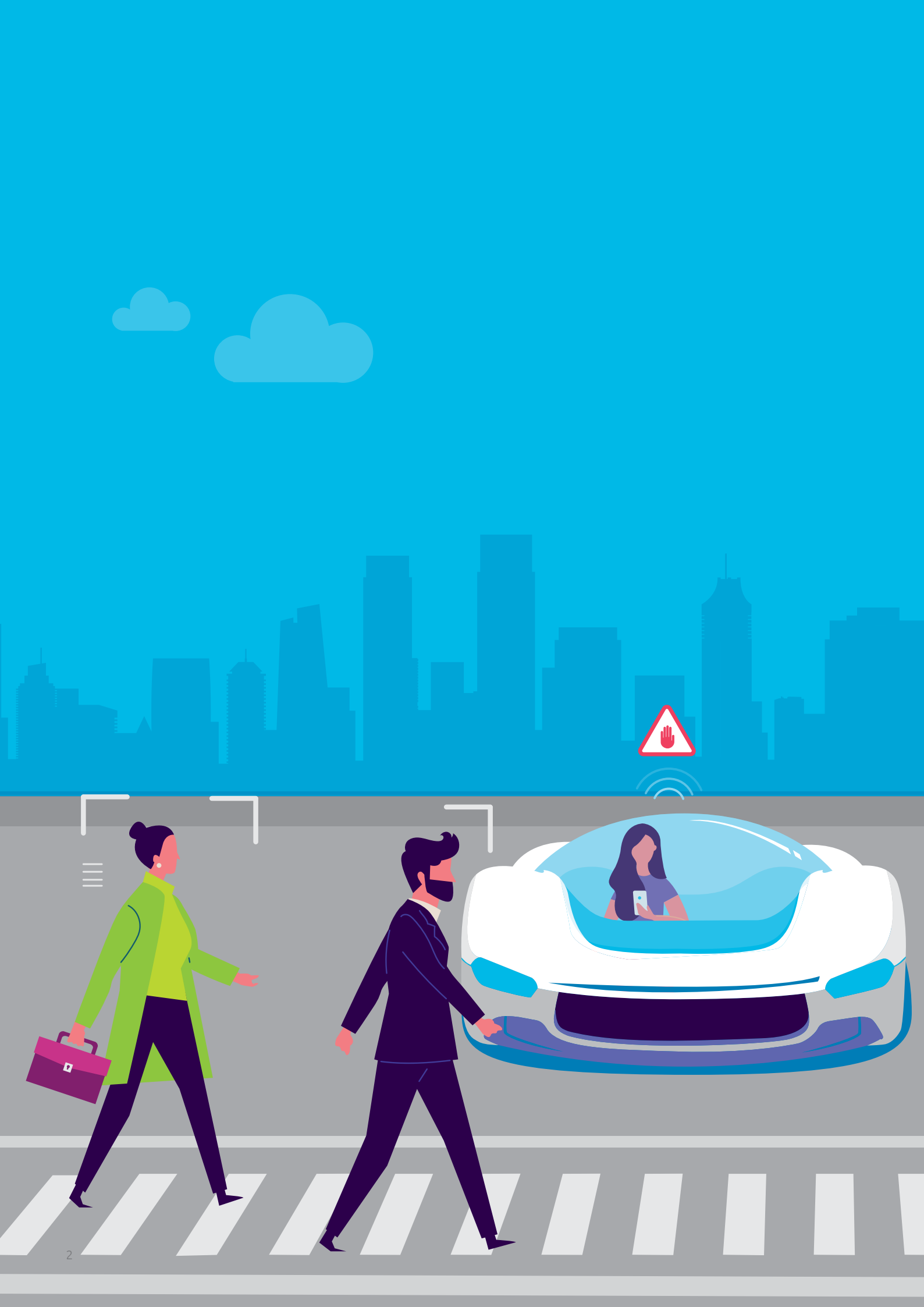


The **autonomous car**

A consumer perspective





Executive Summary

Extensive survey of over 5,500 consumers from around the world, as well as executives at 280 companies, from automotive OEMs to technology players

Key findings

Consumers are ready for self-driving cars and optimistic about the future of this technology

- They are positive about autonomous cars and a majority (59%) are awaiting their arrival with "anticipation"
- Acceptance is growing: within five years 52% would prefer to be driven in a self-driving car than a normal one
- Consumers trust automotive OEMs over new startups when it comes to these vehicles and are more optimistic than auto executives when it comes to overcoming the challenges of self-driving

Consumers see self-driving cars are more than just a means of transport

- They see an expanded remit for these vehicles: over half (54%) are comfortable with the self-driving car picking up or dropping off family members and friends, and close to half (49%) see these vehicles running errands
- They see these vehicles making their lives better: half (50%) expect self-driving cars to save them time, expecting to save as much as 6.5 hours a week

The in-car experience will be critical, with consumers' wants having implications for many other industries, such as media and entertainment, retail, and healthcare

- 63% want to spend the time that self-driving cars save them in "socializing"
- 58% want to disconnect from digital tools and enjoy the road
- Nearly one in four consumers want to spend the time saved engaging in physical activities that will help them stay fit

These expectations of in-car experiences will not only impact the automotive industry, but also multiple other industries, including media and entertainments, retail, and healthcare.

Four priorities for organizations looking to accelerate the journey towards a self-driving future

- Keep the consumer informed and listen to customer needs
- Understand and reassure the consumer: safety and security are key
- Build an ecosystem of services: partner with technology and content providers
- Develop software competencies: accelerate the change inside the company

Introduction

It will not be long before self-driving cars evolve from their testing phase to become a concrete reality for consumers. Both automotive players and suppliers, such as GM, Daimler, Ford, Continental, and Bosch and tech players, such as Google and Tesla, are involved. These organizations are making significant investments in hardware and software capabilities as well as in testing and piloting vehicles.

As of December 2018, the US had 24 pilots running, with nearly 50 other pilots taking place in other parts of the world, including Europe, Canada, China and Australia.¹ The self-driving technology company Waymo has been conducting consumer testing of self-driving cars. Since July 2018, 400 families in Phoenix, Arizona have been volunteering for Waymo's autonomous ride-hailing cars,² and the company launched its ride-hailing service in Phoenix in December 2018.³ Bosch is collaborating with Daimler to launch a pilot autonomous program in San Jose, California, in late 2019.⁴

Initiatives such as these – as well as the considerable attention that self-driving cars have been generating in the media for some time now – have resulted in significant consumer awareness. The vast majority of consumers in our survey, 93%, had heard of self-driving cars before taking the survey. However, we wanted to understand more about consumer expectations and how companies are addressing them. We therefore undertook significant research involving both sides of the debate; in total, we spoke with over 5,500 consumers and 280 executives from leading organizations.

We supported this quantitative research through in-depth interviews with industry experts. The research methodology at the end of this report provides further details.

For this study, we focused exclusively on the ownership of self-driving vehicles by end consumers who would use a self-driving vehicle for personal, non-commercial use. Mobility services based on self-driving cars are beyond the scope of this report. While the role of public policy, local and federal governments, and other players is instrumental for a self-driving future, for this research we have limited the scope to automotive players and consumers. The report will help companies understand consumer expectations from a self-driving future, and accordingly prepare their organization.

Specifically, this report has four goals:

1. To explore consumer readiness for driverless cars
2. To understand, in-depth, consumers' expectations for driverless cars
3. To assess automotive companies' investments in driverless cars, and examine where they are missing the mark, in terms of what consumers want and expect
4. To share recommendations on how organizations can accelerate the journey towards a self-driving future.

The Society of Automotive Engineers (SAE) International classifies autonomous vehicles as follows:

- Level 0: Systems in place to issue warnings, but no vehicle control
- Level 1: Shared control between the driver and the system. The driver needs to be alert and ready to take control at any time
- Level 2: Automated systems assume complete control of the vehicle. However, contact between hand and wheel is mandatory during this level to confirm driver readiness to take over
- Level 3: The driver can safely turn their attention away but must still be prepared to intervene within some predefined time
- Level 4: Driver attention is not mandatory. Completely autonomous self-driving possible within limited area (geofenced) or under special circumstances (for example, traffic)
- Level 5: No human intervention required



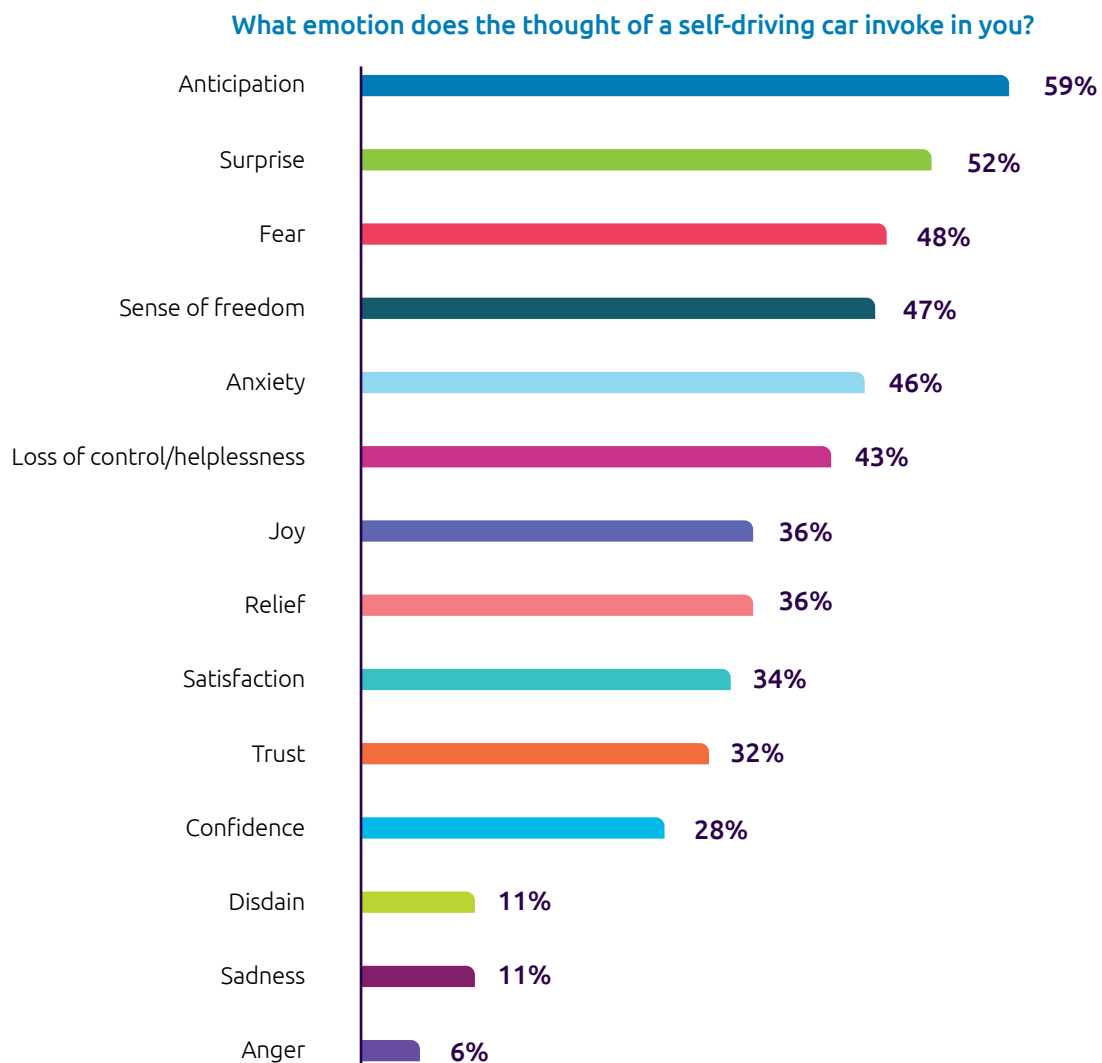
59% *Share of consumers who feel a sense of anticipation about self-driving cars*

Consumers are ready for driverless cars

For over a hundred years, cars have excited a wide range of emotions. We found that consumer sentiment about self-driving vehicles is often positive – 59% say they feel a sense of anticipation about the future (see Figure 1). However, a negative sentiment is also prevalent. Close to half (48%) point

to fear and 46% associate self-driving cars with anxiety. This reinforces how important it is for the industry to work on consumer awareness of these technologies. We discovered that two groups are particularly positive about driverless cars – Chinese consumers and millennials/urbanites.

