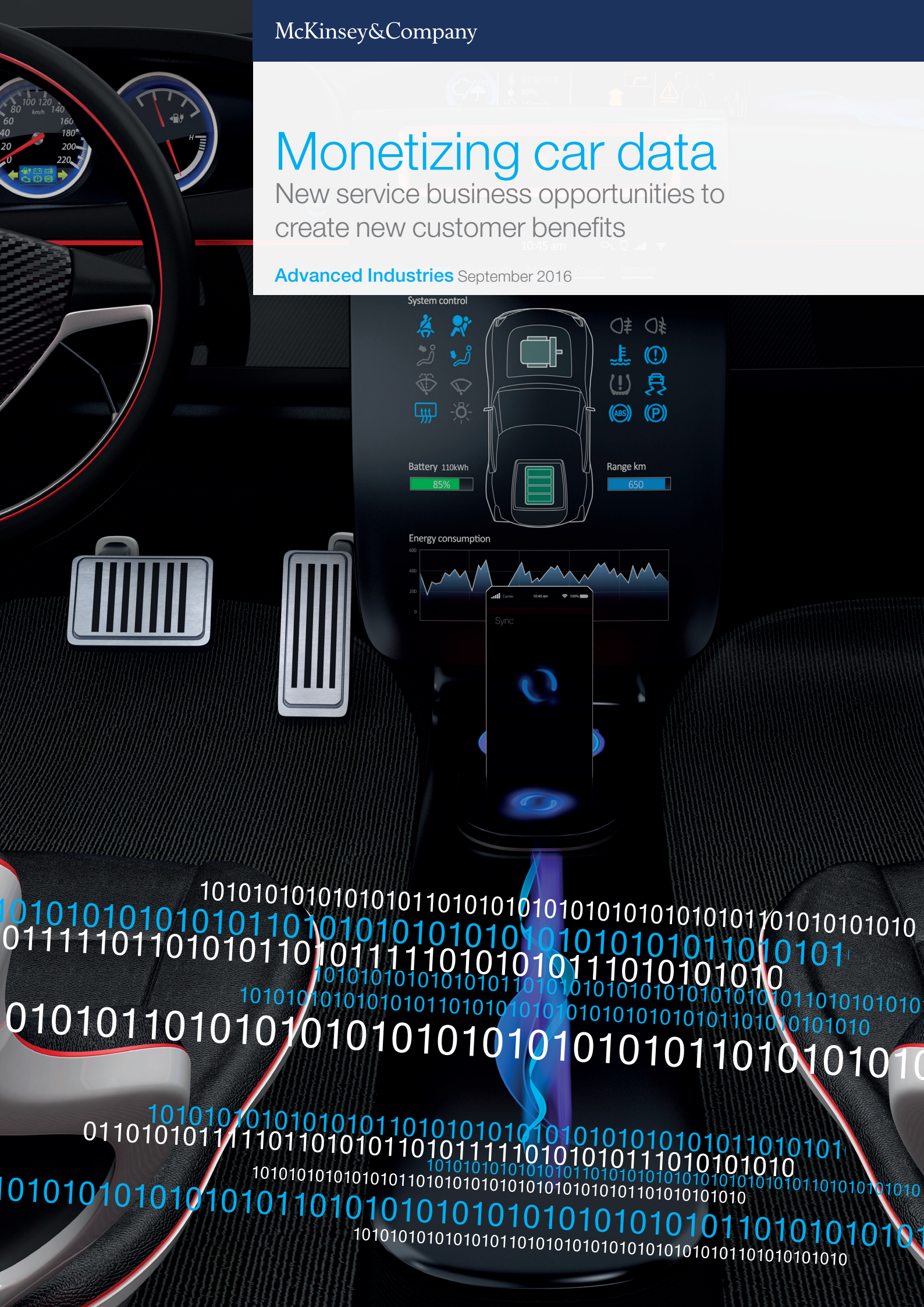
McKinsey&Company

Monetizing car data

New service business opportunities to create new customer benefits

Advanced Industries September 2016



Foreword

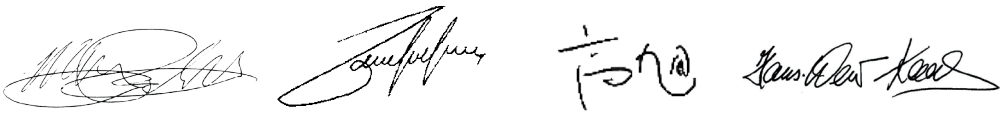
As privately owned vehicles become increasingly connected to each other and to external infrastructures via a growing number of sensors, a massive amount of data is being generated. Gathering this data has become par for the course; leveraging insights from data in ways that can monetize it, however, is still in its nascent stages.

To answer key questions around car data monetization and to understand how players along the connected car value chain might capture this potential, McKinsey & Company launched a large-scale, multimodality knowledge initiative course of research:

- Roundtable sessions conducted in Germany and the USA convened leaders from the automotive (OEMs, suppliers, sales), high-tech, insurance, telecommunications, and finance sectors.
- Surveys administered in China, Germany, and the USA assessed the preferences, trends, and concerns of about 3,000 customers regarding car data.
- One-on-one interviews explored the perspectives of car data leaders on the trends and monetization matters in the space.
- "Customer clinics" collected user observations around preferences and attitudes towards the practicality of various car connectivity features and services.
- A model was developed to quantify the overall revenue pool related to car data and the opportunity for key industry players based on selected, prioritized use cases.

In the following you will find a synthesis of the key findings of this broad, ongoing knowledge effort.

We would like to thank the many organizations that participated in this exploration of the potential and requirements of car data monetization and that through their contributions made this effort possible.



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Executive summary

Cars generate data about how they are used, where they are, and who is behind the wheel. With greater proliferation of shared mobility, progress in powertrain electrification, car autonomy, and vehicle connectivity, the amount of data from vehicles will grow exponentially, raising a key question:

How might industry players in the evolving automotive ecosystem turn car-generated data into valuable products and services?

Through a comprehensive course of research – comprised of surveys, interviews, and observations – McKinsey analyzed consumer perspectives on the prospect of accessing car-generated data, identifying and assessing the value and requirements of possible car data-enabled use cases. The overall revenue pool from car data monetization at a global scale might add up to USD 450 - 750 billion by 2030. The opportunity for industry players hinges on their ability to 1) quickly build and test car data-driven products and services focused on appealing customer propositions and 2) develop new business models built on technological innovation, advanced capabilities, and partnerships that push the current boundaries of the automotive industry.

Customer value proposition. The car data monetization opportunity begins with an environment in which customers believe that there is something of value in it for them and that the cost is worth the benefit. The survey revealed that, in general, customers are interested in data-enabled features that make mobility safer or more convenient and save them time or money. Across geographies, nearly two-thirds of consumers saw the various car data use cases as personally relevant, and more than three-fourths deemed them useful. Certain use cases rely on driving-related or systems data (route, vehicle usage, etc.), while others require users to share more personal data, such as the content of personal communications. Customers are more reluctant to share the latter type of data, but 60 percent of them are willing to do so when the feature is safety or convenience related. Younger customers appear to be significantly more open to the adoption of data-enabled features and services in cars than customers over 50 years of age, and frequent travelers (those spending more than 20 hours per week in the car) are almost twice as likely to adopt them than occasional drivers.

Use cases and business models. Through roundtables, interviews, customer clinics, and problem solving with industry leaders, we identified more than 30 separate use cases that could generate value for end customers and industry players, ranging from predictive maintenance to over-the-air software add-ons and from vehicle usage scoring to usage-based insurance. Each use case has the potential to create value in one of three main ways: revenue generation, cost reduction, or safety and security enhancement. Multiple direct monetization options exist; features and services can be charged to end customers – by rolling their cost into the vehicle price, selling them as a one-time purchase after initial vehicle sale, or offering them via subscription or rechargeable credit – or provided free of charge when customers agree to receiving advertising as part of the deal.

Customer willingness to pay for features – as opposed to a preference for free, ad-supported features – varies across use cases and geographies. For example, 73 percent of consumers globally are willing to pay for predictive maintenance services, but the spread ranges from 78 percent in China to 71 percent of consumers in the USA. When it comes to connected navigation services, the global average for customer willingness to pay

drops to 43 percent, mainly driven by the availability of credible, free alternatives already established on the market. As a consequence, industry players must pragmatically develop and tailor their offerings to each specific use case and to the local preferences.

In this landscape, it is critical for industry players to clearly define their strategic stance vis-à-vis a set of control points, i.e., critical technologies to capture value from the use cases. Across a number of existing control points, accessing the car data gateway, shaping the human-machine interface (HMI), and matching customer ID with data strings will be of central importance for industry players.

Enablers. The monetization of car data requires a set of enablers across three broad categories: in-car technology enablers include sensors, high-performance computing, in-car HMI, car OS, connectivity, data storage, and location/navigation hardware. Infrastructural technologies outside of the vehicle to enable car data monetization include 4G/5G data towers, big data analytics, cloud computing, software platforms, high-definition maps/high-resolution positioning, smart-road infrastructure, and V2X communications. Back-end processes facilitate the analysis and sharing of car data and ensure the functioning and security of the whole ecosystem. Among others, these enabling players are regulators, infrastructure operators, content providers, cybersecurity players, and data center operators.

Capabilities and partnerships. For incumbents like auto OEMs or tier-1 suppliers, building and operating service businesses is a new and significant challenge, requiring the development of specific capabilities either internally (e.g., hiring, developing, and retaining digital talent) or externally, partnering or acquiring digital-native players.

From a capabilities angle, the starting point for incumbents to enter the car data monetization arena is to step up their data management capabilities in terms of:

- Data preparation collection, cleansing and formatting from a multitude of relevant sources (e.g., the car, OEM Web site, social media, dealer management system)
- Data analysis that applies “big data/advanced analytics” techniques to extract valuable insights from this wide and complex data landscape
- Data usage and value delivery, deploying features, products, services, and recommendations to final customers and/or to business partners in order to capture the opportunity and continuously refine their offerings.

Pushing beyond the basics, making services, R&D, factories, and channels “digital ready” – especially for traditional automotive organizations – is likely to require a fundamental shift from current ways of working that may be less conducive to the digital innovation required to succeed in car data monetization. Industry executives concur that organizational complexity and lack of specific digital skills fundamentally hinder OEMs’ ability to innovate at the rate of nimbler high-tech players and start-ups. Digital innovation for large OEMs might entail the establishment of a “digital accelerator” unit that is 1) independent enough to inspire creativity, 2) agile enough to quickly develop (or kill) innovations as a “venture capitalist” would, and 3) linked closely enough to the business to ensure that innovation translates into value for the broader company at scale.

Looking outside of the organization, technology, market, and regulatory trends will make strategic collaboration increasingly necessary. Players in the car data monetization space will be naturally forced to partner with multiple entities (e.g., high-tech suppliers, their own customers, public institutions) to access specific capabilities and to reduce development costs. Openness and agility in creating partnerships on R&D and sales channels development will be required to succeed.

Looking ahead. High-tech companies, start-ups, alternative mobility operators, data management services, insurers, roadside assistance providers, and infrastructure operators will all be players in the car data monetization landscape. It is the most traditional of automotive players, however, who may find staking a claim most challenging. OEMs and suppliers are accustomed to seven-year product cycles, full control over a stable value chain, consolidated monetization models, and few interactions with end customers. They are also used to delivering products and services with limited digital capabilities. Car data monetization will challenge all of these current realities and compel incumbents to quickly make pragmatic changes to their approaches. In order to succeed, industry players can start making their way now with some practical early steps:

- Fix an initial car data monetization "ambition target" at CEO level and set the organization towards truly transformational change!
- Prioritize the use case offerings most suited to the organization, and define a realistic estimate of the overall value pool and timing for market development!
- Begin pragmatic piloting on a limited number of use cases and quickly collect customer feedback to adjust the course!
- Lay robust IT foundations for the future, but do not be afraid to leverage IT work-arounds to test the use cases today!
- Note the spaces where long-term capabilities need to be developed or integrated, and build an ecosystem of partners to deliver on the use cases!
- Cultivate a cross-functional, cooperative dynamic that fosters innovation, and identify the best organizational setup to act as "technological accelerator" for the company going forward!