Figure 1. The most common emotion is a sense of anticipation about self-driving cars



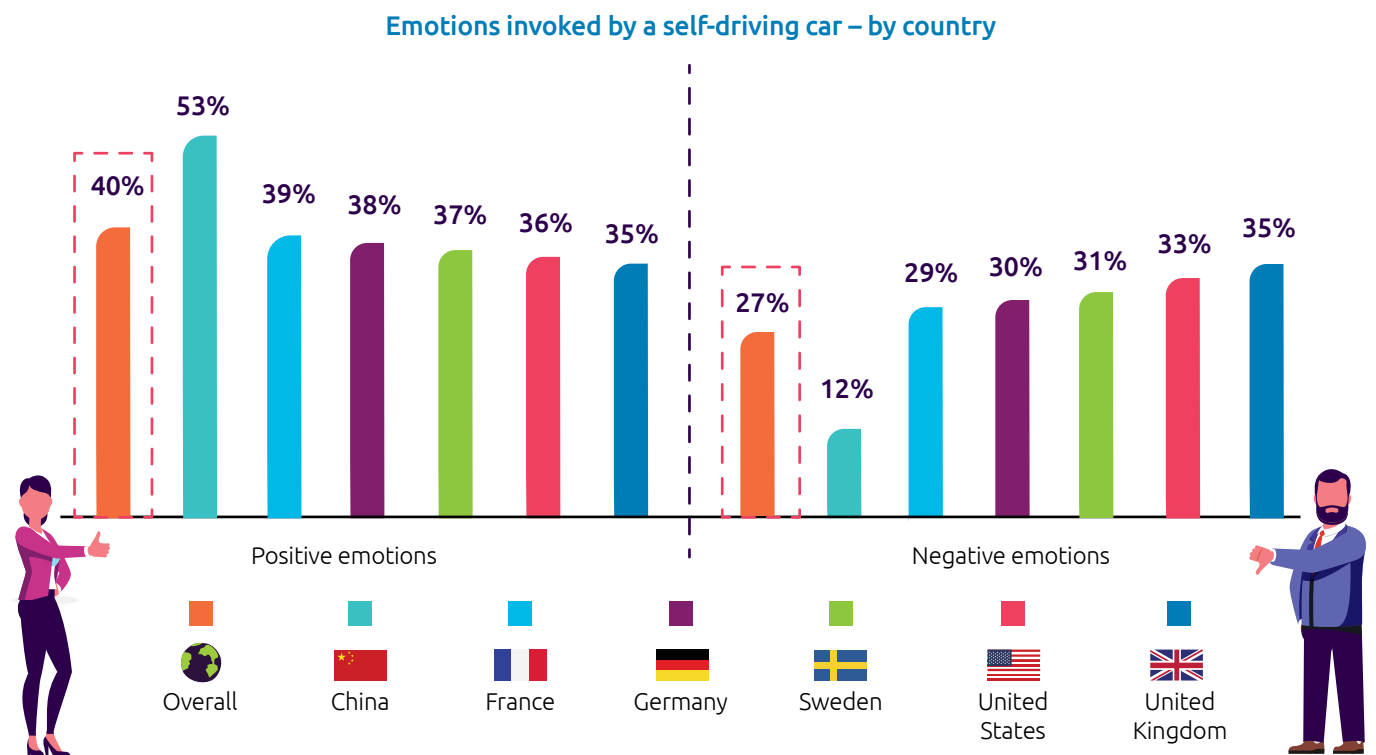
Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

1. Chinese respondents display the most positive emotions

Sentiment varies across different countries, as Figure 2 shows:

- In China, respondents are the most positive and least negative: over half (53%) report positive emotions and only 12% negative.
- In the UK, positive and negative feelings are more evenly matched, with the 35% who feel positive matched by the same number who report negative emotions.

Figure 2. More than half of Chinese consumers surveyed have positive emotions about self-driving cars



Source: Capterra Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers. Positive emotions include relief, joy, trust, surprise, confidence, satisfaction, sense of freedom, and anticipation. Negative emotions include fear, loss of control, anger, anxiety, sadness, and disdain.

There could be a very good reason why driverless cars garner so much enthusiasm in China. Over the past couple of decades, traffic on Chinese roads has worsened significantly. In a report on global traffic black spots, three Chinese cities featured in the top ten cities with the worst traffic in the world.⁵ Borjana Lambreva, head of Autonomous Driving/ Connected Car and Services and New Business Models at Volkswagen China Group, also points to differences in attitudes to driving between China and other geographies. *“There are cultural and geographic differences that could drive higher adoption for self-driving cars in the Chinese market,”*

she says. *“In the Chinese market, more consumers prefer not to drive themselves, given the nature of the roads. In other markets, like the US and Continental Europe, a lot of consumers may still enjoy driving.”*

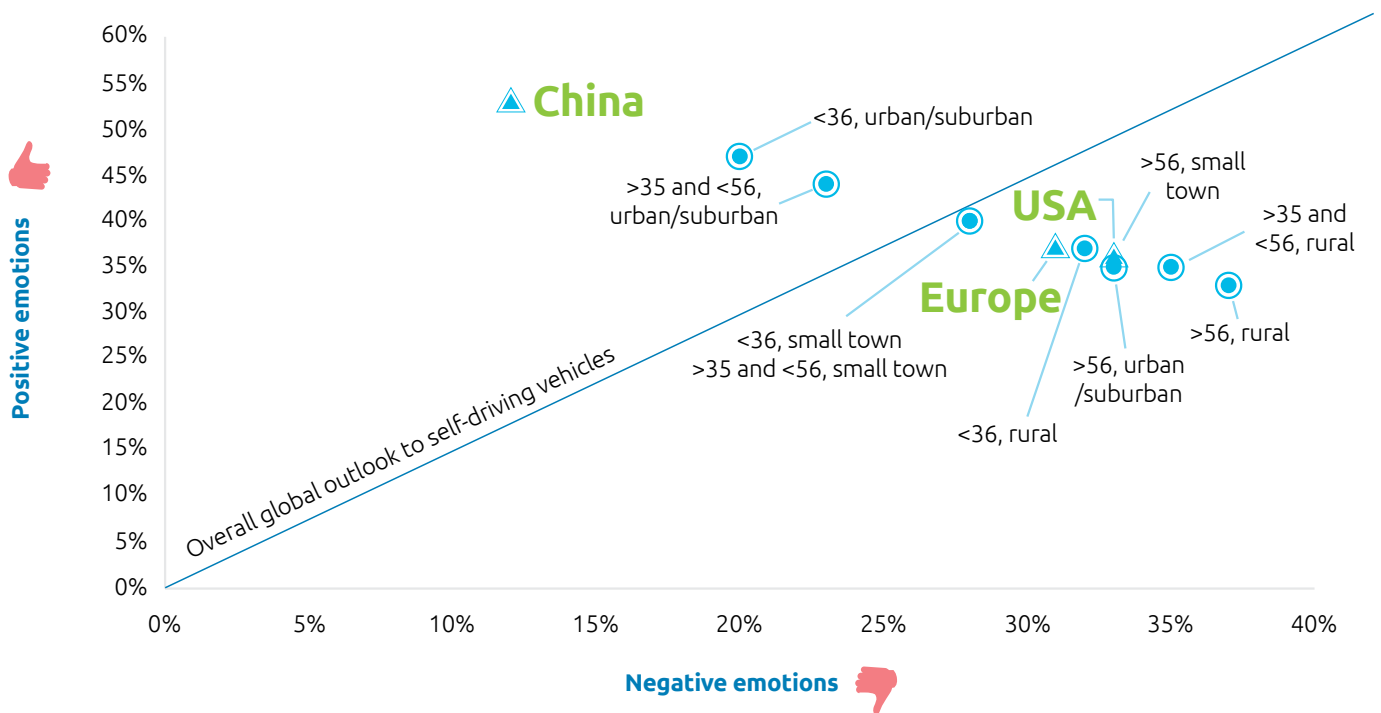
In addition to the industrial push and consumer appetite, the Chinese government is encouraging self-driving cars. The government has set a goal for at least 30% of new vehicles to have Level 2 autonomous driving capabilities by 2020, as per the action plan by the Ministry of Industry and Information Technology released in late December 2018.⁶

2. Millennials and urban/suburban dwellers

We also found that millennials (aged under 35) as well as urban/suburban consumers tend to be more positive compared to those in rural areas and small towns (see Figure 3). Millennials seem to have fewer issues trusting

autonomous vehicles, which can explain the more positive outlook towards self-driving cars. Moreover, millennials are more welcoming of smart tech in their daily routines. According to research conducted by Pew Research Center, clear trends emerge where millennials are heavy adopters of key digital consumer technology, such as smartphones and social media.⁷

Figure 3. Urban consumers have the most positive outlook towards self-driving vehicles



Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n= 5,538 consumers.



“There are cultural and geographic differences that could drive higher adoption for self-driving cars in the Chinese market”

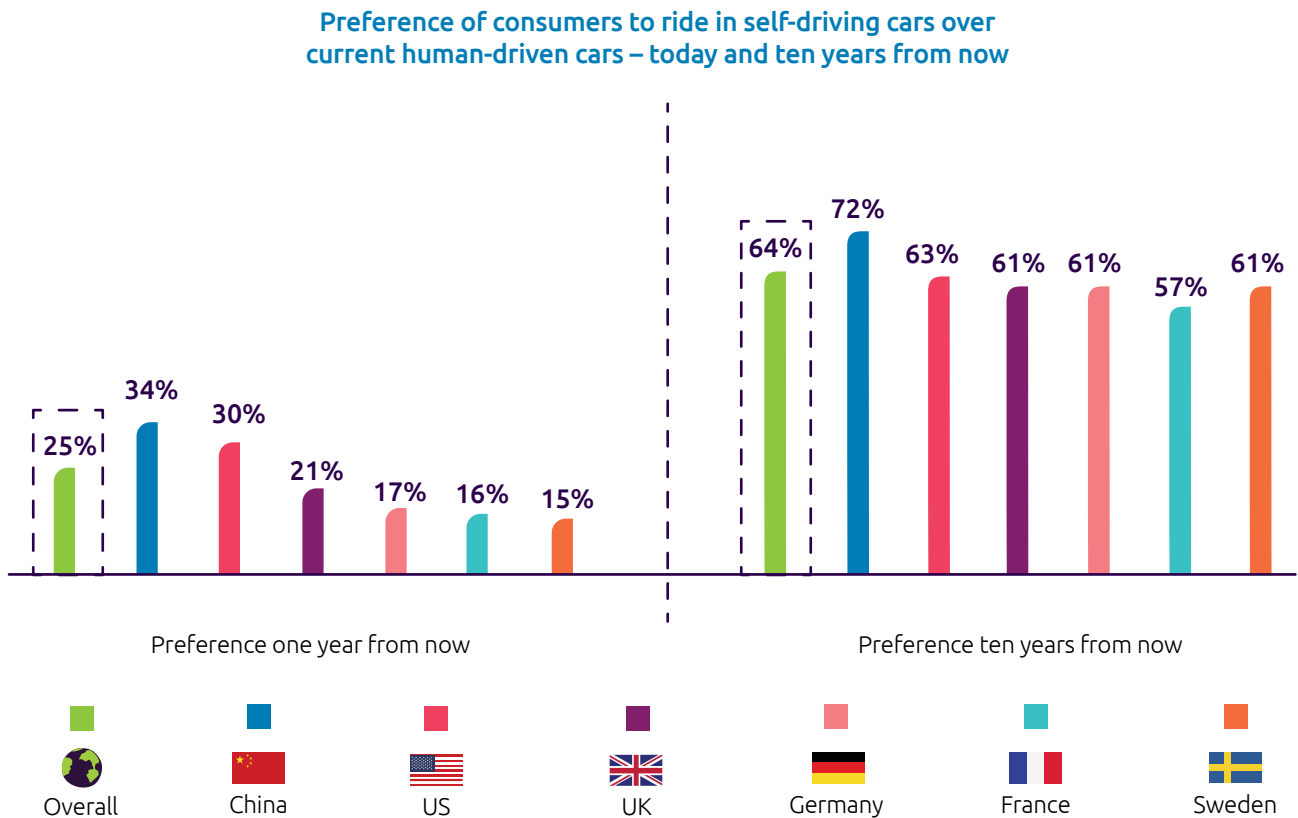
Borjana Lambreva, head of Autonomous Driving/Connected Car and Services and New Business Models at Volkswagen China Group

Consumer acceptance of self-driving cars will increase over time

We found that consumer preference of riding in self-driving car over traditional cars is set to double in five years. While only 25% of consumers would prefer to ride in a self-driving car over a normal one in 12 months' time, over half of the surveyed consumers (52%) would prefer self-driving cars five

years from now. This uptake in preference can be attributed to the consumer expectation that self-driving vehicles will become a mass market product over the years and potential maturity of the market, thereby easing adoption. As before, we found this tendency towards self-driving cars was particularly pronounced not only among Chinese but also in US consumers (see Figure 4).

Figure 4. In ten years, three out of four Chinese consumers will prefer self-driving cars over current human-driven cars



Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

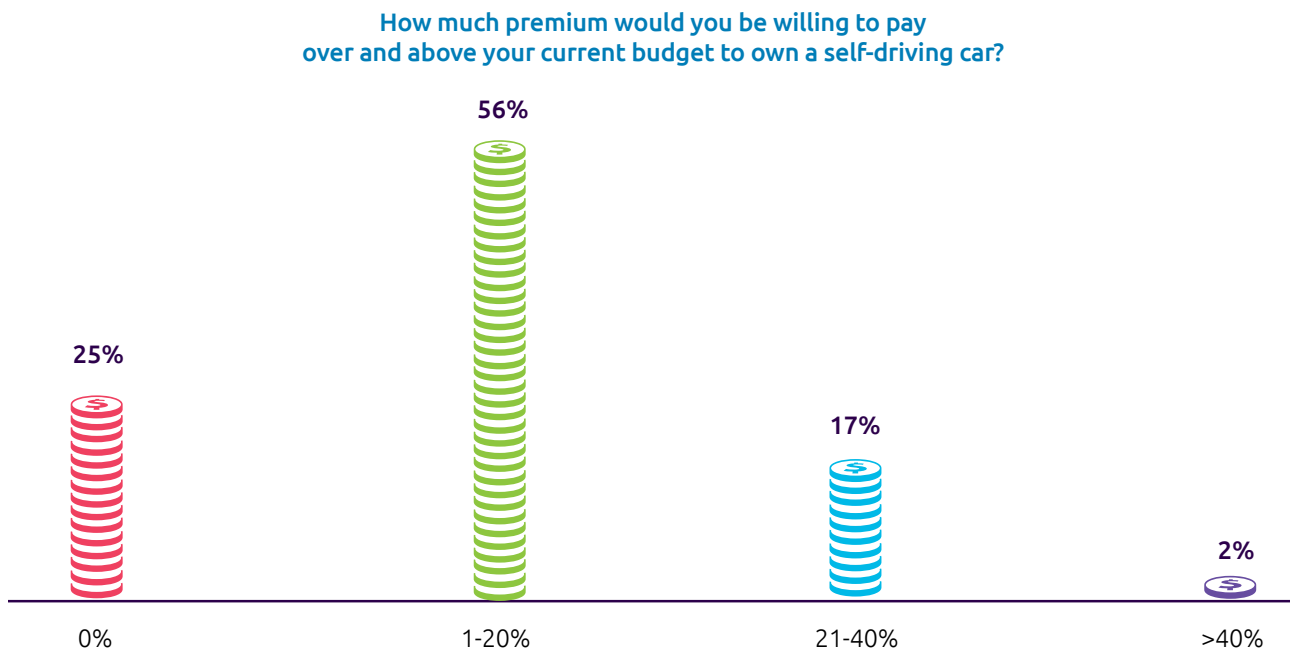
52%
Share of consumers who would prefer self-driving cars five years from now

Consumers are willing to pay a premium for driverless cars

Our research shows that consumers see added value in self-driving vehicles over their traditional counterparts. We found

that more than half of the consumers surveyed are willing to pay a premium of up to 20% over their current budget to own a self-driving car (see Figure 5). Close to one in five consumers are willing to pay an even higher premium to own a self-driving vehicle.

Figure 5. More than half of consumers surveyed are willing to pay a premium of up to 20% for a self-driving car



Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

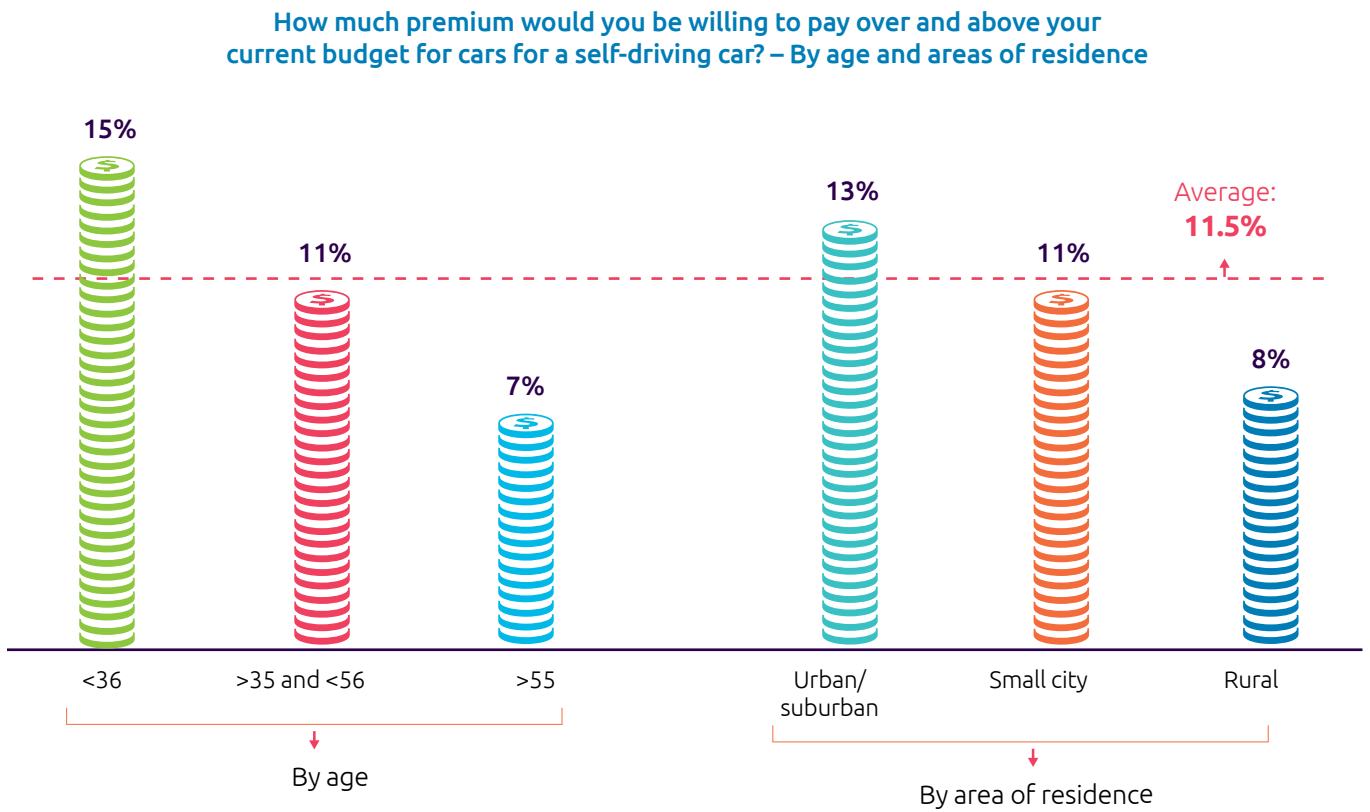
56%

Share of consumers who would be willing to pay a premium of up to 20% over their current budget for a self-driving car

When split across age groups, millennials are willing to pay the highest premium of 15% over their current budget for a self-driving vehicle (see Figure 6). Across areas of residence,

urban/suburban consumers are willing to pay a higher premium for a self-driving car compared to other groups.

Figure 6. Urban/suburban millennials are willing to pay a higher than average premium



Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

Self-driving car “early adopter”: profile

We wanted to understand more about the preferences and needs of those who would be more likely to be early adopters of this technology. We defined this group in our research as those who **stated a preference for early adoption** and who said they would **buy a self-driving car within one year of it being released**. Out of our 5,500 respondents, this group comprised 328 people. The key demographics and characteristics of this group are as follows:



Autonomous vehicle early adopters



Are predominantly male (63%)

Have higher-than-average income
(47% earning more than \$80,000 vs. 26% overall)



Are primarily urban dwellers (68% living in large city vs. 37% overall)

Fall below 36 years of age (60%)



Characteristics of an early adopter



Emotions invoked by a self-driving car (top three):

Joy
(72%)

Sense of freedom
(69%)

Anticipation
(64%)

Self-driving car “early adopter”: profile (continued)



Will be encouraged to buy/use a self-driving car for:

Secure **data systems**

Reduced **environmental hazards** and **carbon footprint**

Higher **fuel efficiency**



Will be willing to pay a higher premium for a self-driving car

48% early adopters will be willing to pay a premium of more than **20%** over their current budget vs. **19%** overall



Will prefer spending their time in a self-driving car for:

In-car **entertainment**

Socializing with friends and family

For completing **personal chores**



Top 3 expectations from a self-driving car:

Fewer **accidents**

Increased **productivity**

Efficiency of **travel**



Is comfortable with:

Self-driving cars following **traffic rules** and **legal requirements**

Self-driving cars making **sound decisions** during **unexpected situations**



Will be willing to share their data with

Traditional car companies

Technology companies (e.g., Uber, Tesla, etc.)

State authorities responsible for road planning and urban development

What are consumer expectations from a driverless car?

Do consumers only expect a self-driving car to assume their driving responsibilities, or do they expect more? Our study shows that consumers are looking to self-driving cars to take a larger role in their lives. They want self-driving cars to not

only be autonomous in the act of driving, but also to have a degree of autonomy in running errands and completing chores. Many of these expectations are an extension of the car as a mode of transport, as we will see in this section.

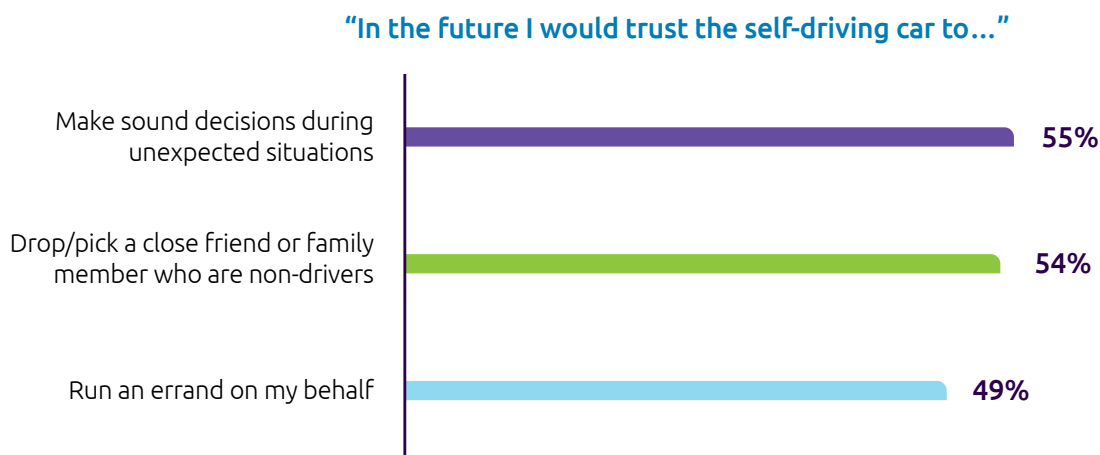


Consumers trust self-driving cars to pick-up non-driving family members

We found that more than half of consumers (55%) trust self-driving cars to make to make sound decisions during unexpected situations (see Figure 7). Safety and security

while in a self-driving care are important to consumers, given that more than 90% of accidents can be attributed to driver error according to data from the US Department of Transportation.⁸ Therefore, demonstrable improvement on these fronts can help automotive firms to align more closely with consumer expectations.