Introduction: global automotive macrotrends and the value opportunity from car data

By and large, there are four powerful global automotive megatrends behind the explosion in car data availability and its growing potential to be monetized.

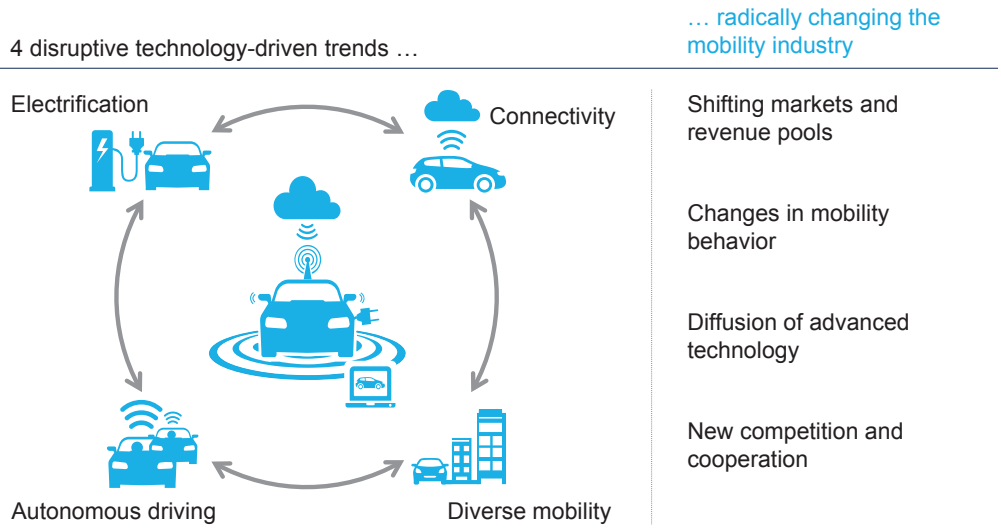
Powertrain electrification is being driven by stricter emission regulations, lower battery costs, widely available charging stations, and increasing consumer acceptance. Electrified vehicles (hybrid, plug-in, battery electric, and fuel cell) could account for a share greater than 10 percent of new vehicle sales by 2030, and in selected geographies this number could go as high as 50 percent.

Shared mobility as an alternative to privately owned vehicles is growing as a mobility model. By 2030, one out of ten cars sold could be a shared vehicle. This trend could spawn the rise of a market for fit-for-purpose mobility solutions that will represent an attractive alternative to the current "one-car-for-all-purposes" model.

Car connectivity will allow for new functionalities and features to be offered to drivers and passengers and will support the effectiveness of advanced driver assistance systems (ADAS).

Autonomous vehicles (AVs) will represent the ultimate manifestation of ADAS, marking the shift from driver-assisted functionality to fully autonomous vehicle operation. A progressive adoption scenario might imply that up to ~15 percent of passenger vehicles sold in 2030 could be fully autonomous, although significant differences in adoption might arise across different markets. Autonomy will progressively transform the car into a platform from which drivers and passengers can use their transit time for personal activities, which could include the use of novel forms of media and services (Exhibit 1).

Exhibit 1 **Global megatrends trigger trends in the automotive industry that have the potential to radically change the mobility industry**



SOURCE: McKinsey

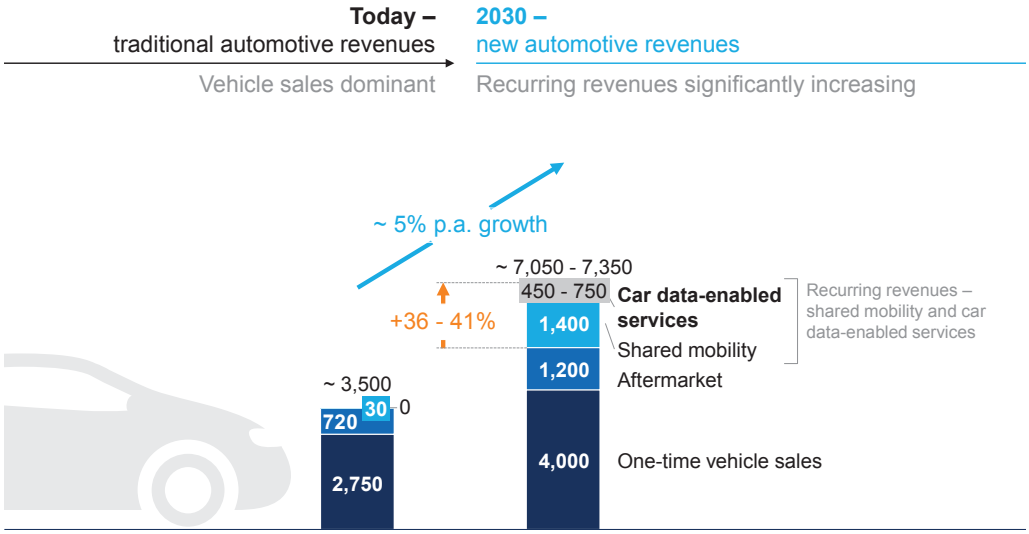
These trends, thoroughly described in McKinsey's report "Automotive Revolution – perspective towards 2030," will define new mobility models, and data-enabled services and features will become increasingly available and relevant for customers.

What the trends described above have in common is their contributions (current and future) to an unprecedented explosion in car-generated digital data, with significant implications not just for traditional automotive industry businesses but for new players as well. Companies representing the high-tech, insurance, telecommunications, and other sectors that at once seemed, at most, "automotive adjacent" will play critical roles in enabling car data-related services that customers may be willing to pay for.

With increasing proliferation of new features and services, car data will become a key theme on the automotive industry agenda and – if its potential is fully realized – highly monetizable. We have identified and described about 30 data-enabled use cases, clustering them around their fundamental value creation model: direct revenues generation, costs saving, or safety/security increase. Together, these use cases have the potential to result in a total revenue pool of USD 450 - 750 billion by 2030 (Exhibit 2). Importantly, these valuations should be interpreted as a projection of current trends and assumptions of probable scenarios across these trends based on our current understanding – and are thus not deterministic in nature.

Exhibit 2 **Car-generated data may become a USD 450 - 750 billion market by 2030**

USD billions



SOURCE: McKinsey

In order to position themselves to capture value from car data, industry players will need to respond to four fundamental challenges:

- Developing a compelling value proposition for customers to share their data and preferences
- Defining data-related use cases and business models in detail
- Putting the required technical enablers in place
- Building the necessary capabilities and partnerships.

Clearly, there is no single strategy to succeed in car data monetization, as targeted and company-specific approaches are required. Each player will be expected to develop a plausible and pragmatic blueprint, acknowledging its starting point and current capabilities as well as its future ambitions and prospects.

It is precisely against this background and with a view to facilitating this undertaking that we introduce and discuss the findings and insights from our research in the following four core sections.

Developing a compelling value proposition for customers

The first challenge on the path towards car data monetization is communicating to the end customers exactly what is in it for them. The exchange of data for benefits lies at the very heart of the value creation process related to car data. Benefits for consumers typically fall into four broad categories: safety, convenience, time savings, and cost reduction.

In the safety category, car data can enable real-time emergency calls, immediate information that facilitates rescue services, and road hazard warnings that allow drivers to be informed and respond quickly. When it comes to convenience, car data can reduce breakdown risk/downtime with predictive maintenance, concierge services can make light work of routine tasks (such as car washing and refueling), and connected infotainment can provide easy-to-access entertainment. These features can also be big time savers for users. Optimized routing and navigation can reduce delivery/travel time, and systems of networked parking

can mean never having to search for a parking space. Finally, customers who are willing to receive in-car advertising and share information with insurers could save money at the retail point of sale and on their insurance premiums, respectively. Participation in automated payment schemes could also present customers with an opportunity to save on tolls or municipal road-related taxes.

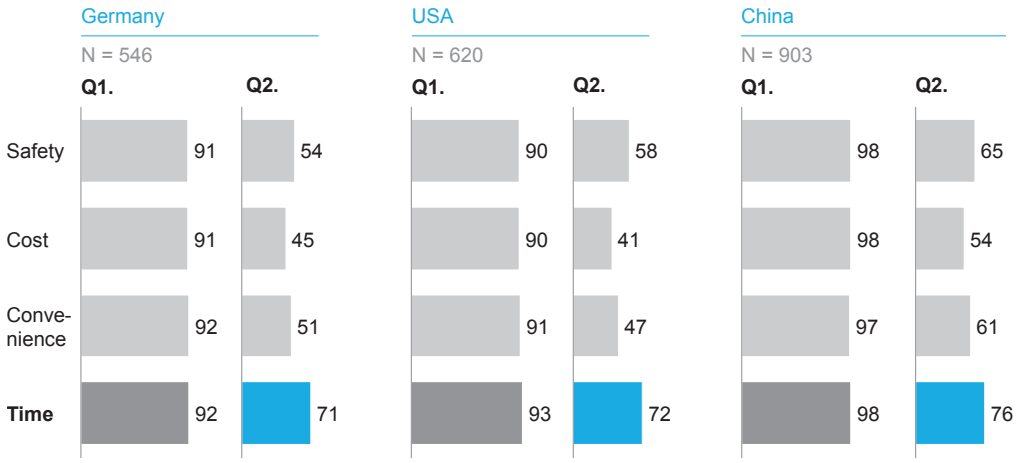
In our survey, customers showed a higher willingness to share data (and to pay!) for time-related use cases, such as networked parking, allowing them to save valuable time in city centers often spent looking for available parking spots (Exhibit 3).

Exhibit 3

Across geographies, willingness to share data and pay for time-saving use cases is high

Q1. Willingness to share data: Which of the following service versions would you prefer?
Percent of respondents selecting either full version or basic version in Q1 in exchange for sharing data

Q2. Willingness to pay: What would be your preferred subscription model for this service?
Percent of respondents selecting any of the paid options in Q2 instead of free, ad-supported versions



SOURCE: McKinsey Car Data Monetization Survey 2016

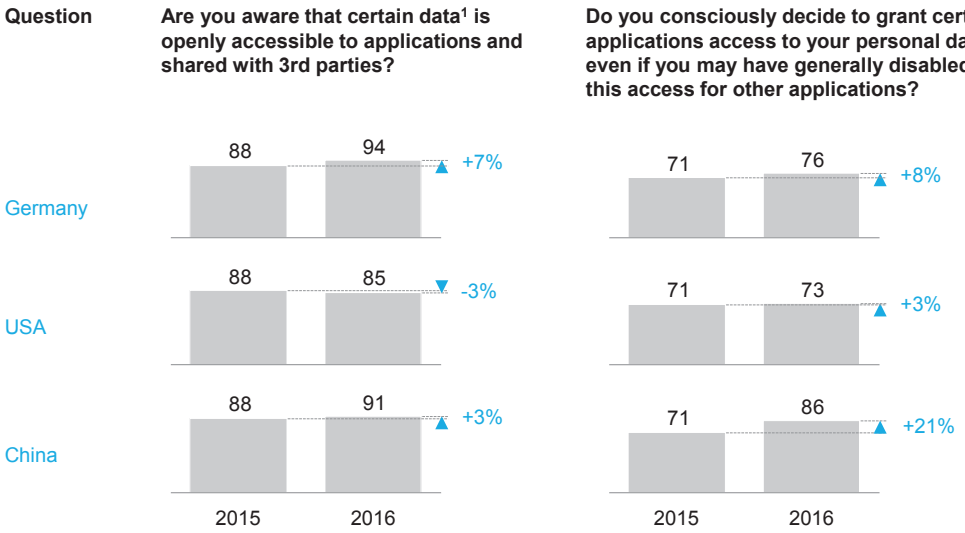
The broader good news is that customers are increasingly aware of and interested in the benefits related to car data-enabled features and services. When compared to the results of our 2015 car connectivity survey (Exhibit 4), customers across markets today are:

- More aware that data is openly accessible to applications and third parties (~90 percent of globally surveyed customers, +2 percentage points vs. 2015)
- More willing to consciously grant access to their data (79 percent of globally surveyed customers, +11 percentage points vs. 2015)
- More comfortable sharing personal data with apps/smartphone OS rather than for data-enabled use cases related to mobility (79 percent willingness compared to 62 percent).