Figure 7. More than half of consumers surveyed would trust a self-driving car to drop off/pick up non-driving close friends or family members



Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

Consumers also see self-driving cars taking on tasks that have traditionally been associated with the driver. Our research shows that more than half (54%) would trust the self-driving car to drop off or pick up non-driving friends and family members. This is an attractive use case and the sort of area that Singapore’s Nanyang Technological University is focused on. *“Singapore is aging more rapidly and [at] a faster rate than anywhere else in the world, and so we have a situation where, in order to provide mobility for seniors, it would be really advantageous to have such technology available,”* said Subodh Mhaisalkar, the professor in charge of Nanyang’s Energy Research Institute, which carries out autonomous vehicle research.⁹ Almost half (49%) of consumers would also be comfortable with self-driving cars running an errand on their behalf (see Figure 7).

Consumers expect driverless cars to save them time

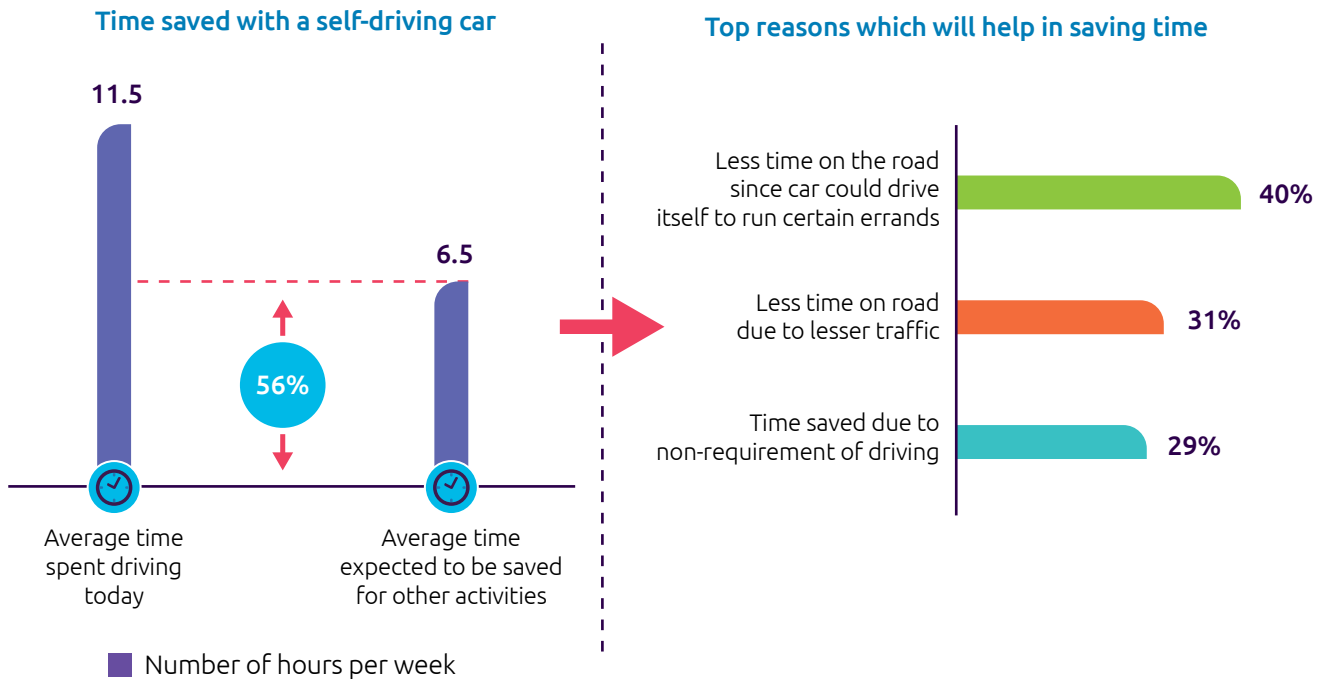
Half the consumers (50%) surveyed expect self-driving cars to help them save time to pursue other activities, with just 25% saying they did not expect time to be saved. We found that those who anticipate a time savings currently spend, on average, more than 11.5 hours driving per week. These consumers hope to save up to 56% of this time to pursue other activities (see Figure 8).

54% *Share of consumers who would trust the self-driving car to drop off or pick up non-driving friends and family members*



50% Share of consumers who expect self-driving cars to save them time

Figure 8. Consumers expect time spent driving to decrease by more than 50% with self-driving vehicles



Source: Capterra Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

The ability of a self-driving car to run certain errands on its own emerged as the most popular way to save time (selected by 40% of respondents). This suggests that consumers will use these cars for more than just transport. For instance, self-driving cars can drop off/pick up children from school without the need for a human driver. *“Autonomous vehicles will eliminate a lot of trips that people make to go places and fetch things,”* says David Silver, head of self-driving cars at Udacity. *“Hopefully, self-driving vehicles will reduce the amount of time people have to spend in the car because autonomous vehicles, self-driving delivery vehicles will bring things to people instead of people having to go places.”* Similarly, some automotive companies have already initiated trials where retailers can deliver packages to the trunks of cars. For example, Amazon has a partnership with GM and Volvo to deliver directly to the trunk.¹⁰ Such initiatives can be further simplified with a self-driving car.

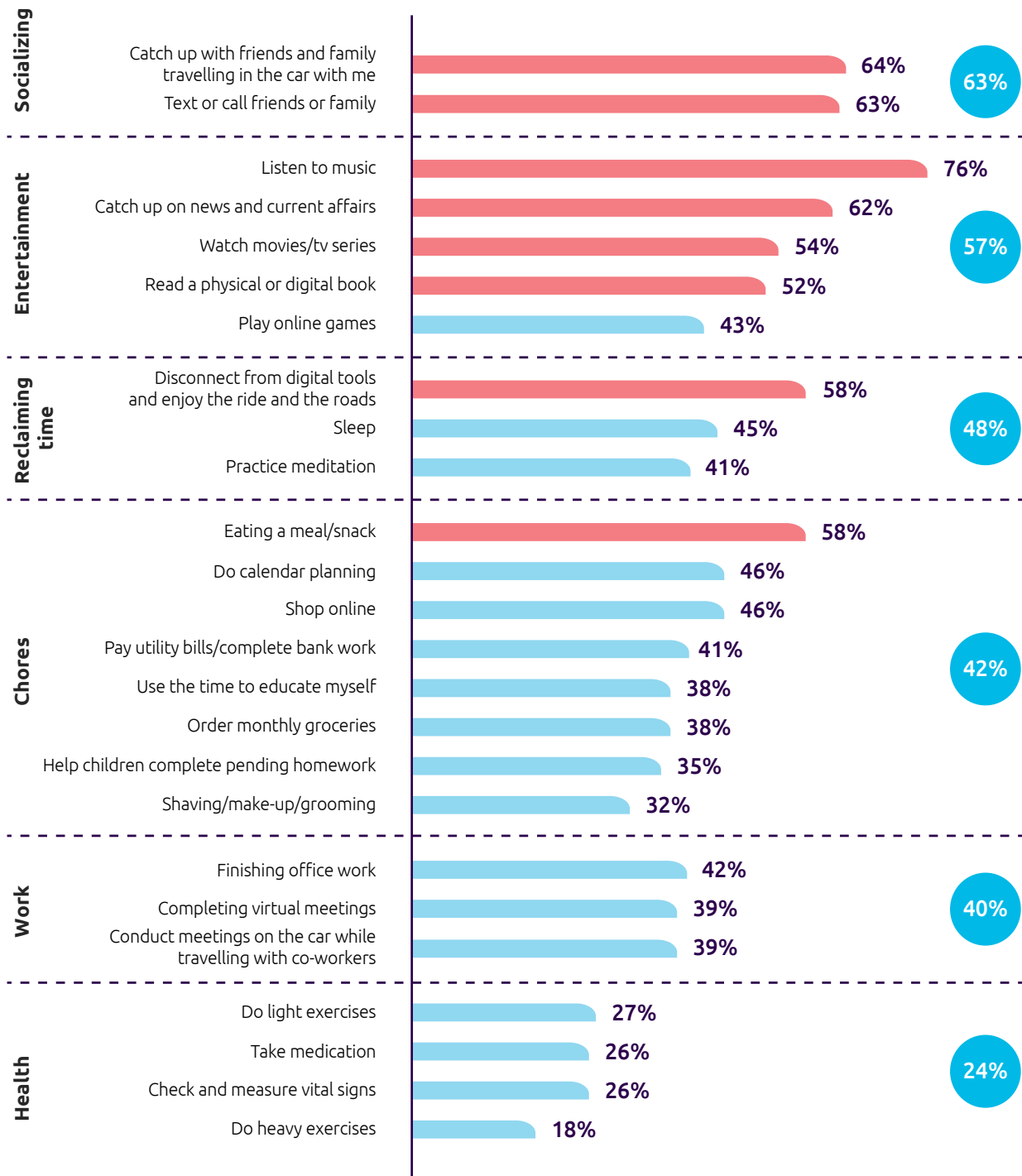
Nearly a third of consumers (31%) also expect self-driving cars to reduce traffic congestion (see Figure 8). Whether self-driving cars will actually reduce traffic or increase congestion is still being debated. According to a research by Rutgers University, self-driving cars could mitigate stop-and-go traffic, which can be created, for example, by human drivers suddenly changing lanes.¹¹ On the other hand, a recent study

– using game theory and traffic simulations – suggests that self-driving cars could make urban traffic worse, because it would be cheaper to have empty cars circulating the streets than it would be to meet parking costs. Since self-driving cars have not been launched in the mass market, there is still time to ascertain whether they will improve or aggravate traffic conditions. We do know now that consumers see them as a positive knock-on effect.

Consumers are clear on how they want to spend the time while not driving

Consumers are clear on how they would like to spend their time while not actively steering the car during transit. We found that close to two-thirds of consumers (63%) would like to spend their time socializing with friends and family, either virtually or when sharing the car space (see Figure 9). Conversely, 58% said that they would like to disconnect from digital tools and enjoy the ride and roads. This shows a strong need to use technology as an enabler to disconnect from technology and pursue human connections, and not necessarily a time for completing work or tasks. A self-driving vehicle will enable consumers to pursue each activity based on individual preferences. Consumers can choose to watch a movie one day and digitally disconnect the next day.

Figure 9. Nearly two-thirds would like to socialize with friends and family when in a self-driving car



Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

The idea of “me time” is further strengthened by the second highest-ranking area of interest: in-car entertainment. Over half (57%) would like to use the saved time for entertainment. Over three-quarters (76%) wanted to listen to music and close to two-thirds (62%) wanted to catch up on news and current affairs.

We investigated the most common activities that millennials and urban/suburban consumers are likely to engage in

while in a self-driving car and compared them with other demographics to gauge the likelihood across age groups and areas of residence. We discovered that consumers across areas of residence have a similar view towards how they would spend their time in a self-driving vehicle (see Figure 10). However, by age, millennials are more likely to spend their time engaging in these activities when compared to more senior demographics.