There is still, however, work to be done. A more granular look at consumer openness to data sharing reveals persistent cautiousness and fear that certain data types, perceived as privacy critical, could be misused. Framing data types is therefore important to understanding how customers approach the issue of exchanging data for benefits.

Exhibit 4 Customer awareness of how applications access and share personal data is high as is their willingness to trade data for benefits

Percentage of respondents saying "Yes", N = 3,000 (in 2015), 3,186 (in 2016)



1 E.g., your current location, address book details, browser history

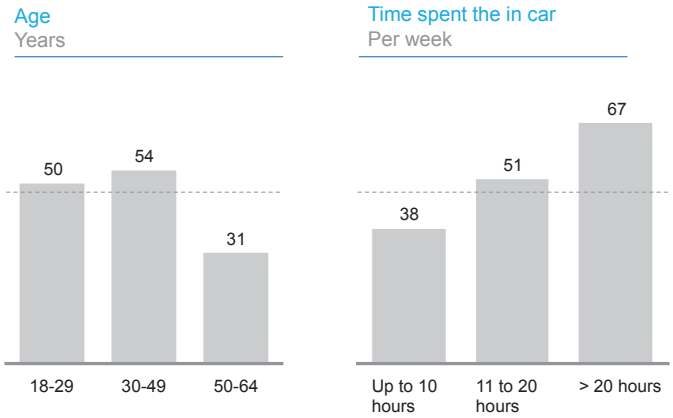
SOURCE: McKinsey Car Data Monetization Survey 2016

Consistent with McKinsey's observations in the 2015 "Competing for the connected customer" survey, younger and middle-aged customers declare to be more interested in data-enabled features and services than mature drivers. Similarly, interest in connectivity features increases with the time spent in the car. As we observed in our customer clinics, people typically have a limited familiarity with current infotainment systems: once they get more used to their interfaces, they feel more confident in testing new services and features (Exhibit 5).

Exhibit 5 Younger audiences and frequent travelers show a higher initial interest in car data-enabled features and services

Question: Do car data-enabled features/services solve a problem or fulfill a relevant need for you?

Percent of respondents selecting "Probably" or "Definitely"[1], N = 3,186

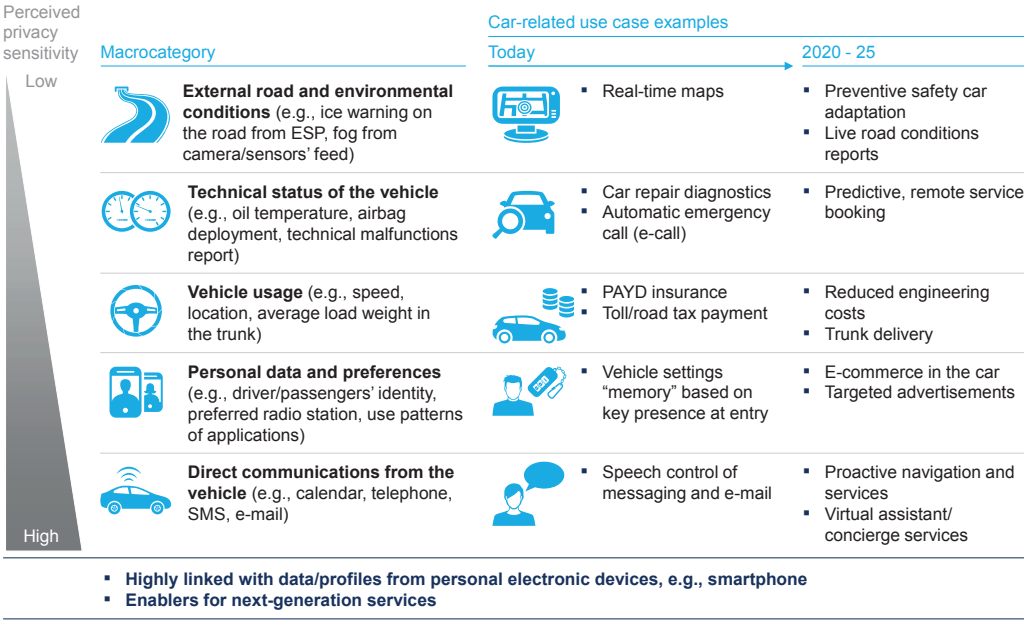


1 Aggregated responses related to the use cases tested in the survey

SOURCE: McKinsey Car Data Monetization Survey 2016

The car data-enabled features for which consumers may be willing to pay rely on a mix of data macrocategories. These categories imply different degrees of customer sensitivity in terms of data sharing (Exhibit 6).

Exhibit 6 **The car generates different macrocategories of data, each of which with different levels of perceived privacy sensitivity by the customer**



SOURCE: McKinsey

At the low-sensitivity end, external environment conditions, the vehicle's technical status, and vehicle usage are the data categories in which consumers are most willing to share information. This is perceived to be "objective" data and generally less critical. Nonetheless, smart management of this information is required, as in the case of vehicle location and usage. In our customer clinics (Text Box 1), consumers declared to be:

- Generally open to sharing when and on which stretches of road they drive to support traffic flow analysis and to improve road safety
- Not at all willing to share the "start point" and "end point" of their trips, allowing external actors to track exactly where (and when) they are driving.

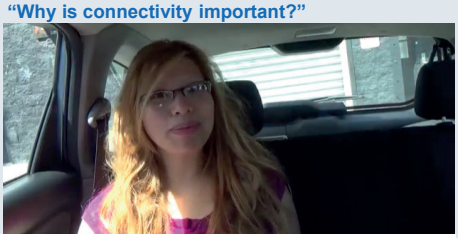
In order to respond to consumers' points of willingness and reluctance, industry players are offering "batch data" analysis, which would delete the first and last few minutes of the trip from the data logs, so that start and end point would remain undiscoverable.

Text Box 1 Deep dive on customer clinics

A series of customer clinics was conducted by LUNAR in Chicago and Silicon Valley, where shared mobility and car users opened up about their attitudes towards data sharing, connectivity, and autonomous vehicles in a real-life environment. These full-day sessions enabled us to capture the voices of real people into our conversation about car data monetization and to test in depth their attitudes towards potential future technologies and interfaces (Exhibit 7).

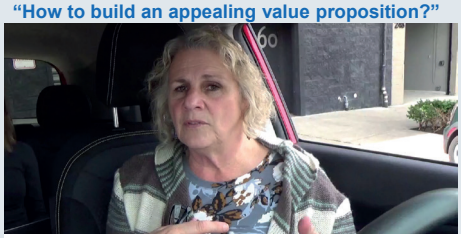
Exhibit 7 We have run customer clinics on car data use cases with LUNAR, the design firm recently acquired by McKinsey

"Why is connectivity important?"



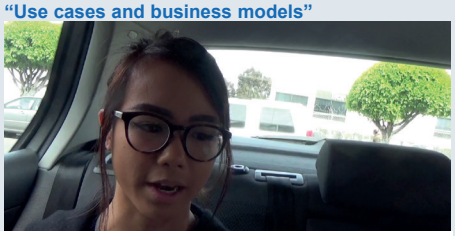
"I would be bored if I weren't connected to something, it's really just to keep me from getting bored"

"How to build an appealing value proposition?"



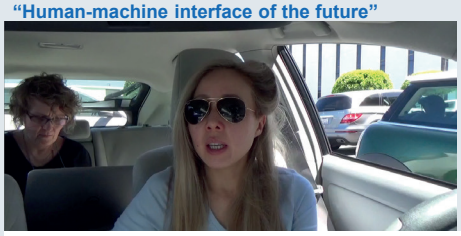
"There's so much stuff that you can get online – it's give and take, but if you don't let go, you can't have it"

"Use cases and business models"



"It sounds like a great idea because people have to work for good insurance rates – if they drive well, then they get a better insurance rate"

"Human-machine interface of the future"



"The interface will be really smart, you will be able to communicate with it like with a friend"

SOURCE: LUNAR, McKinsey

Key findings from the clinics include:

- Consumers understand they will share personal information as part of their digital lives – they just expect to get a fair value in return.
- Keeping car technology up to date is perceived as exciting. People instinctively draw the connection between an upgradeable phone/OS and an upgradeable car.
- People are open to the concept of voice-activated assistants and generally find current HMI cumbersome. Many refrain from using cool car features because they do not want to look foolish trying.
- People who drive better want to claim benefits. People who do not, want to be sure that their behavior is not monitored by the car.
- Driving styles are an expression of individual personality. People are willing to take suggestions from the car but they do not want it to cross over into the territory of nagging.
- Ride sharing users are much closer to accepting the idea of self-driving fleets than nonusers, as they believe it will significantly improve their mobility experience.

> *"The time you spend in a car is the constraining commodity … multiple devices are competing for it and currently the smartphone is winning."*
>
> *– High-tech player from Silicon Valley*

At the other end of the spectrum, customers perceive data categories as riskier when those imply sharing personal data and preferences and the content of personal communications from inside the vehicle. Customers are generally more reluctant to share these types of data, as they consider them private.

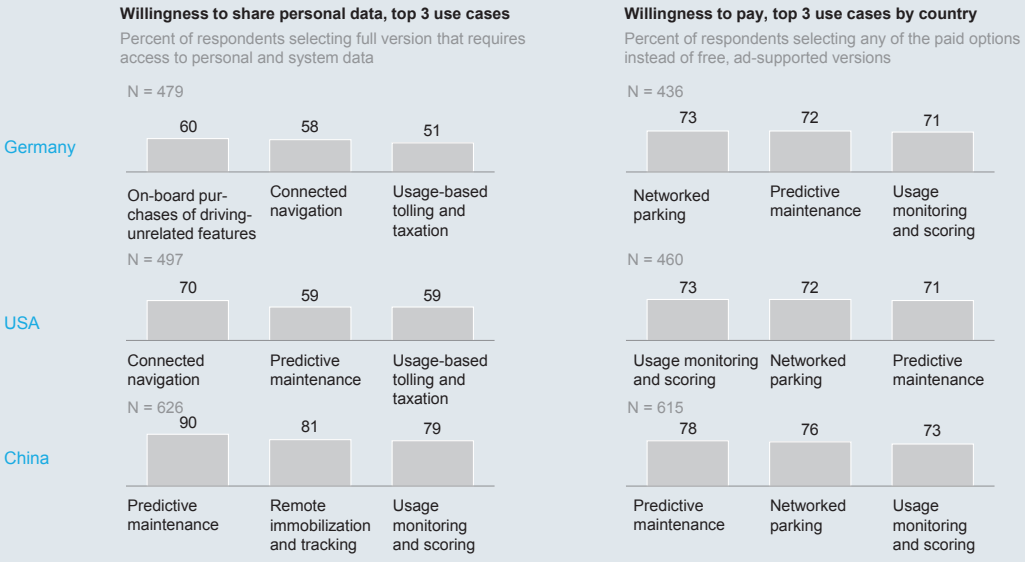
Within the "nonpersonal" categories in which customers are most willing to share data, they expect a fair level of benefit in exchange. When it comes to what they might get in return for the very personal data they share, their expectations are even higher, and sensitivity to mistakes in managing data becomes critical for the reputation of the industry player.

Customers' thresholds for data sharing and the trade-offs with which they are comfortable are ever changing (Text Box 2). A sizable share of customers is resistant to data sharing, but nearly half of those who express concern make it clear that with certain assurances, their reluctance to sharing data diminishes (Exhibit 9).

Text Box 2 Willingness to share does not necessarily imply willingness to pay

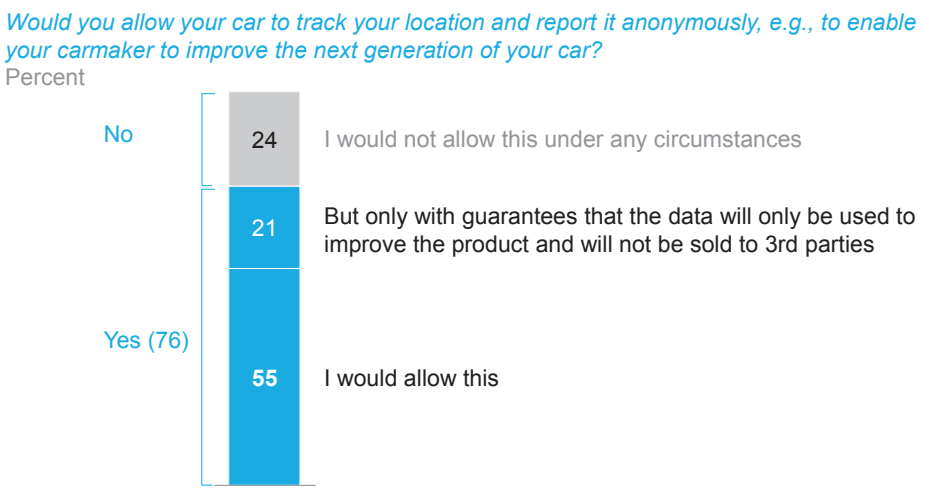
Unsurprisingly, the willingness to share data varies significantly across use cases and geographies. Customers are willing to trade their data only if they clearly understand the benefits they will get and perceive them as being relevant. As you can see in Exhibit 8, absolute willingness to share data varies significantly across markets. On the other hand, out of our ~30 use cases, the ones benefitting from the highest willingness to pay are the same across the surveyed markets (although in different orders): networked parking, predictive maintenance, and vehicle usage monitoring and scoring.

Exhibit 8 Willingness to share data in exchange for a feature varies by feature type and geography; willingness to pay, however, is high for parking, maintenance, and usage monitoring features and consistent across geographies



SOURCE: McKinsey Car Data Monetization Survey 2016

Exhibit 9 About half of customers are comfortable sharing data with OEMs, and with assurances the data will not be sold, that share goes to three-fourths



Counter to initial expectations, data privacy concerns do not appear to be a major roadblock for the proliferation of connectivity features

SOURCE: McKinsey Connectivity and Autonomous Driving Consumer Survey 2015

A continuous exploration of customers' attitudes towards data sharing will be crucial to players' abilities to cash in on the data opportunity. Players in the car data space who are best able to build and maintain trust will find themselves in ideal positions to capture the potential rewards of car data.

These matters of privacy, security, and information sharing raise the critical issue of trust. For digital-native customers, data has become the currency that facilitates the exchange between customers and businesses. This will become increasingly important as the share of digital natives grows and more traditional customers find themselves jumping on the digital bandwagon. As this trajectory continues, all businesses – and particularly those in the car data sphere – will need to focus on their ability to build trust with their customers.

Measuring success through customer trust

The critical aspect highlighted by end customers in our customer clinics was the element of trust in the brand they share their data with. For a player active in data monetization, building (and defending!) its reputation is fundamental to motivating people to engage in a fair "data for benefits" exchange.

Nonetheless, building and maintaining trust faces multiple challenges; cyber attacks, data leakages, and misusage of customer data can occur. Unfortunately, multiple cases affected the automotive industry, consumer electronics, and even the banking industry in the last five years.

> *"Rule No. 1 is not to use data against the customer."*
>
> *– European telematics player*

Against this background, we asked senior executives in our industry roundtables what were the five golden rules of building and maintaining customer trust. These are the answers they provided:

1. *Never use data against your customers, but rather in their service.* Frequency of interaction is critical, as customers do not want to be stressed by continuous questions or propositions.

2. *Provide clarity and education on what kinds of data are to be used,* why and how (e.g., anonymized vs. personalized), with a simple experience in the "terms and conditions" acceptance.

3. *Do not misuse and do not allow potential third parties to misuse data,* aggressively promote data security and respect of privacy, and be clear on "legal aspects."

4. *Give customers the choice of what to share* and what not to share and for which purposes (i.e., customers need to be in control of their own data); periodically remind customers that they can revise the parameters of data sharing.

5. *Make gathered data available to customers.*

Of course, despite best efforts, issues might still arise. Our industry roundtable participants identified five golden rules for dealing with a customer trust crisis:

1. *Admit the mistake openly.*
2. *Identify responsibilities with clarity.*
3. *Apply good crisis management.* Explain publicly what the problem is, what the solutions are, which actions will be taken, and how you will prevent the same from happening again in the future.
4. *Provide customers with some additional benefit* as tangible compensation for the disservice.
5. *Maintain open and clear communication* throughout the crisis (e.g., on social media), sharing the resolution of the issue as loudly as the issue itself.

> *"You have got to give customers a credible corporate response, and do everything you can to be sure that it won't happen again. Prolonged, repeated crises can sink any brand, even more when you're talking about handling customers' data ..."*
>
> *– High-tech player from Silicon Valley*

Setting business models, use cases, and monetization options to capture the opportunity

The market being created by access to massive amounts of car data is broadening the set of players in the car ecosystem, providing new sets of value creation models, and generating a large number of (related) use cases and monetization options. In the following, we will first offer systematic overviews of all of these elements as an orientation on the market's strategy options (see also Text Boxes 3 and 4), before illustrating how individual players could approach the challenge of capturing the car data monetization opportunity (see also Text Boxes 5 and 6).

In terms of relevant players, start-ups providing data-enabled services and established players from sectors that were once, at best, "automotive adjacent," are now finding themselves squarely in the thick of automotive's car data landscape.

The following is a look at who is already active in the car data space and how they are making their marks:

Automotive OEMs. In addition to selling connectivity-related options and services (e.g., infotainment, navigation), OEMs are already becoming active in car data analytics to better understand how customers use their cars, shape their repair and maintenance choices, and improve the link between dealers and customers (e.g., allowing for real-time, remote booking of vehicle check-ups).

Automotive suppliers are developing the software and hardware that are forming the infrastructure capable of capturing, analyzing, and selling car data. Although the range of technologies and applications spans widely, suppliers are now facing the challenge of understanding how to leverage data to 1) reach end customers directly; 2) better serve their B2B customers; and 3) improve their own product and services portfolio.

Insurers are able to capitalize on car data by offering usage-based insurance contracts, exploring occasion-related policies (e.g., short-term, location-based motor insurance) and extending their understanding of customers' behavior beyond the yearly contract signing touch point.

Roadside assistance providers can collect and process distress calls in real time from vehicle sensors and automated alerts, optimize the dispatching of rescue vehicles, but also analyze accident and breakdown data to provide valuable information to car OEMs and road infrastructure operators.

Infrastructure operators, including billing/toll road operators and recharging/refueling players, are analyzing car data to optimize the geographic deployment of their respective services, explore variable-pricing options, and monitor the status of their assets to reduce maintenance costs and improve safety.

High-tech giants are positioned to provide the fundamental car data analytics services that car OEMs and advertisers are willing to buy. In addition to being the IT backbone, they can offer front-end applications. Moreover, as the car is a central environment for digitization, multiple high-tech giants are developing in-car platforms and operating systems to boost the data generation and provide seamless connectivity experience across handhelds, vehicles, and other connected environments (e.g., the home). As we will see later, some functionalities, such as "smart, voice-activated virtual assistants" (e.g., Apple's Siri, Google Now, Microsoft's Cortana) might be the "killer applications" to persuade OEMs to offer their platforms and to motivate customers to share an even larger chunk of their data (as described in Text Box 7).

Start-ups are the smaller counterparts of the high-tech giants, entering the car data monetization space from a variety of angles, such as developing new apps, engineering innovative hardware/interfaces (e.g., retro-fittable gesture-activated controls), and offering services through innovative monetization schemes (as, for example, Pandora and Spotify did for music-related content).

Service providers offer data management services (e.g., analytics, pseudonymization, storage) and operate the back-end infrastructure and processes (including customer care, invoicing/billing) for the players in the ecosystem.

Mobility providers already rely on car data to be able to offer their services such as car sharing and e-hailing. They use the power of car data (e.g., car location, usage, battery status)

and user data (e.g., customer ID, credit, preferences) to even further approximate public transportation infrastructures and improve vehicle allocation, recharge, and fleet operations.

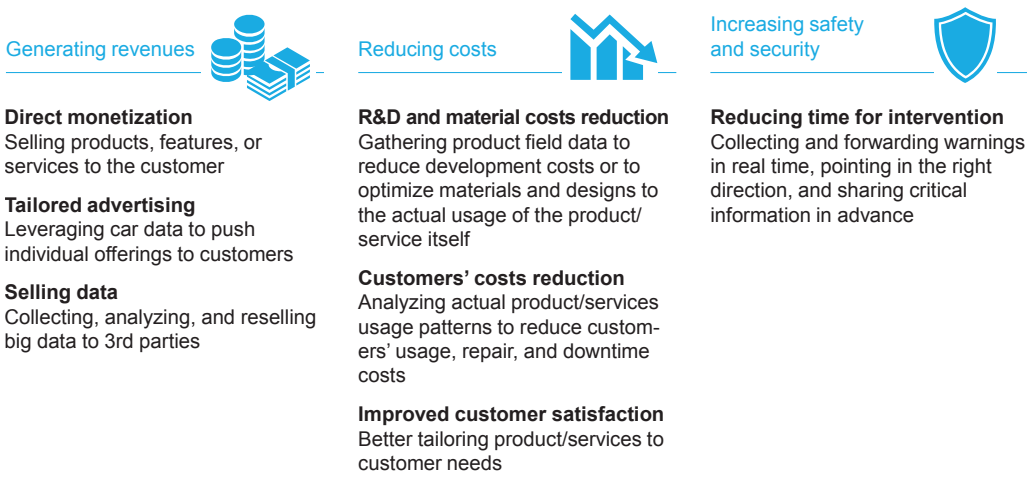
Retailers and service centers are using car data analytics to optimize their sales network and get the messages about their offerings directly to drivers. For example, by purchasing traffic flow data, retailers can define with greater precision their stores' footprint (i.e., number, type, and location of stores) and their inventory on the basis of actual traffic data, even segmenting the type of end customer actually driving in front of the store. Assuming they obtain customers' clearance, they could push highly tailored advertising to car screens and drivers' handheld devices on the basis of proximity and customer preferences.

Regulators/government institutions are setting the standards regarding the collection and sharing of car data. They are also in a position to mandate car data-enabled services that support the public good, such as emergency call features, and regulate controversial topics, such as technical certification of the connected vehicles, data ownership rights, and intellectual property rights over shared technologies and services. Working with infrastructure operators on big data, regulators can also seek to minimize congestion and reduce car accidents using traffic flow data analysis.

The three main value creation models of car data monetization

Players in this evolving automotive space are creating value from car data in one (or in a combination) of three overarching categories (Exhibit 10). First, players are generating revenue through the sale of products/services to customers, tailored advertising, and the sale of data to third parties. Second, they are using car data to reduce costs by, for example, making R&D more efficient or minimizing the need for repairs. Third, players are increasing safety and security by leveraging car data's ability to speed up safety interventions that protect drivers from physical harm or from the theft of their belongings or personal information.

Exhibit 10 Industry players may focus on 3 main macrocategories of value creation models



SOURCE: McKinsey

The car data monetization use cases

Within the three value creation models discussed above, we identified more than 30 distinct use cases that hold the potential to monetize car data (Text Box 3).