Figure 10. Top 5 activities that urban/suburban and millennial consumers would like to engage in while in a self-driving car

Activity	Urban/suburban consumers	Small city consumers	Rural consumers
Listen to music	78%	73%	75%
Catch up on news and current affairs	66%	57%	55%
Text or call friends and family	66%	60%	56%
Catch up with friends and family	67%	61%	56%
Disconnect from digital tools and enjoy the ride	62%	54%	51%

Activity	<36 years old	>35 and <56 years old	>56 years old
Listen to music	81%	78%	68%
Text or call friends and family	71%	65%	49%
Catch up with friends and family	71%	65%	52%
Disconnect from digital tools and enjoy the ride	64%	59%	49%
Catch up on news and current affairs	64%	65%	55%

Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

 **63%** *Share of consumers who would like to socialize when in a self-driving car*

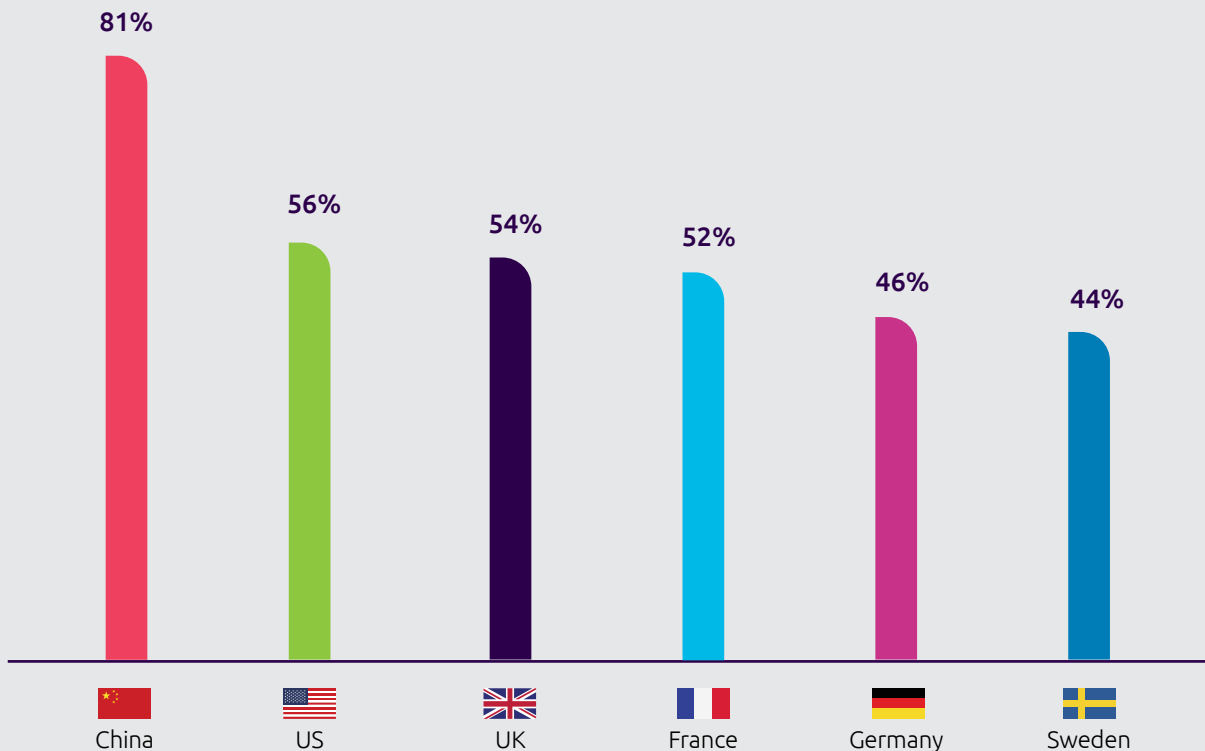
“Digital detox” consumers: profile

We wanted to understand more about the preferences and characteristics of those who would like to disconnect from digital tools while in a self-driving car. Our research shows that almost three out of five consumers (58%) would like to disconnect from digital tools and enjoy the ride. The key demographics and characteristics of this group are as follows.

Digital detox consumers:

- Are primarily urban dwellers (44% living in large urban city vs. 37% overall)
- More than four out of five Chinese consumers would like to disconnect from digital tools

Share of digital detox consumers



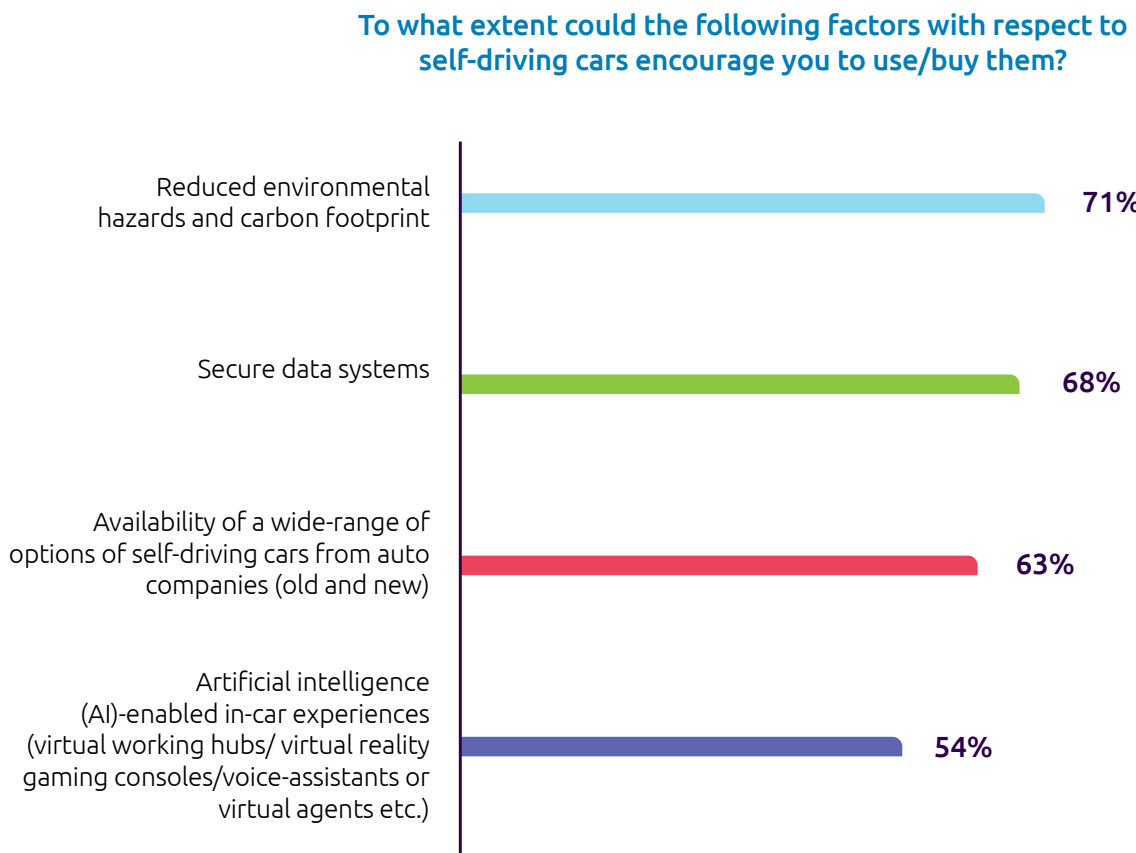
- Are more positive about self-driving vehicles than average. Emotions invoked by a self-driving car (top three):
 - Anticipation (62%)
 - Sense of freedom (55%)
 - Surprise (55%)
- Are more comfortable than average in allowing self-driving vehicles to:
 - Keep their travel history safe and secure (70% vs. 56% overall)
 - Run an errand on their behalf (61% vs. 49% overall)
 - Drop off or pick up a close friend/family member (66% vs. 54% overall)

Consumers expect driverless cars to have higher fuel efficiency and be more environmentally sustainable

An environmentally sustainable means of travel can help encourage consumers to use/buy self-driving vehicles. Consumers find greater fuel efficiency (73%) to be a compelling use factor, closely followed by a reduced environmental hazard and carbon footprint (71%) as key factors to encourage purchase/use of self-driving cars. According to former Chief Counsel and Public Policy Director of one of the largest OEMs, *“Consumers are likely to experience benefits in terms of reduced emissions and fuel efficiency, where the per-mile fuel cost would be significantly lower than internal combustion engines.”*

Autonomous vehicles that can communicate with other vehicles can help reduce congestion, which in turn, can help vehicles achieve a higher fuel efficiency. This can help avoid traffic congestion, especially “phantom jams.” In an experiment published in *Transportation Research Part C: Emerging Technologies*,¹² eight cars with the ability to communicate their position and speed with each other were driven as a convoy. Only one of the cars was “automated” with the ability to accelerate and brake autonomously, while the other seven cars were human-controlled. With prior data on speed and position of a car several ahead, the autonomous vehicle was able to brake more smoothly and avoid a jam. This also resulted in an energy efficiency of 19% and 7% in the autonomous and human-controlled vehicles respectively. This study suggests that self-driving vehicles have the potential to be environmentally more sustainable over their current counterparts.

Figure 11. Reduced environmental hazards and carbon footprint are key



Source: Capgemini Research Institute, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

Self-driving cars will create opportunities for multiple industries

As consumers share their preferences for how they would like to spend their time while riding in a driverless car, it is clear that industries that can adapt to these consumer demands stand to benefit over the coming years. As the car becomes a “hands-free device,” the consumer will have the ability to engage in a variety of new services – be it media and entertainment, e-commerce activities, banking services, or health and wellness services.

While media and entertainment industry will benefit incrementally in the new self-driving car, opportunities exist for retail as well, where nearly one in two consumers (46%) shared their inclination to shop online while in the car. Moreover, in addition to in-car services, there is

a possibility for physical stores that are on the way for passengers to feel the impact as well. For example, nearly three in five consumers (58%) shared their inclination to eat while riding. What could this mean for the restaurant and dining industry? Could providing lucrative offers as alerts to consumers as they pass the restaurant/store lead to a boost in sales and consumer engagement?

Lastly, a majority of consumers pointed towards wanting to socialize with friends and family (either in person or virtually) or the need to disconnect from digital tools and relax. It will be up to suppliers of IT-enabled services to think how they could innovatively promote these socializing or relaxation experiences in the future without being intrusive or annoying.





Automotive companies, already investing heavily in self-driving cars, are favorably placed with consumers

Automotive players have been making significant investments in self-driving cars:

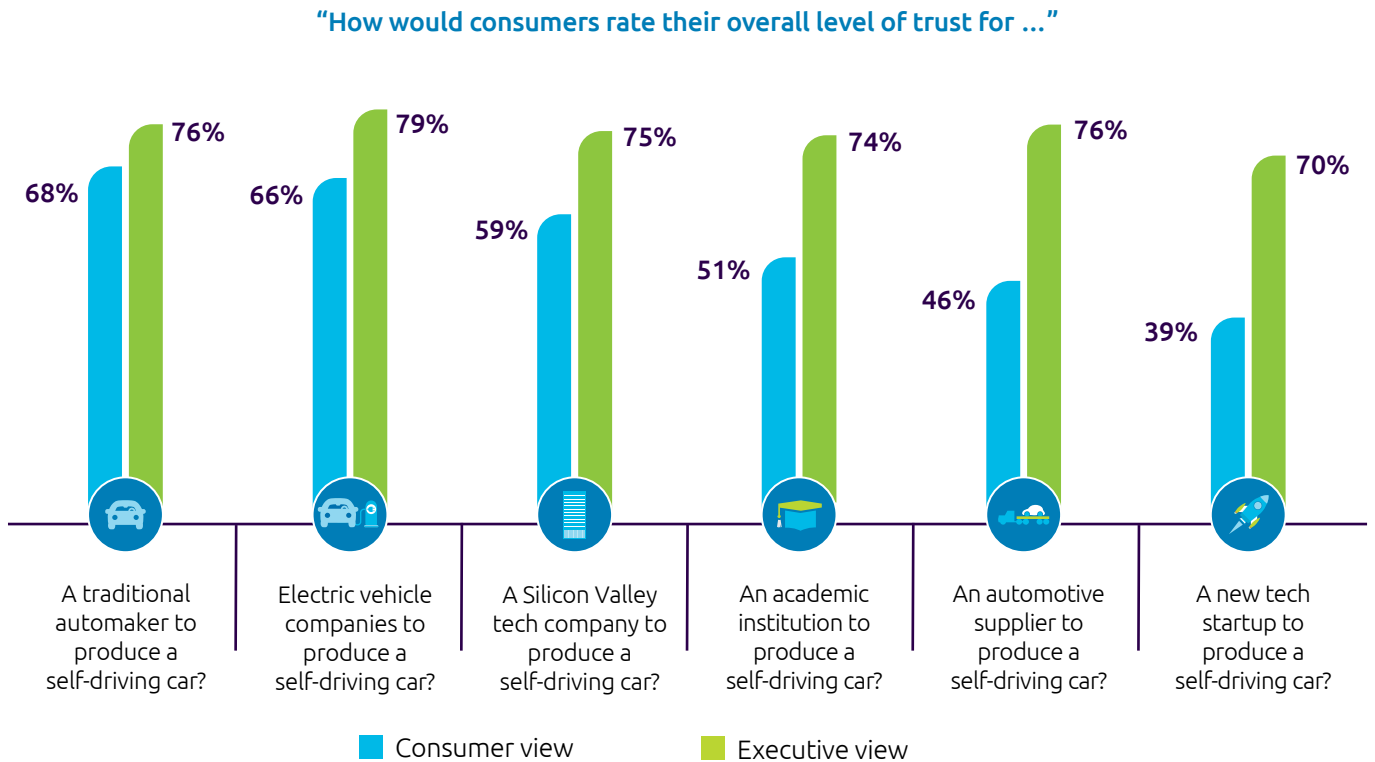
- Ford will invest \$4 billion in its separate Ford Autonomous Vehicles venture over five years.¹³
- Bosch, the German electronics and engineering company, will invest \$4.6 billion by 2022.¹⁴
- Honda has invested \$750 million in GM's "Cruise Automation" self-driving unit, with a commitment to invest another \$2 billion over the next 12 years.¹⁵
- Toyota started Toyota Research Institute-Advanced Development (TRI-AD), a dedicated company to develop self-driving technologies. Toyota, along with suppliers Aisin Seiki and Denso, plan to invest \$2.8 billion into TRI-AD.¹⁶
- Audi, under the German Volkswagen Group, is scheduled to invest \$16 billion over five years on transportation technologies of the future including digital services, autonomous driving, and electric mobility.¹⁷