Text Box 3

Overview of distinct use cases

Value creation models		Use cases			
Generating revenues 	Direct monetization Selling products, features, or services to the customer	●	Over-the-air software add-ons	●	Usage-based tolling and taxation
		●	Networked parking service	●	"Gamified"/social-like driving experience
		●	Tracking/theft protection service	●	Fleet management solutions
		●	Vehicle usage monitoring and scoring	●	Remote car performance configuration
		●	Connected navigation service	●	In-car hot spot
		●	Onboard delivery of mobility-related contents/services		
		●	Onboard platform to purchase non-driving-related goods		
	Tailored advertising Leveraging car data to push individual offerings to customers	●	Predictive maintenance		
		●	Targeted advertisements and promotions		
Reducing costs 	R&D and material costs reduction Gathering product field data for development	●	Warranty costs reduction	●	Data-/feedback-based R&D optimization
		●	Traffic-data-based retail footprint and stock level optimization		
	Customers' costs reduction Analyzing actual usage patterns to reduce repair and downtime costs	●	Usage-based insurance – PAYD/PHYD	●	Car pooling
		●	Driving style suggestions	●	P2P car sharing
		●	E-hailing	●	Trucks platooning
	Improved customer satisfaction Better tailoring product/services to customer needs	●	Early recall detection and software updates		
Increasing safety and security 	Reducing time for intervention Collecting and forwarding warnings in real time, pointing in the right direction	●	Driver's condition monitoring service	●	Aggregated car data-based CCTV service
		●	Improved road/infrastructure maintenance and design	●	Road laws monitoring and enforcement
		●	Breakdown call service		
		●	Emergency call service		

Depending on the use case and on the players along its value chain, a use case could generate value for a set of players, but also "destroy" value for other players

1 A "car data core use case" is defined as a use case that can only exist through car data (e.g., predictive maintenance)

2 A "car data-enabled use case" is defined as a use case that either does not strictly need the car environment to exist (e.g., in-car hot spot) or needs car data to "function," but car data is not the key enabler for the existence of the use case

● "Enhanced value" by autonomy ● "Reduced value" by autonomy ● Autonomy not relevant

Core use case[1] Enabled use case[2]

Depending on the use case and on the players along its value chain, a use case could generate value for certain players but also destroy value for others. In fact, the value of these use cases for industry players ranges widely and is a function of a large set of drivers, among which are:

- Customers' adoption rate and willingness to pay, driving the economic attractiveness of the opportunity
- Value chain complexity, possibly forcing a large number of players to partner (e.g., in the case of "networked parking" or "e-call/b-call services" use cases)
- Access and ability to shape the critical control points in the value chain and technology stack required for the use case (as shown in Exhibit 14)
- Actual ability of the organization to quickly react and leverage car data and insights, setting the timing for revenues and profits generation.

Fear of cannibalization of the existing business is also frequently regarded as a limiting factor. One relevant example is "pay as you drive/pay how you drive" insurance offerings: insurance players struggled for years to determine whether the net effect of a higher penetration of these offerings would be beneficial or detrimental to their overall revenue pool (despite the customer pull for more tailored insurance pricing).

Text Box 4 Deep dive on monetization options

Methods of monetization can vary significantly. Very often, direct monetization (i.e., "selling services to end customers or B2B clients for money") is considered as the first, and often the only, monetization option to be pursued. Nonetheless, in the sharing economy, new use cases based on sharing cost savings are more and more common. B2B customers in particular are increasingly expecting to get the benefits before paying for the ongoing cost of a data-related partnership.

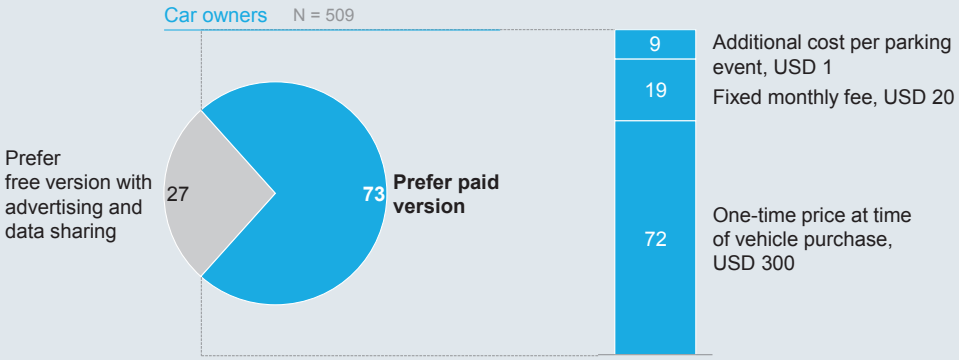
Even in the case of direct monetization of features and services, the value can be captured via different modes, reflecting the purchasing attitudes and needs of local customers. In fact, the price can be:

- Rolled into vehicle (or mobility service) price
- Charged as a one-off payment after the initial vehicle purchase, often via an aftermarket channel
- Paid regularly as a subscription, such as an annual fee for navigation map updates
- Deducted/debited from a rechargeable credit, as offered for selected content downloads
- Covered by monetizing tailored advertising pushed to the end customers or elaborating, analyzing, and reselling data generated by these use cases.

Through the survey, we analyzed customers' willingness to pay and preferred payment methods, and very significant differences are visible across use cases. Let us take the example of networked parking (the possibility to know in advance which parking spots are available, book them, and pay remotely) and connected navigation (providing real-time information on traffic, road hazards, recommended routes, and map updates through the in-car navigation system). While the interest in the use case is high for both examples, the difference in customers' willingness to pay is very significant (Exhibits 11 and 12).

Exhibit 11 Majority of consumers are willing to go for the "paid" version of the "networked parking" service, and the highest preference is for paying a one-time price at time of download

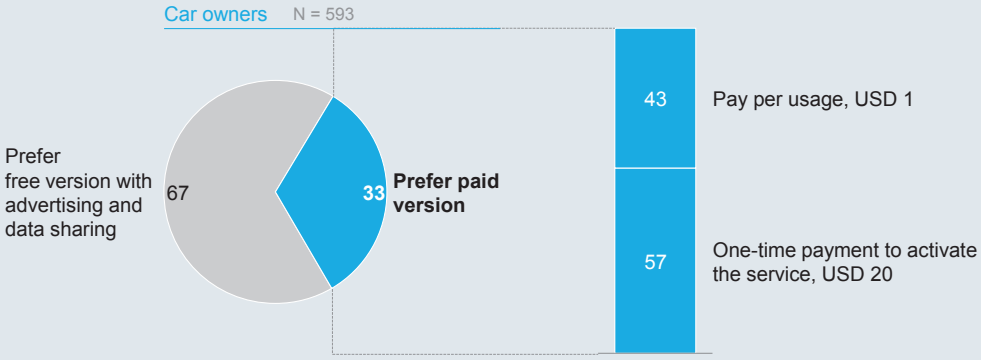
Question: What would be your preferred subscription model for the "networked parking" app/service?
Percent of respondents by subscription option



SOURCE: McKinsey Car Data Monetization Consumer Survey 2016, N = 509 car owners across Germany, the USA, and China

Exhibit 12 Among those (33%) who prefer the paid version of "connected navigation", there is higher preference for paying a one-time charge at time of download

Question: What would be your preferred subscription model for the "connected navigation" app/service?
Percent respondents by subscription option, among those who prefer paid version



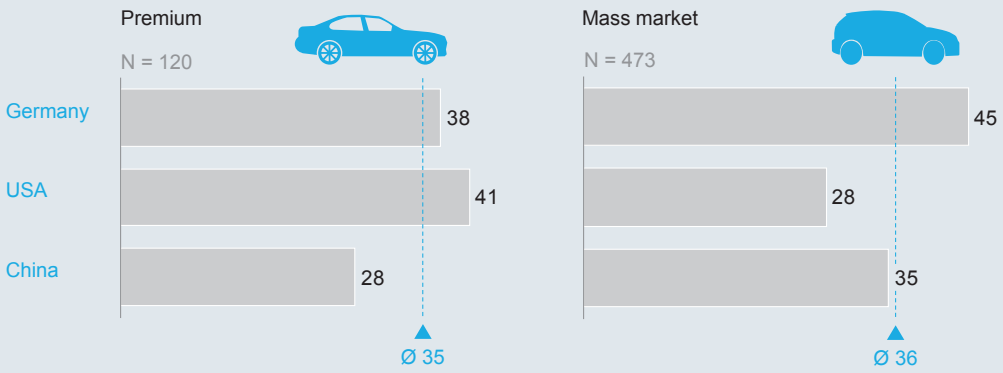
SOURCE: McKinsey Car Data Monetization Consumer Survey 2016, N = 593 car owners across Germany, the USA, and China

The lower willingness to pay for connected navigation services was also identified in our customer clinics; consumers frequently declared that they were used to the free navigation apps on their smartphones/handheld devices and preferred to stick to the familiar interface of those apps.

Equally significant disparities are visible across different markets, reflecting diverse local needs and perceptions of the validity of alternative offerings. Let us look again at the "connected navigation" use case (Exhibit 13).

Exhibit 13 Mass market car owners in China and Germany exhibit higher levels of willingness to pay for connected navigation

Question: What would be your preferred subscription model for "connected navigation" app/service?
Percent respondents who prefer any of the paid options instead of a free version supported by ads/customer feedback



SOURCE: McKinsey Car Data Monetization Consumer Survey 2016, N = 593 car owners across Germany, the USA, and China

Overall, premium car owners' willingness to pay is higher in Germany and the USA than in China. This might reflect the fact that Chinese premium car buyers often prefer to be driven rather than to drive. Moreover, their average age is higher than that of mass market car buyers. Conversely, US buyers of mass market cars are used to free or "freemium" navigation apps, and the lack of integration in the car cockpit bothers them less than their German and Chinese counterparts.

The speed of implementation depends on a number of factors. Technological availability and affordability are certainly important, but customer pull is essential. Getting customers to demand features they have yet to experience is definitely a difficult proposition. Players may have to work hard to communicate the benefits of the car data-enabled feature to an otherwise unreceptive audience that is likely not to fully grasp its potential.

Text Box 5 Four (tire) square: connectivity makes driving social and fun

Beyond safety and convenience, connectivity opens the door to making mobility fun. As driving becomes increasingly autonomous, drivers will have more time not only to make their commutes productive but also to enjoy that time in social contexts as well.

The data generated by the car can be enriched to serve as the foundation of a social experience among driving peers, taking interaction between drivers to new levels. With access to drivers' location, driving style, pictures, and other data – directly from the driver as well as from the OEM – platform providers can offer participating drivers a social and interactive experience much like that enabled by the search-and-discovery service, Foursquare. With in-car screens and augmented reality as the interface, this type of data also has the potential to support interactive games between drivers.

What is fun for drivers can be quite lucrative for the players who control car data's social space. OEMs selling the service to customers and advertisers paying for the data are among the business models that might contribute to the value of the data-enabled social driving experience, which is expected to have an estimated value of USD 7 - 8 billion by 2030.

Laying the groundwork to develop and, thus, monetize these experiences will require investments in car technologies, such as cameras to capture the driver's image and other sensors, as well as in a communications platform. Multiple players can cooperate and compete in this arena: OEMs, suppliers, gaming software houses, and telcos would also have a stake in the game as would third-party tech players, like the social media giants, who could gain more in-car access to their users.

The way to make the entire concept work is to communicate its value to customers. "Who needs driving to be social or a game?" is likely to be a response from consumers who have yet to experience it. But, if the enthusiastic global response to the Pokémon GO phenomenon is any indication, the value of a social/gaming experience that goes beyond living rooms and extends into the "real" world is massive, and its appeal becomes apparent the moment consumers get a chance to try it.

Other use cases can be challenged in their definition and deployment by the complex interaction across different players in the value chain but still have high potential to create significant value for the customer. In these cases, disruptive change happens frequently, potentially bringing into the arena new players that attempt to become the reference point.