Consumers trust incumbents more than new startups

Traditional auto incumbents, our research shows, stand to gain a unique advantage by drawing on the bond that already exists between them and their consumers. In our research we found that when it comes to self-driving cars, consumers trust traditional automakers (e.g., Ford) and EV companies

(e.g., Tesla) more than they do tech startups (see Figure 12). More than two-thirds of consumers trust a traditional automaker, but only 39% trust a new tech startup. But OEM and EV executives need to ensure they do not overestimate this trust bond, with executive perception of trust levels out of synch with consumer sentiment.

Figure 12. More than two in three consumers trust OEMs to produce a self-driving car



Source: Capgemini Research Institute, Self-driving vehicles executive survey, December 2018–January 2019, n = 280 organizations, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

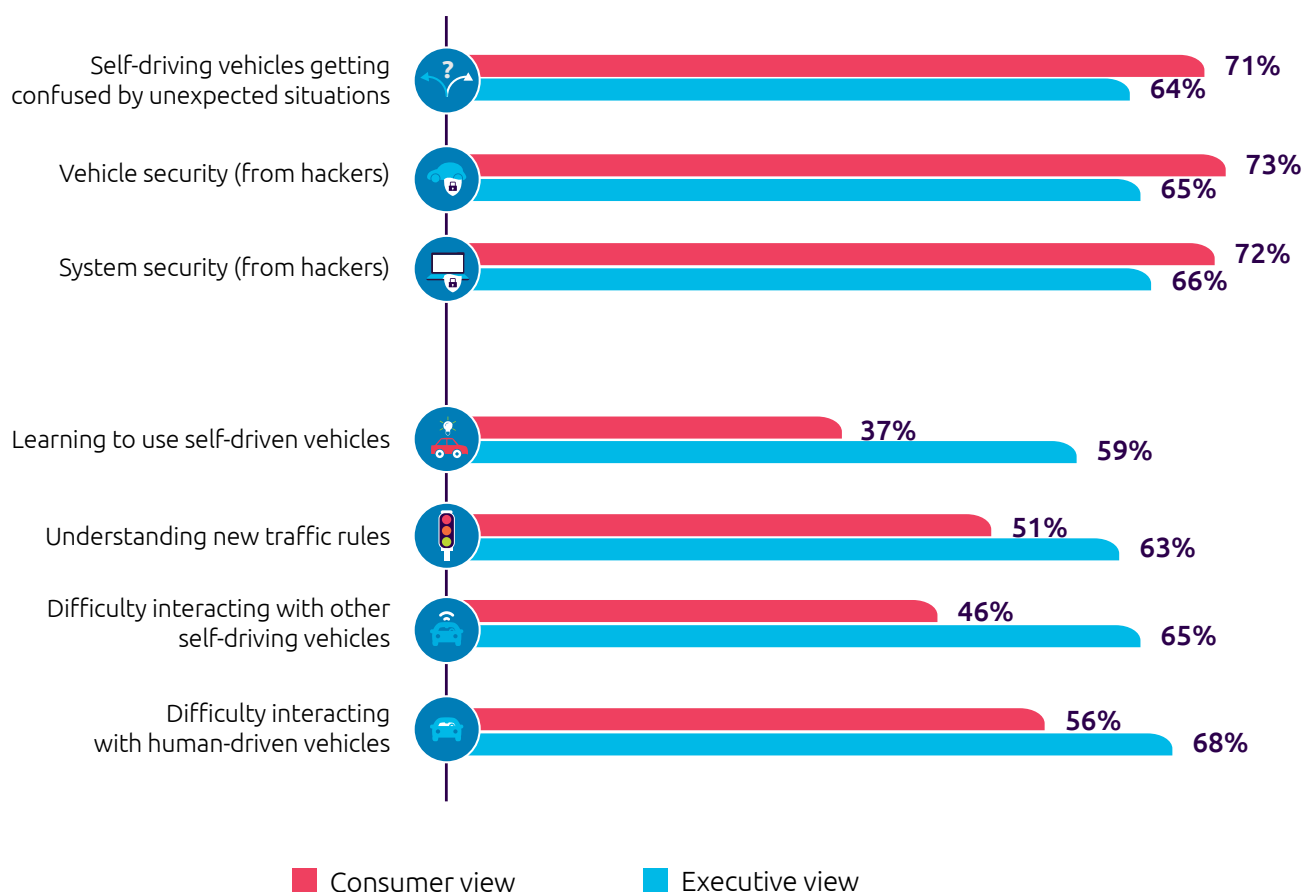
Auto companies have a trust dividend with consumers

Our research found that although auto companies are investing heavily in autonomous vehicles, they remain more conscious of challenges than consumers are. For instance, three in five executives believe that learning how to drive a self-driving car will be a major barrier to adoption. However, fewer than two in five consumers (37%) agree (see Figure 13). These differences in perception create a potential trust

dividend for the auto companies with consumers when it comes to self-driving cars. On the other hand, there are areas where auto companies should focus in building greater consumer trust. These include aspects such as vehicle security and safety, which are top concerns for consumers.

Figure 13. More than seven out of 10 consumers see vehicle safety and security as key barriers to adoption

What are the main barriers that could prevent consumers from adopting self-driving cars?



Source: Capgemini Research Institute, Self-driving vehicles executive survey, December 2018–January 2019, n = 280 organizations, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.



49% vs. 78% *Share of consumers vs. executives who think that consumers would be comfortable sharing personal data with OEMs*

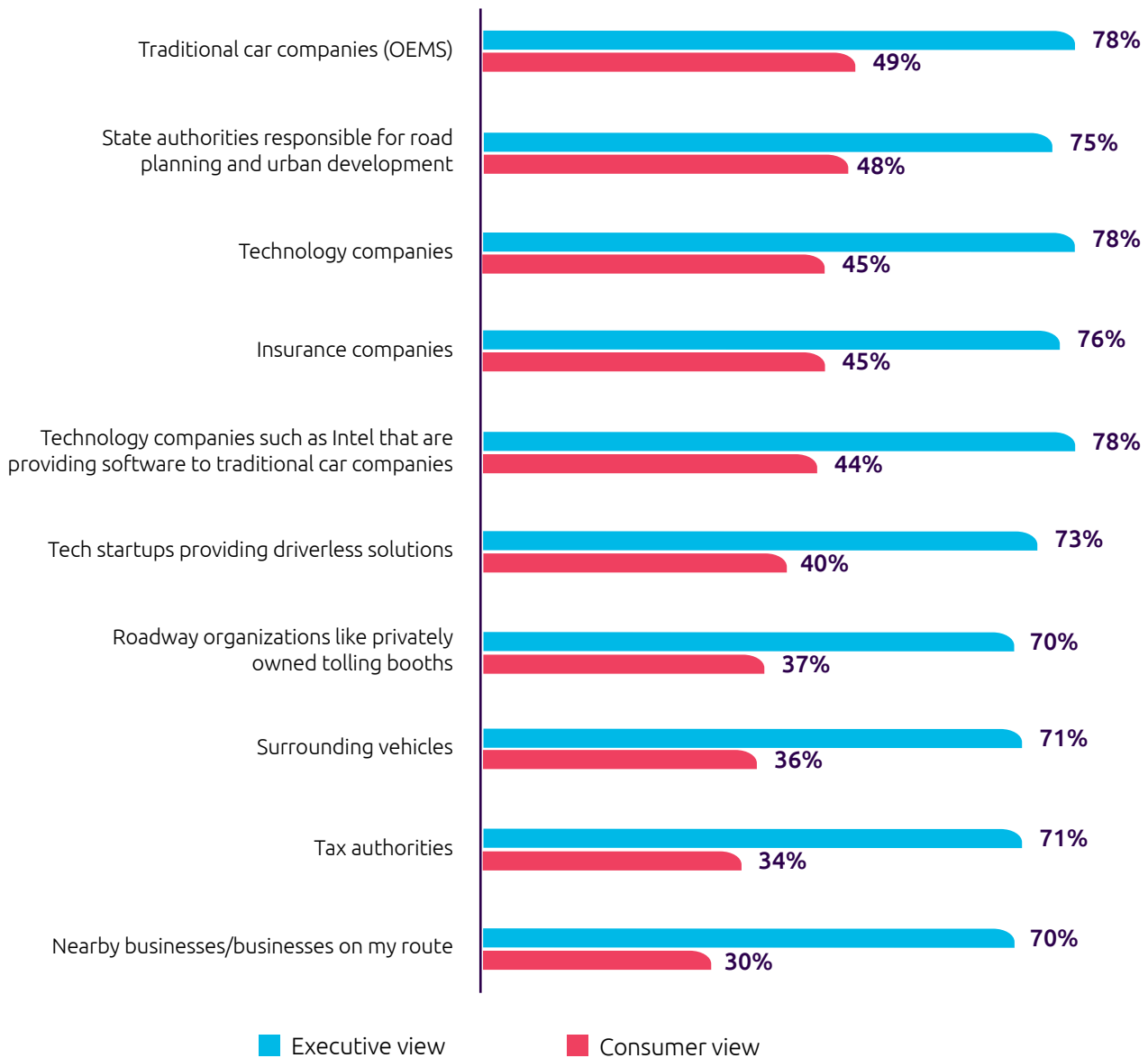
Auto companies seem disconnected about consumer discomfort in sharing personal data

Consumers are less willing to trust organizations with their

personal data than executives think. We found that fewer than half of consumers (49%) trust traditional automakers with their personal data. As Figure 14 shows, there is a significant mismatch between consumer and organization sentiment on this area.

Figure 14. Executives overestimate consumers' comfort with sharing personal data with organizations

"Consumers would be comfortable sharing their personal data with ..."