Text Box 6 Monetization from "vehicle usage monitoring and scoring": a car data use case

Car data has the potential to enable an unprecedented level of vehicle usage monitoring. Data captured by car sensors and GPS can provide a complete historical record of exactly how the vehicle has been driven (including car crashes, average speed, overload, type of roads driven) along with its full maintenance and repair history.

This level of information is of particular value in the used-car market. In this use case, for example, either the OEM itself or an external provider, such as a telematics services player, might collect vehicle usage data on a regular basis. Data could be enriched by, for example, matching vehicle history with external sources (e.g., end customer profile, feedback provided to the aftersales services), and a synthetic "used-car usage score" could be elaborated for that specific vehicle. OEM dealerships and certified preowned programs could be provided with this score along with detailed usage/maintenance information that would allow them to provide a very factual valuation of the trade-in vehicle and cost-optimally refurbish used vehicles (not fixing what is not broken).

This usage-based score would allow used-car professionals to provide would-be buyers with the added assurance of knowing the precise condition of the vehicle. Making it cheaper to certify a used vehicle, this data-enabled feature may allow resellers to sell cars that are in better condition at a higher price.

Vehicle usage and monitoring also has implications for the warranties issued by OEMs and the policies issued by insurers. Information on usage that is directly attributable to a particular driver gives both entities opportunities to make data-informed adjustments to their contracts with customers.

Nonetheless, implications for the overall value chain might be even more profound. If the "used-car usage score" were available to car owners at any point in time, this would provide a solid option to certify the quality of a used vehicle, representing an alternative to the traditional certified preowned programs. This might accelerate the growth of peer-to-peer used-car sales, reducing the uncertainty associated with buying cars from strangers.

Full autonomy as accelerator (or killer) of car data use cases

One of the core elements of all of the car data-related use cases is how customers can interact with the technology, activate the required functions, and enjoy the benefits.

Let us think about car infotainment systems: today they are mainly engineered to allow for audio and basic interactive content to be provided to a driver, who is (supposed to be) fully concentrated on the critical task of driving. How would the car infotainment change, once fully autonomous vehicles are on the market and drivers/riders have the freedom to devote themselves to other tasks? How much more content and how many more movies and virtual-reality videogames could be sold if drivers could enjoy them while riding in their autonomous vehicles?

More broadly, full autonomy might be the main enabler for certain use cases, such as offering virtual-reality movies or games to drivers/riders. Further, full autonomy may increase the value of some use cases (e.g., selling a larger number of features and products to drivers through the car as platform) while possibly decreasing the value of others (e.g., providing driving style-related tips and suggestions).

Control points are critical to fully capture the value creation potential

The possibility to actually capture value from the car data-enabled use cases discussed above will depend on the players' ability to establish themselves in the new car data value chain and gain access to customer data. In fact, we identified a set of control points that span across in-car technologies, connection, and the cloud. Whoever gets access and shapes the control point is in the best position to capture the value of the car data-enabled feature (Exhibit 14).

Exhibit 14 A set of control points will determine who captures future profits and where companies will need to focus to compete successfully

Area	Control points	Rationale
"Inside the car"	HMI[1]	▪ Key for customer experience ▪ Gateway to the customer ▪ Enabler to increase value of extracted data Critical control point
	Data gateway[2]	
	Customer ID	
	App store/ecosystem	▪ Critical to increase willingness to spend and ensure loyalty
	Billing platform	
	IVI[3] OS	▪ Potential control points if they give the right to use car data
	Apps/content	
	CPU/control unit	
	Car sensors/actuators	
"Connection to cloud"	Mobile connection	
"Data cloud"	Granular map data	
	Dynamic real-time geo-information	

1 Includes OS and personal identification information
2 E.g., OBD II port, mobile data connection, radio, USB port
3 In-vehicle infotainment

SOURCE: McKinsey Connected Car

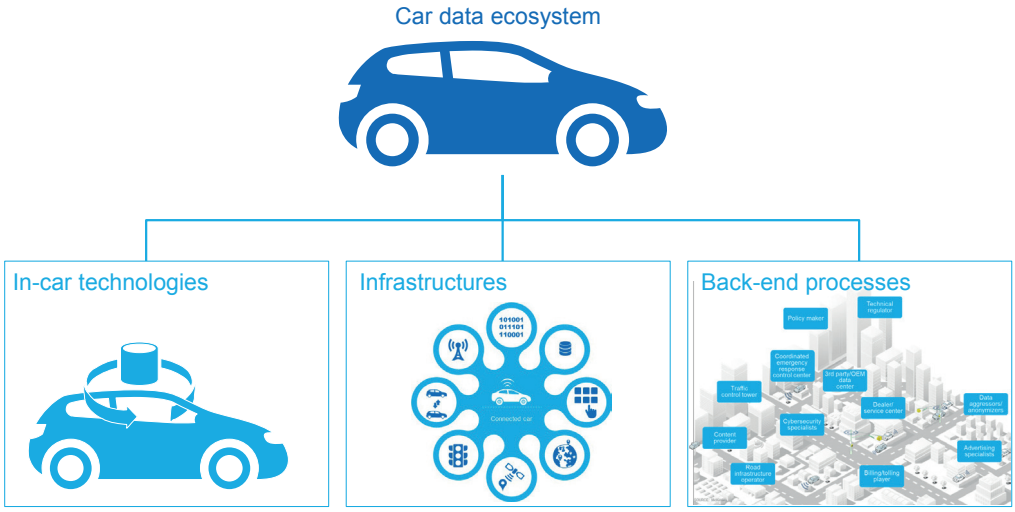
Of course, in-car technologies are not the only data gateway to customers: smartphones, tablets, and other personal devices represent viable alternatives to deliver contents and services. Safety- and practicality-related considerations, however, lead us to believe that a seamless integration between external devices and the car's infotainment system will become paramount to deliver more complex offers to drivers and passengers. Whether the apps and software enabling these offerings will reside in the car's systems or will mirror what is installed in the customers' handheld device is still an open topic for industry players.

We will tackle the technological enablers in detail in the following, but it is worth noting how gaining access to car data and being able to link the data streams to the ID (identification code) of the customer who generated the data, are critical elements to monetize.

Putting the three key technical enablers in place

Car data monetization relies on three main enabler sets, spanning across very different layers: in-car technologies, infrastructural technologies, and back-end processes (Exhibit 15).

Exhibit 15 The car data ecosystem relies on 3 main enabler sets: in-car technologies, infrastructures, and back-end processes



SOURCE: McKinsey

Although significant progress and even a few major breakthroughs have been achieved – almost all of them in recent years – there are still a number of open technical questions that need to be solved across each layer before car data monetization can reach its full economic potential.

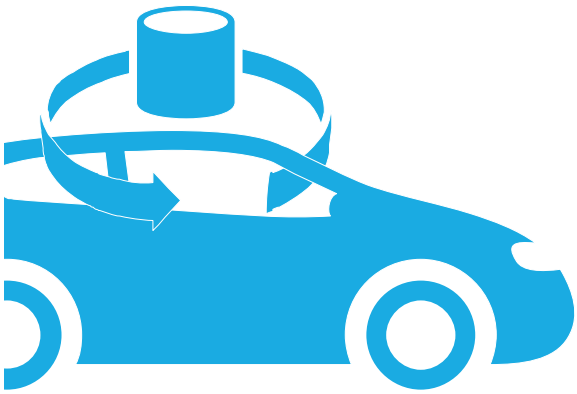
The development of these enablers is the domain of OEMs, suppliers, infrastructure operators, and a host of digital players. To orient players to the landscape of what car data capture, analysis, and usage require, the following three subchapters lay out a detailed description of each enabling element by category.

> *"The car is a browser for the physical world."*
>
> *– Shared mobility player*

In-car technologies

The ability to monetize car data hinges on the technological development (and actual customer acceptance) of in-car technology in eight specific areas (Exhibit 16):

Exhibit 16 Overview of in-car technologies required to enable car data monetization



A | Vehicle technical sensors

B | Environment sensors

C | High-performance computing

D | Reimagined human-machine interface and customer ID

E | Software platform

F | Connectivity

G | On-board data storage

H | Location/navigation

SOURCE: McKinsey

Vehicle technical sensors monitor the vehicle's performance status, track malfunctions, and enable remote/predictive maintenance capabilities. Moreover, collecting data on running cars allows OEMs and suppliers to observe how their products withstand usage and establish a clear cause-effect relationship for breakdowns. Setting type and frequency of data gathering and integrating the findings with R&D processes still represent an open point that OEMs and suppliers are tackling.

Environment sensors detect data related to whatever is around the car (e.g., road, weather, nearby vehicles and hazards) and inside of the car (e.g., driver, passengers, and cargo).

Thinking specifically of the driver, an array of fingerprint sensors, cameras, and microphones already monitor the drivers' presence and attention. An even larger set of sensors could be fitted to monitor a driver's physical condition/vital signs (e.g., heart rate, blood pressure) or sobriety. Monetization opportunities here will largely depend on the degree to which customers are willing to share bio-information about themselves and their passengers.

High-performance computing enables the real-time processing and communication that are central to unlocking the potential of car data. Key decisions in this area of in-car technology include determining which elements of computing are performed onboard vs. in the cloud and if the hardware will be upgradable.

HMI and customer ID. The HMI is the set of technologies by which end customers access/activate the vehicle's features and receive the outputs of the vehicle's computing in response. Buttons, touch screens, voice commands, and visual/gesture recognition sensors among the technologies that must be reimagined to create an optimal user experience (see Text Box 7).

Text Box 7 Deep dive on the HMI (r-)evolution

Three main technologies will have the potential to revolutionize the HMI going forward.

1. Voice-activated smart virtual assistants

High-tech players started launching "virtual assistants" years ago, with the goal of helping customers navigate the functions of their devices. Microsoft's "Clippy" is a very early example. The range and precision of the answers provided by these assistants grew exponentially along with computing power, access to the cloud (allowing for remote elaboration), and deep-learning algorithms, allowing the refinement of answers on the basis of the feedback received by users. Siri, Cortana, Alexa, and Google Now are among the most famous smart assistants that high-tech giants are aggressively pushing on the market. One fundamental rationale for this push is that these assistants typically represent a compelling feature to motivate customers to provide access to a larger number of data types. These virtual assistants become smarter and more useful as the user feeds more information into the system. Calendar content, e-mails, preferences, user-generated recommendations on products and services, and GPS current and historic positions are highly relevant data sets. The combination of these data sets might enable our cars to suggest something like "Your lunchtime meeting has been cancelled, and a table for two at your favorite sushi restaurant nearby has just become available. A route that avoids current traffic can get you there in five minutes – wanna book and reroute?"

The voice activation is a critical element for customer acceptance. In the customer clinics we conducted in collaboration with LUNAR, HMI complexity and customers' lack of familiarity with car OEMs' interfaces were often referred to as "real annoyances" hindering the enjoyment of more complex services. Having a natural conversation with virtual assistants has the potential to relieve the customer from the complexity of functions/services activation and would allow OEMs to provide tailored, proactive recommendations more naturally and effectively.

"The customer ID race is the million dollars issue for us."

– Digital advertiser

2. Customer ID

Customer registration has long been regarded as a boring and yet indispensable step to access Web-based services: from opening an e-mail account to subscribing to a cloud-based music service. The endless entry of information on structured forms often discouraged flocks of users from registering on "yet another site." Nonetheless, tracking customers' identity has an enormous value for businesses: besides enabling the purchase itself from a legal and transactional point of view, it allows industry players to track and analyze customers that engage with them and to tailor their offering accordingly. Moreover, a "string" of data is much more valuable once the ID is available. Knowing that, for example, 10 customers drive past a store every hour is useful for a retailer; knowing their gender, work, education level, and preferences along with having a reliable proxy for their income is significantly more valuable and actionable.

Establishing a simple way to collect the customer ID has been central for businesses, and it is why high-tech giants offer customer ID solutions, such as Facebook's "Facebook Login," the Apple account, or the Google ID.

In this context, the automotive industry can be considered a laggard in the matter of structurally tracking each event to a single customer ID: often the same customer is registered separately by "new," "used," and "aftersales" divisions of a car OEM. Most progressive OEMs (often in the premium segment) have recently started to pursue a "single ID" approach but face significant complexity due to legacy systems and fragmentation in dealer management systems.

In this sense, establishing a single customer ID to match each "car data string" with the profile of the user who generated it is highly critical to fully capturing the car data monetization opportunity for industry players. As an example, let us think about a family car driven by all members of the

household: if the system were to infer musical preferences of the driver considering all the music played over a day by each family member, it might end up recommending a terrible mix of different and unrelated musical genres. Similarly, location-based advertising from a soccer merchandising store would be much more valuable if the only soccer fan in the family were actually in the car at the time the ad was pushed. Of course, all of this requires an even greater focus on protecting personal ID integrity and confidentiality by all players in the mobility ecosystem.

> *"The challenge for industry players is that data will not be car centric, but customer centric."*
>
> *– European premium OEM*

3. *Virtual reality*

One of the big technological revolutions of 2016 is the launch of a wide array of virtual-reality headsets for consumer application. Movies, videogames, even Web browsing can be taken to the next level of customer involvement once a fully immersive experience can be provided to their users.

Automotive has started to embrace this type of technology for multiple early applications, for example, helping engineers to review digital mock-ups of their designs or allowing car buyers to visualize their future car in 3-D, instantly changing trim level and colors.

A more fundamental change might occur in the short term, though. As customers already look at their small phones while in the car (and unfortunately often while driving), what would car passengers do if virtual-reality headsets delivered on their promise of high-quality audio and fully immersive video experience? As an added bonus, VR headsets can help reduce motion sickness due to eye-tracking technologies that are already being tested for application in autonomous vehicles. In this sense, cars' HMI related to infotainment (i.e., screens, loudspeakers) might be challenged by the offerings of consumer electronics players active in virtual-reality offerings, who would find themselves best positioned to monetize from it. Moreover, once full autonomy becomes available, this proposition could easily be extended to the driver/rider.

Software platforms support the vehicle's various applications as well as the protocols for high-speed data transmission. Questions regarding the reliability of over-the-air software updates and which of those updates consumers will pay for are fundamental to successful car data monetization.

Connectivity concerns the link between the vehicle, its onboard sensors and devices, and the Internet. The gateways of connectivity include Wi-Fi, Bluetooth, USB, RFID, and radio, but it is perhaps the high-speed 4G/5G modem gateway that comes with the biggest challenges. As vehicles travel, geographical gaps in high-speed data connectivity become an issue that must be resolved, along with the (currently significant) cost of continuous data connectivity.

Onboard data storage is the local hardware repository for data generated by the vehicle. Necessary developments in this area include determining which data is stored onboard and who has access to it (e.g., insurers) as well as ensuring that this data is protected from external attackers.

Location/navigation technologies are also critical enablers of car data monetization. Which map's "technical archetype" to adopt, how maps are updated, and how vehicle location (i.e., GPS) information is stored, shared, and transmitted are among the critical decisions going forward for industry players.

> *"When talking about infrastructural technologies, the traditional setup does not work anymore. There is a need for a joint business/technology view, and at times technology sets the pace for services innovation."*
>
> *– Insurance*

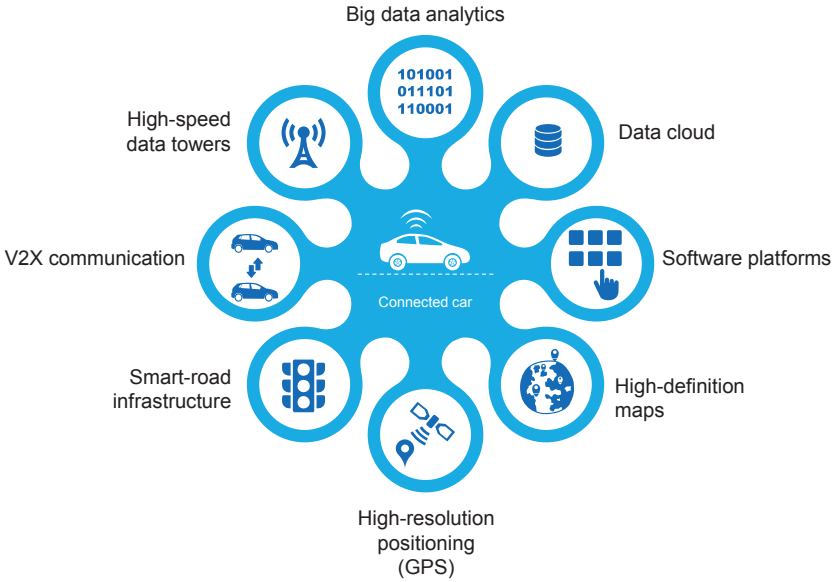
Infrastructural technologies

Beyond the processors, sensors, and gateways with which the vehicle itself is equipped lies a network of external technologies that are "grounded" in the road itself or related to the operation of the in-car technologies. This infrastructure comprises eight technologies, the development of which is fundamental to car data monetization (Exhibit 17):

High-speed data towers provide the 4G/5G connectivity required of vehicles traveling at high speed, but adequate coverage is key to maintaining continuous and reliable performance. The deployment speed and cost of the towers are central issues, and an array of alternative connectivity technologies (e.g., satellite based) are being explored for low-density areas.

V2X communication is the data link between a vehicle and the infrastructure and between a vehicle and other vehicles. The successful transmission of traffic, safety, and social data may depend, in large part, on the development of standard formats and frequencies that facilitate this communication. The standardization of communication protocols represents an ongoing challenge for industry players, even more so considering safety-critical communications for autonomous vehicles.

Exhibit 17 Extending beyond the car, 8 infrastructure technologies will enable car data monetization



SOURCE: McKinsey

Smart-road infrastructure includes smart traffic lights, emergency signals, parking garage sensors, and a wider array of devices that collect real-time data and react to traffic conditions and challenges to increase safety and efficiency. As costs to fit/retrofit the road system are likely to be significant, multiple questions about financing the investment by cash-strapped governments and municipalities have yet to be fully answered.

Big data analytics are required to process the large amounts of data generated by connected cars on the road in real time. Industry players are often developing internal competences in advanced analytics that will enable them to leverage this strategic asset (Text Box 8). Specialized players, in turn, are offering their capabilities to assist them in performing the analyses and ramping up internal teams.

Data cloud acts as the remote repository for the massive amounts of data generated by connected cars. The required capacity and redundancy, security levels, and access rights are often the critical elements to be determined.

Software platforms will support the operating systems, app store, and payment systems of the car data infrastructure. More and more players rely on a large number of external programmers to expand their apps offering while at the same time ensuring high quality standards and keeping costs under control. The ability to generate a positive business case for external start-ups and software developers is a key element of success for software ecosystems.

High-definition maps will integrate different layers of information to be collected from multiple sources, including specialized players (e.g., basic road maps, weather conditions), free sources (e.g., location of police cars), and crowd-sourced information from cars and handheld devices (e.g., traffic, distress signals from vehicles activating e-call and b-call). The integration and continuous update of these layers implies significant complexity and, again, is highly valuable for autonomous vehicles.

High-resolution positioning (GPS) leverages satellite networks to determine – down to the inch – exactly where a vehicle is located, an essential piece of information to enable autonomous driving.

Text Box 8 Data as a strategic asset

As we extensively discussed, data is the fundamental enabler of a multitude of use cases that generate significant economic value for their holders. It also requires a significant set of back-end processes and costly infrastructures to be captured, secured, analyzed, and leveraged. As such, data is an asset, an intangible, measurable asset that is still partly overlooked by large automotive players, both in terms of mapping available assets and valuing them.

Mapping is core to understanding what data is available to deploy relevant use cases, what data sources are being leveraged, the degree of uniqueness of available assets (e.g., are we the only holders of critical information? Can we contact our customers directly?), and which partnerships or acquisitions can/should be sealed to expand the data assets base.

Valuing of data assets is critical as it provides a structured, quantitative way to prioritize investments and use cases. As car data-related business cases will require more and more capital by players in the value chain, a strict methodology to assess the value of critical data assets is central to ensuring the correct prioritization of investments and initiatives (Exhibit 18).

Exhibit 18 Data is a relatively new type of asset – mapping and valuing it requires ad hoc approaches and capabilities, already mastered by digital players

		Measurability	Valuation methods
Tangible assets		Precisely measurable	"Hard" methodologies ▪ Mark to market ▪ DCF ▪ Cost of reproduction/ repurchase
Intangible assets	Data assets	Measurable	No established data valuation methodology ▪ Gartner's Doug Laney published articles on "infonomics," mostly conceptual
	Other (e.g., brand)	Usually through proxies, e.g., human capital	"Weak" methodologies using proxies ▪ Goodwill (in M&A) ▪ Earnings surplus, e.g., premium charged by a brand

Methodology to valuate data assets		Description
Cost value		**Replacement cost:** cost to rebuild or reacquire data
Economic value	"Use case" approach	Sum of economic values/ **business cases of potential use cases** using techniques like DCF, scenario analysis, real options, stochastic simulation
	"Deep value" approach	Determines **"deep" information value of data** for owner based on (i) value of underlying economic entity, (ii) data quality/value uplift, and (iii) applicability/ accrual to owner
Transaction value		**Value of market transaction** when data is traded at arm's length

SOURCE: McKinsey

In our industry executive roundtable meetings we extensively discussed the issue of "data as an asset," highlighting a very sharp difference in current awareness and readiness between players involved:

- Best-practice digital players and shared mobility players consistently reported that they held and maintained a complete mapping and valuation of their data assets, even prioritizing their R&D efforts and M&A strategy on the basis of the expected growth in their data assets base.
- Many of the major car OEMs, suppliers, and infrastructure players
  - Reported that they had neither a holistic mapping of their data assets nor a process to regularly evaluate them
  - Claimed that IT was the only department to have visibility on data availability and quality, while strategic business functions did not have a clear understanding of the current situation.

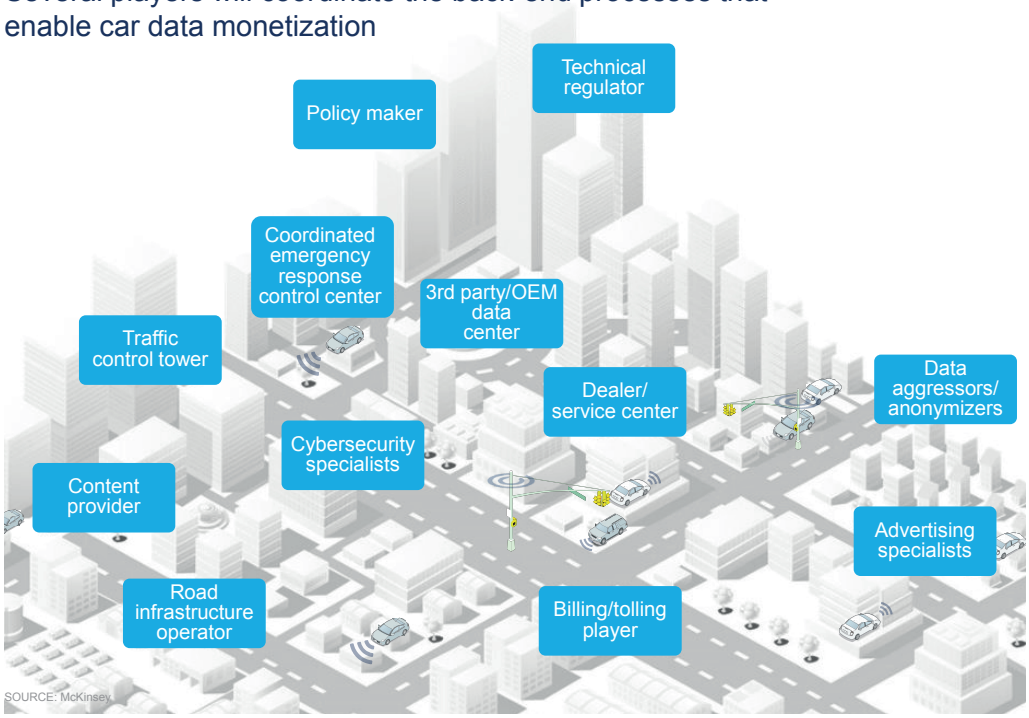
Going forward, shareholders will increasingly look at intangible assets as enablers for long-term value creation, and major industry players in automotive will be required to develop and maintain crystal-clear transparency regarding the value and risks associated with their data assets.