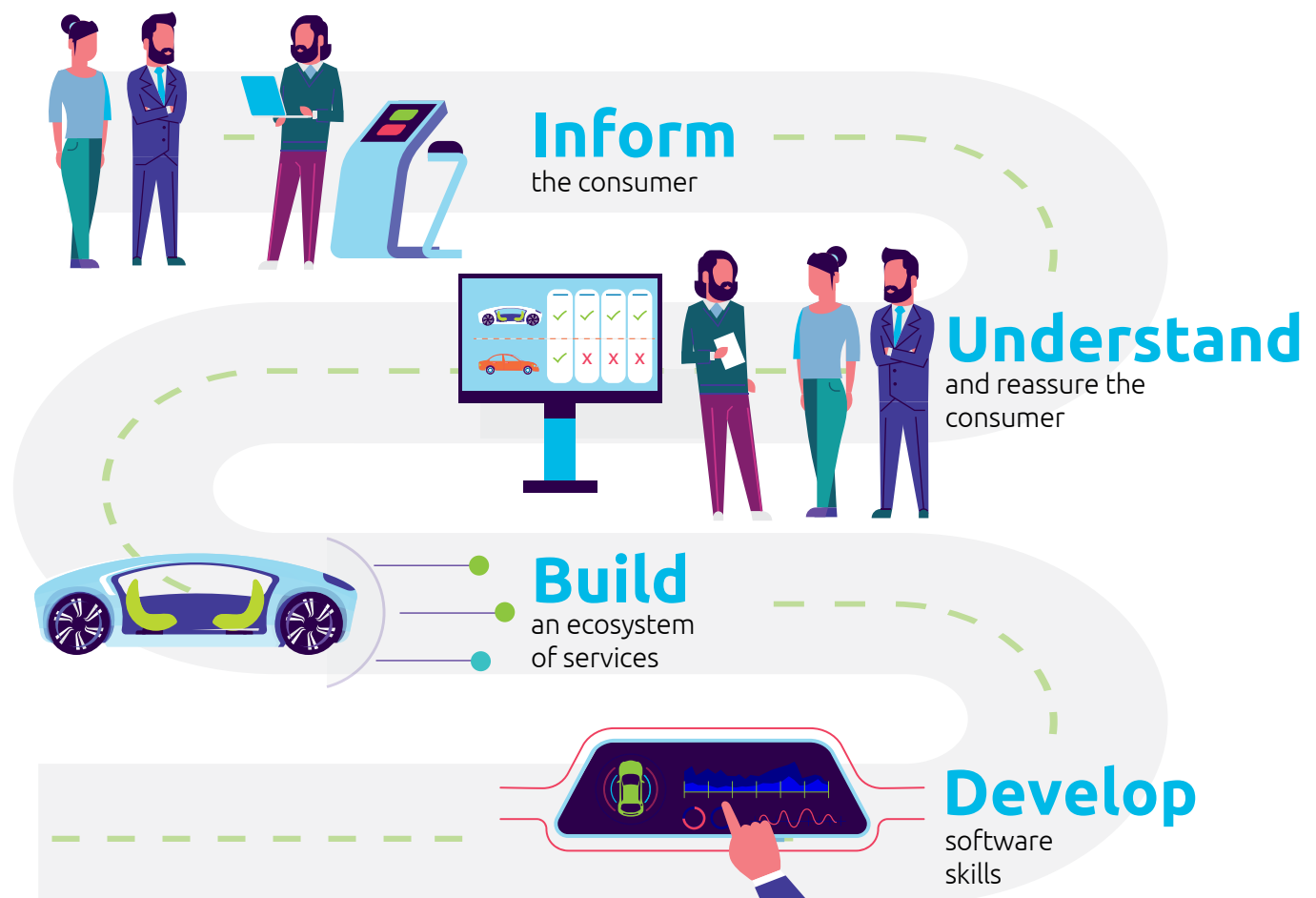
Source: Capgemini Research Institute, Self-driving vehicles executive survey, December 2018–January 2019, n = 280 organizations, Self-driving vehicles consumer survey, December 2018–January 2019, n = 5,538 consumers.

Recommendations for accelerating the journey towards a self-driving future

Companies need to bring consumers along for the ride when they transform their own operations for a self-driving future. As Figure 15 illustrates, four areas will be critical:

- Keeping consumers informed about the capabilities of these vehicles, to manage and set the right expectations about what self-driving cars can and cannot do
- Building a close understanding of consumer expectations to tailor a compelling self-driving car experience while also reassuring them regarding any concerns, such as security
- Building an ecosystem of services to provide consumers with the expanded suite of offerings they are looking for
- Embracing a software-led future, so that companies make building the critical digital capability and skills needed a central part of their strategy, rather than something that is dealt with as just an "innovation project."

Figure 15. The road ahead for automotive companies in self-driving cars



Keep the consumer informed

One of the key findings of our study was that consumers expect self-driving cars to be autonomous not just in getting them from point A to point B, but also taking on a range of other tasks. They even went so far as to say that they would be willing to use these vehicles to run errands or transport friends and family members. This is an important shift from how the car has historically been seen. In consumers' eyes, the car is moving from a means of transportation to a quasi-personal assistant. This shift places a significant burden of responsibility on the auto company to be candid about the capabilities of the car and avoid any risk of misrepresentation. Industry initiatives in this area are already underway. For example, Euro NCAP plans to have a rating system in place by 2020 that will not only assess the technical systems, but also the manuals and advertising materials. This will allow it to rank manufacturers that sell self-driving technologies. The Insurance Institute for Highway Safety in the US is also developing a similar ranking system.¹⁸

Understand and reassure the consumer

Our research shows that consumers have distinct views on the experience they expect from a self-driving car, including how they will use the time they save driving. Auto companies need to build a detailed and nuanced understanding of these expectations and bake it into the design process itself. For instance, we found that nearly three in five consumers would like to use the in-car time for entertainment, which is something that needs to be translated into how these vehicles are designed. *"In the future, vehicles will be much more purpose tailored,"* says Volkswagen's Borjana Lambreva. *"For Mobility-as-a-Service, consumers will have the opportunity to choose different car concepts depending on the purpose of the trip – for example, a trip to the office versus a trip to the mountains with the family."*

We also found that some consumers are skeptical about certain aspects of self-driving cars. Nearly three-quarters are concerned about safety and security and nearly half (48%) said that the dominant emotion stirred in them by these vehicles was "fear." Automotive companies will need to ensure that investments are made to allay these concerns if they want to drive adoption. A key example is concerns around hacking incidents. A recent test of nine popular connected car Android apps showed that researchers were able to locate a car, unlock it, and in some cases even start its ignition.¹⁹ In another case, researchers were able to remotely manipulate and ultimately "kill" a Jeep during a demonstration.²⁰ Some auto companies have already started an education and awareness campaign to bring consumers up to speed with the safety aspects of self-driving cars.

For instance, BMW recently released an advertisement to promote the safety aspects of driverless cars under the theme – "The future of driving is nothing to be afraid of."²¹

Build an ecosystem of services

Consumer expectations for self-driving cars make it clear that automotive companies need to expand the scope of their consumer offerings, either directly or through partnerships. As we have seen, consumers expect a wide variety of in-car experiences, related to areas ranging from entertainment to health. Delivering these experiences will require that auto companies partner with a new set of technology and content players, creating an entire ecosystem of services. Some auto companies have already begun to take early steps. For instance, Audi recently partnered with Disney to introduce a combination of augmented and virtual reality experiences for car passengers. The company also introduced a new startup, Holdridge, to bring such experiences to Audi and other cars.²²

Develop software competencies

"Software will account for 90 percent of future innovations in the car ... Compared to a typical smartphone, a car has ten times as many lines of software code, and a self-driving car will have a thousand times that amount." – Herbert Diess, CEO, Volkswagen.

It is estimated that 20 years ago cars had around a million lines of code. By 2017, that number had likely increased to more than 100 million and it can only be expected to rise further.²³ For this reason, automotive companies cannot view their self-driving car initiative as just another innovation project, but need to integrate it into their overall company strategy. Our recent research into digital mastery across different sectors found that less than a third of automotive companies say that they have the necessary technology skills for digital transformation. But at the same time, only 38% make upskilling/reskilling on digital skills a top priority.²⁴ This is alarming when seen in the context of our earlier research with LinkedIn on the state of digital skills. We found that nearly one in two employees in automotive companies believe that their skillset will be redundant in four to five years.²⁵

Only by integrating self-driving cars into enterprise strategy will organizations make the concerted effort required to build software competencies and other critical digital capabilities.

Conclusion

To ensure that they deliver a return on their significant investments and unlock the growth potential of self-driving cars, automotive organizations need to invite the consumer along for the journey. Our research shows how expectations are emerging, helping to create a nuanced perspective on the consumer views that companies need to integrate when building and investing in driverless technology. This means building on the awareness and positivity that exist while carefully managing

the emerging concerns and fears. As they focus on consumer expectations, organizations also need to pay attention to building an ecosystem of services and developing their software competencies to meet the skill requirements. Automotive organizations have a huge and exciting opportunity to tap into evolving consumer expectations and deliver a winning, customized, and personalized driverless car experience.

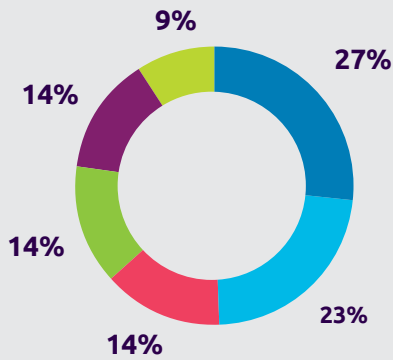


Research Methodology

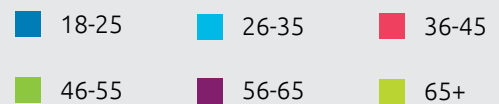
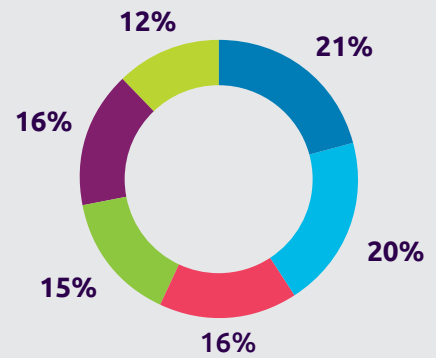
Primary surveys

Consumer survey: We conducted a primary consumer survey of 5,538 consumers across six countries in US, UK, France, Germany, Sweden, and China

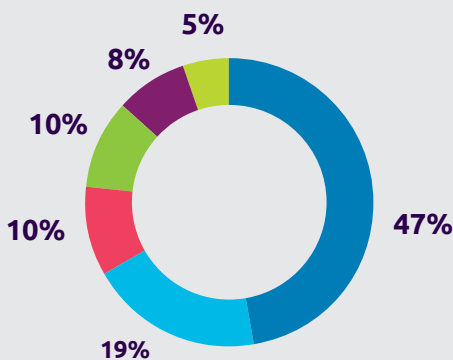
Consumers by country



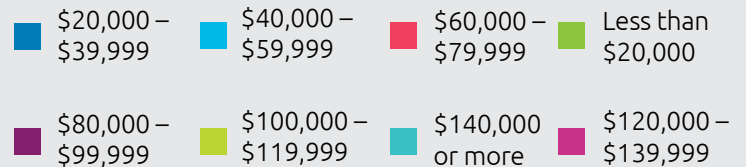
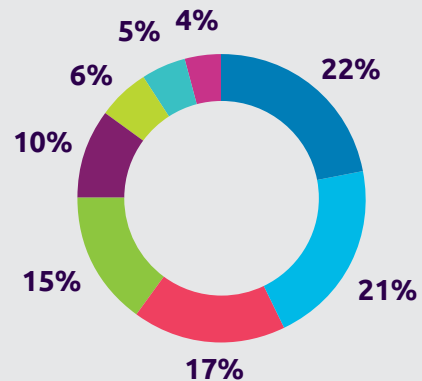
Consumers by age



Consumers by occupation



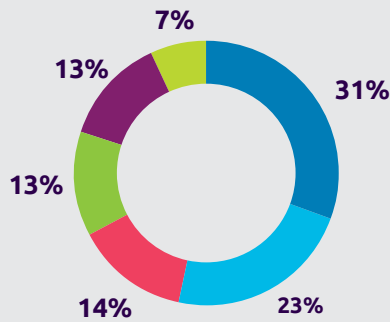
Consumers by income



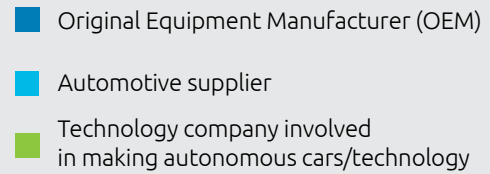
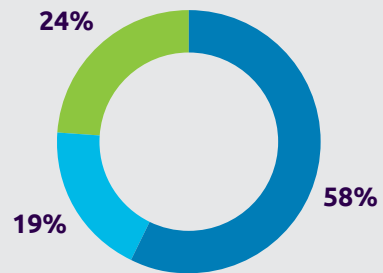
Executive survey:

We surveyed executives from 280 companies from automotive OEMs, suppliers, and technology companies. These executives belonged to companies headquartered in US, UK, France, Germany, Sweden, and China

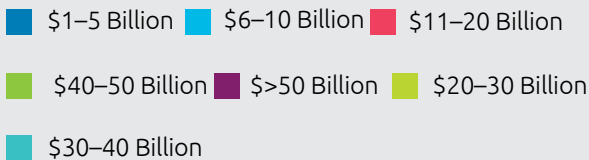
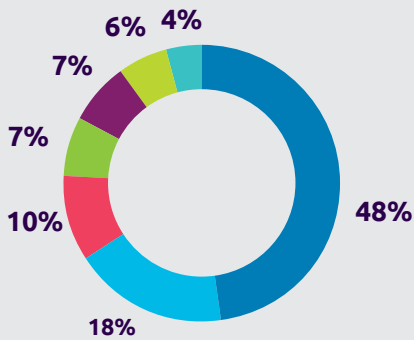
Organizations by country



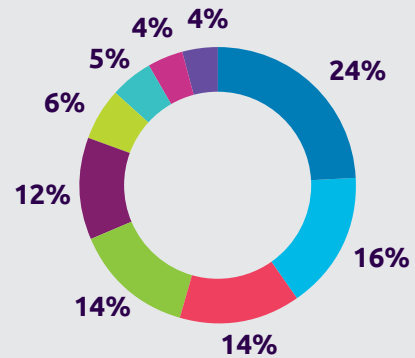
Organizations by company type



Organizations by revenue



Organizations by designation



We also conducted interviews with academics and industry leaders, policy makers examining the impact of autonomous cars on consumers and the overall automotive ecosystem, and the emerging best practices.

References

1. Quartz, "All the places self-driving cars are being tested around the world," December 2018.
2. Bloomberg, "Waymo's Self-Driving Cars are Near: Meet the Teen Who Rides One Everyday," July 2018.
3. The Verge, "Riding in Waymo One, the Google Spinoff's first self-driving taxi service," December 2018.
4. VentureBeat, "Daimler and Bosch lay out plans for autonomous taxi service in San Jose," November 2018.
5. World Atlas, "Cities With The Worst Traffic In The World," January 2018.
6. China Daily, "Pushing pedal to the metal for more self-driving cars on roads," January 2019.
7. Pew Research, "Millennials stand out for their technology use, but older generations also embrace digital life," May 2018.
8. NHTSA, "Critical Reasons for Crashes Investigated in the National Motor Vehicle Crash Causation Survey," February 2015.
9. CNN, "Singapore wants self-driving cars to help its aging society," February 2019.
10. The Verge, "Amazon will now deliver packages to the trunk of your car," April 2018.
11. Phys.org, "Study shows autonomous vehicles can help improve traffic flow," February 2018.
12. Wired, "It takes a single autonomous car to prevent phantom traffic jams," May 2018.
13. Engadget, "Ford's self-driving division is now its own company," July 2018.
14. NDTV, "Bosch To Invest Four Billion Euros In Autonomous Cars Development," January 2019.
15. Reuters, "Honda to invest \$2.75 billion in GM's self-driving car unit," October 2018.
16. The Verge, "Toyota starts a new \$2.8 billion company to develop self-driving software," March 2018.
17. Algorithm-XLab, "Audi Pledges to Invest £12.5 Billion on Self-driving and Electric Cars," December 2018.
18. Wired, "Drivers Wildly Overestimate What 'SemiAutonomous' Cars Can Do," October 2018.
19. Wired, "Android Phone Hacks Could Unlock Millions of Cars," February 2017.
20. Wired, "Hackers Remotely Kill a Jeep on the Highway – With Me in it," July 2015.
21. Mediapost, "Driverless BMW Scares A Ghost," March 2019.
22. Mashable, "Audi partners with Disney to entertain car passengers with VR," January 2019.
23. New York Times, "Why Car Companies Are Hiring Computer Security Experts," June 2017.
24. Capgemini Research Institute, "The Need for Speed: Four recommendations to turbo-charge digital performance in the automotive industry," December 2018.
25. Capgemini Research Institute, "The Digital Talent Gap: Are Companies Doing Enough?," October 2017.

About the Authors



Markus Winkler

Executive Vice President, Global Head of Automotive & Mobility
markus.winkler@capgemini.com

Markus Winkler has been with the Capgemini Group since 2005 and leads the Global Sector Automotive & Mobility. He has gained wide-ranging experience in delivering major business and technology transformation programs in the automotive industry with a focus on consumer experience, connected services, and digital excellence, notably at BMW Group, Volkswagen Group, Volvo Cars, Toyota, etc. He is a recognized expert in digital transformation and works with our delivery teams for leading automotive clients.



Dr. Rainer Mehl

Executive Vice President and Managing Director – Manufacturing, Automotive, Life Sciences
Capgemini Invent
rainer.mehl@capgemini.com

Rainer leads the global MALS practice for Capgemini Invent. With his background in the automotive industry for the last 20+ years, Rainer is a recognized expert in organizational, process, and technology topics. He has published several articles, blogs, and ebooks on the digital transformation of the automotive industry.



Håkan Erander

Vice President, Automotive, Capgemini Invent
hakan.erander@capgemini.com

Håkan Erander has been with the Capgemini Group since 2005 and leads the global Automotive & Mobility sector in Sweden. He has spent his entire career within automotive with a special focus on customer engagement, analytics, and retail.



Sandhya Sule

Vice President, Automotive, Sogeti
sandhya.sule@capgemini.com

Sandhya Sule is a vice president at the Capgemini Digital Engineering and Manufacturing Services (DEMS). She leads the Automotive Engineering Practice, providing solutions and delivery for clients globally. Her team's current focus is on the adoption of MBSE, cybersecurity, AI, analytics, and data-driven insights to the engineering of autonomous, connected, and smart vehicle ecosystems.



Jerome Buvat

Global Head of Research and Head of the Capgemini Research Institute
jerome.buvat@capgemini.com

Jerome is head of the Capgemini Research Institute. He works closely with industry leaders and academics to help organizations understand the nature and impact of digital disruptions.



Subrahmanyam KVJ

Program Manager, Capgemini Research Institute
subrahmanyam.kvj@capgemini.com

Subrahmanyam is a program manager at the Capgemini Research Institute where he leads the India team. He loves exploring the impact of technology on business and consumer behavior across industries in a world that is being eaten by software.



Amrita Sengupta

Manager, Capgemini Research Institute
amrita.a.sengupta@capgemini.com

Amrita is a manager at the Capgemini Research Institute. She tracks the patterns of digital disruptions across industries and their impact on businesses.



Yashwardhan Khemka

Manager, Capgemini Research Institute
yashwardhan.khemka@capgemini.com

Yash is a manager at the Capgemini Research Institute. He likes to follow disruption fuelled by technology across sectors.

The authors would like to thank Patrick Nicolet and Michel Guiga from Capgemini France, Monika Hespe, Sumeet Nag, Sebastian Tschödrich, Christian Hummel, Volker Darius, Nepomuk Kessler, and Malte Völkoi from Capgemini Germany, Ron Tolido from Capgemini Netherlands, Karl Antonsson, and Kevin Jiang from Capgemini Sweden, Simon Phillips from Capgemini UK, and Charlie Weibel, Will DuPont, Bob Schwartz, and Alex Stock from Capgemini US.

About the Capgemini Research Institute

The Capgemini Research Institute is Capgemini's in-house think tank on all things digital. The Institute publishes research on the impact of digital technologies on large traditional businesses. The team draws on the worldwide network of Capgemini experts and works closely with academic and technology partners. The Institute has dedicated research centers in India, the United Kingdom, and the United States. It was recently ranked Top 1 in the world for the quality of its research by independent analysts.

Visit us at: www.capgemini.com/research-institute

Discover more about our recent research on digital transformation



[Accelerating Automotive's AI Transformation](#)



[Automotive Smart Factories: Putting automotive manufacturers in the digital industrial revolution driving seat](#)



[Unlocking the business value of IoT in operations](#)



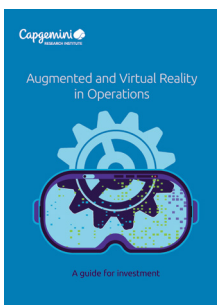
[Digital Transformation Review 11: Artificial Intelligence Decoded](#)



[Turning AI into concrete value: the successful implementers' toolkit](#)



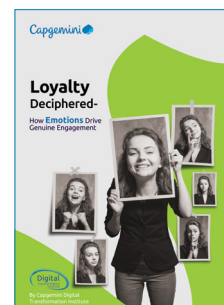
[The need for speed: Four recommendations to turbo-charge digital performance in the automotive industry](#)



[Augmented and Virtual Reality in Operations: A guide for investments](#)



[The Secret to Winning Customers' Hearts With Artificial Intelligence: Add Human Intelligence](#)



[Loyalty Deciphered—How Emotions Drive Genuine Engagement](#)

For more information, please contact:

Global

Markus Winkler
markus.winkler@capgemini.com

Dr. Rainer Mehl
rainer.mehl@capgemini.com

France

Cédric Nouvellet
cedric.nouvellet@capgemini.com

Michel Guiga
michel.guiga@capgemini.com

Nordics

Hakan Erander
hakan.erander@capgemini.com

Caroline Segerstéen Runervik
caroline.segersteen-runervik@capgemini.com

Germany

Henrik Ljungström
henrik.ljungstroem@capgemini.com

Christian Hummel
christian.hummel@capgemini.com

UK

Nathan Summers
nathan.summers@capgemini.com

Spain

Agustín González Rodríguez
agustin.a.rodriguez@capgemini.com

Carlos Garcia Santos
carlos.garcia.s@capgemini.com

Italy

Domenico Cipollone
domenico.cipollone@capgemini.com

India

Ajinkya Apte
ajinkya.apte@capgemini.com

China

Wilson Chu
yan.chu@capgemini.com

Tracy Qinqing Liu
qinqing.liu@capgemini.com

Japan

Hiroyasu Hozumi
hiroyasu.hozumi@capgemini.com

US

Mike Hessler
michael.hessler@capgemini.com

Will DuPont
will.dupont@capgemini.com

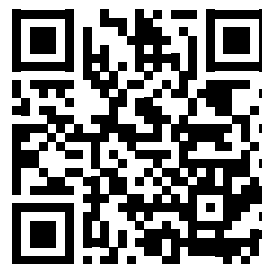
Capgemini's Smart Mobility Connect*

Capgemini's *Smart Mobility Connect** is a series of custom Automotive offers that is addressing the need for customer centricity. Smart Mobility Connect empowers clients to digitalize their core business and customer-facing channels (connected customer), to monetize new growth potential (connected services and products), expand the profit pool with new partnerships (connected ecosystem) and transform to a customer-centric business, leveraging the overarching AI-enabled customer engine platform.

* <https://www.capgemini.com/service/invent/smart-mobility-connect/>

Subscribe to latest research from Capgemini Research Institute

Receive advance copies of our reports by scanning the QR code or visiting [Capgemini.com/Research-Institute](https://www.capgemini.com/Research-Institute)



Capgemini Research Institute

Fields marked with an * are required

First Name *

Last Name *

Email *

By submitting this form, I understand that my data will be processed by Capgemini as indicated above and described in the Terms of use. *

Submit





About Capgemini

A global leader in consulting, technology services and digital transformation, Capgemini is at the forefront of innovation to address the entire breadth of clients' opportunities in the evolving world of cloud, digital and platforms. Building on its strong 50-year heritage and deep industry-specific expertise, Capgemini enables organizations to realize their business ambitions through an array of services from strategy to operations. Capgemini is driven by the conviction that the business value of technology comes from and through people. It is a multicultural company of over 200,000 team members in more than 40 countries. The Group reported 2018 global revenues of EUR 13.2 billion.

Visit us at

www.capgemini.com

People matter, results count.

The information contained in this document is proprietary. ©2019 Capgemini.
All rights reserved.