Back-end processes and operations

A host of players will make up the network of organizations that facilitate the processes regarding the capture, transmission, storage, analysis, and sharing of information that enable car data monetization (Exhibit 19).

Exhibit 19 **Several players will coordinate the back-end processes that enable car data monetization**

NOT EXHAUSTIVE



SOURCE: McKinsey

Policy makers and technical regulators will establish the laws that govern traffic and establish the standards for data- and connectivity-enabled features, e.g., autonomous vehicles. For both bodies, customer protection that does not stifle business innovation will be key to foster successful car data monetization models. Tackling the issues related to the concept of data ownership, the rights of database owners, data anonymization/pseudonymization, and mandatory data security measures will be critical in accelerating (or hindering) the development of the use cases described above.

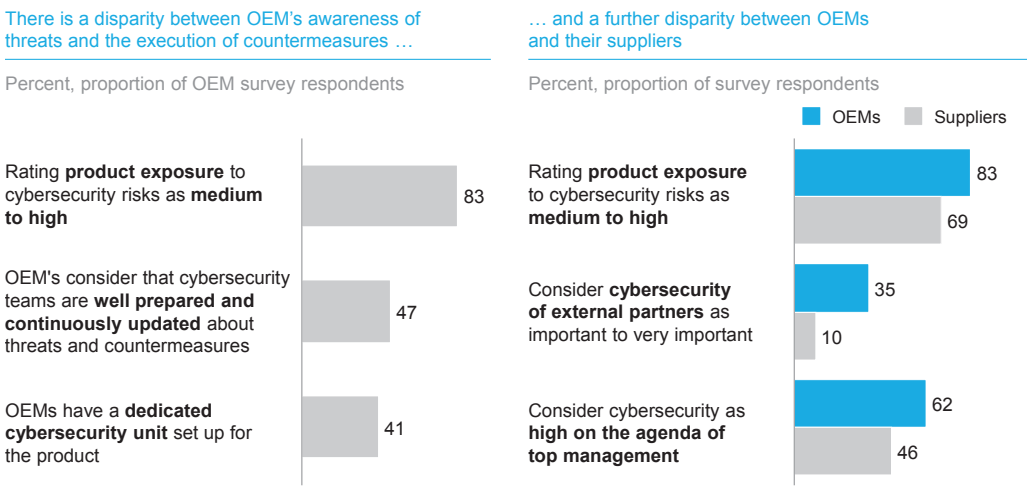
Car data can obviously be leveraged to better regulate the traffic flow for safety, security, CO_2 abatement, and efficiency. Two players will be key here. Traffic control towers might be created to collect data from local traffic, analyze it in real time, and take active decisions on routes and traffic flows. A flood is threatening a coastal area? A car crash is locking down a highway exit? A major concert is expected to clog the stadium area? Push recommendations to drivers (and authorities on the field) need to be defined in real time. Additionally, emergency response control centers will dispatch the required service teams (e.g., ambulances, fire department, police, roadside assistance) leveraging the same data infrastructure.

Similarly, road infrastructure operators will have the task of managing the smart traffic lights, variable tolling booths, and other smart-road features. This might be critical also in case of emergency, for example, giving free access to safe toll roads in case of a major earthquake or crisis.

On the pure data side, data aggregators will collect car-generated information from various sources, and third-party/OEM data centers will store, analyze, and enrich this data.

Both players will need to develop strategies that facilitate the exchange of information while protecting customer privacy. This, among other things, will involve cybersecurity specialists, whose task it will be to protect stakeholders from attacks that not only threaten to steal critical information but also have the power to risk the physical safety of drivers and pedestrians (Text Box 9). These players have an especially interesting task ahead of them, as survey results indicate a significant gap between the majority of automotive players who consider cyber attacks a threat and those who are actually taking steps to protect their customers (Exhibit 20).

Exhibit 20 OEMs are aware of the cybersecurity threat, but less than half are prepared for the threat; suppliers' preparedness is even worse



SOURCE: McKinsey SecureCar survey (September 2015)

The retail/e-commerce opportunity made possible by car data directly involves two additional players. Advertising specialists will have the capability to provide more targeted advertising based on enhanced car data-enabled customer profiles, but this will hinge on their ability to work with OEMs to develop advertising propositions that are acceptable to drivers. Content providers will be instrumental in the development of, for example, data-enriched shopping Web sites optimized for the in-car experience.

Dealers and service centers will seek ways to leverage data to boost sales and bring drivers in for maintenance, and payments players will establish platforms to facilitate the collection of fees/tolls for mobility-related services.

> *"What we can do on a browser and on a phone is different even though it seems to be the same … it could again be very different in a car. Enriching, contextualizing advertising in cars is a great, new opportunity!"*
>
> *– Advertising specialist, Silicon Valley*

Text Box 9 Deep dive on digital defense: the cybersecurity challenge in car data monetization

One of the key risks of digital in automotive is the threat of a purposeful attack that compromises sensitive information or menaces the safe operation of a vehicle. Among the threats posed by attackers are targeting and disabling a vehicle's safety systems, exploiting navigation/positioning information, and using a vehicle's infotainment system as a gateway to wiretap apps and gain access to personal information.

McKinsey's "secure car" research from 2015 suggests that most OEMs (83 percent) consider cybersecurity a real concern. When it comes to proactively addressing the threat, however, less than half have operational cybersecurity units. Compared to other industries, automotive players – namely OEMs and suppliers – are behind the maturity curve when it comes to cyber-defense capabilities. Even among those with up-and-running cybersecurity units, less than half are confident in the capacity of their units to fully handle the threat.

Competence in cybersecurity is essential to car data monetization, and players in this space need to explore three key questions:

Who are the potential attackers and what are their incentives? Today's cyber threats come from a wide array of different potential attackers, which range from highly sophisticated state-sponsored adversaries to insiders helping external hackers or initiating their own incursions. They can be suppliers seeking advantages in negotiations or litigation, criminals looking for customer data, disgruntled customers, or competitors attempting to disrupt business.

What are the valuable data assets that need to be protected? Hackers work to get access to cars' internal networks and their electronic control units (ECUs) that "govern" everything from the infotainment system to the engine, brakes, and steering.

What are the points of attack and what is the associated risk? The cybersecurity risk for connected cars is of particular importance. A breach that allows external access to a car's network can certainly compromise the privacy of a driver's data, but there's much more at stake; the cybersecurity threat in connected/autonomous cars can be a matter of life and death. Within older car architectures most critical systems were interconnected, potentially allowing an attacker to gain access to safety-critical systems of the car. Hackers have the ability to attack systems to steal personal data, compromise infotainment/navigation GPS units, and neutralize vehicle alarm systems. What is worse, they might even threaten drivers' physical safety if they manage to hijack systems like steering and braking. Besides the potential physical harm, security breaches can cause severe reputational damages to car manufacturers and their suppliers and reduce confidence in advanced driving assistance systems (ADAS) and, further along, in autonomous vehicles.

Part of the challenge of being fully prepared to address the cybersecurity threat in automotive is the industry's unique set of challenges:

Increasing complexity. The number of potential points of attack in a car is already high enough to make a full-scale defense a very challenging task. In the coming years, the number of an OEM's potential targets is expected to increase. One core driver of this phenomenon is the fact that the number of vehicle nodes (i.e., electronic controlling units or ECUs) keeps increasing to support the demand for additional functionalities. Today, an average vehicle may contain around 30 units, and more complex vehicle systems can be comprised of up to 100 units. Moreover, each unit requires a significant amount of dedicated software, implying that a single car today might require 100 million lines of software code (more than some fighter jets), potentially increasing software vulnerability.

Multiple stakeholders. Development of countermeasures is difficult as connected car systems involve multiple stakeholders from a fragmented supply chain with a high integration risk. The 30 to 100 control units per vehicle described above can be the contribution of more than 20 different suppliers. A high number of components developed and manufactured by multiple suppliers means an increased risk of compromised cybersecurity. Specifically, regardless of the strength of the individual components, poor integration can result in a vulnerable network of interconnected elements. Recent successful cyber attacks on cars leveraged the peculiar vulnerability that can result from an interconnection in which individual components are perfectly secure on their own, but software/hardware integration under "diffused authority" (i.e., multiple players and separate, siloed engineering departments) led to a compromised system.

Supplier vulnerability. OEMs are used to getting support from their suppliers in areas like quality or product innovation. Unfortunately, when it comes to cybersecurity, suppliers appear to be less prepared than OEMs. In McKinsey's 2015 "secure car" survey, only 10 percent of the industry executives from car suppliers we interviewed rated "cybersecurity" high on their top management's agenda compared to 35 percent of OEMs. Around 45 percent of suppliers consider the level of cybersecurity of their subsuppliers and external partners as being an important/very important selection factor, compared to more than 60 percent of automakers.

While ensuring that customers' safety and personal information are protected is paramount, the risks of overprotection are a barrier to innovation and might imply extremely high investment costs. In this sense, the optimal level of protection provides adequate security, allocates security funds efficiently, and does not inhibit innovation.

Building capabilities and partnerships

Industry players seeking their niche in the car data value chain must successfully tackle the challenges described so far. They need to communicate the value of car data-enabled features to customers, build promising business models, and develop/shape the various elements of the car data ecosystem in ways that enable monetization. Ultimately, however, players will only be as successful as their organizational structure and capabilities allow: adequate capability building requires a clear strategic shift towards digitization across the entire organization and developing productive partnerships with leading players in the digital space.

Organizational (re-)structuring

The organizational implications of the increasing role of digital in vehicles, with its fast product development and obsolescence cycles, will be profound for automotive players. Fitting more connectivity features into the car requires what is typically called “2-speed

R&D/IT" in order to push fast developments in software, virtual prototyping, human-machine collaboration, and intelligent tools, while the development of vehicle architectures and backbone IT systems still implies much longer development cycles. Successful car data monetization will also require players to build capabilities in digital sales channels: providing a seamless multichannel experience (i.e., in the dealership, at home, on the road) and tailoring commercial propositions to each customer through big data analytics will be critical trends to benefit from. Similarly, car sharing and data-driven business models entail that organizations develop sophisticated digital services.

This massive shift towards digital technology is compelling many traditional automotive companies to ask themselves what organizational changes are required to deliver on this digital mandate. Many of them are also realizing the degree to which their traditional ways of working are not always conducive to developing game changing innovations at the speed they require.

In fact, in our industry roundtables, greater freedom from rigid corporate procedures was raised often as a major advantage of start-ups (and selected high-tech players) over traditional automotive players. In order to achieve this, Silicon Valley start-ups and best-practice tech players typically:

- Foster digital innovation through structured incentives and allow their employees to propose and experiment new ideas in their working hours
- Do not constrain early development stages with the typical "conglomerate" approval processes (e.g., related to purchasing, product testing)
- Rely heavily on field experimentation rather than lengthy strategic thinking
- Benefit from informal ideas exchanges with suppliers, partners, and even competitors.

> *"We have plenty of ideas on connectivity, but our execution is too slow, there are too many constraints. By the time we can get to market, other players claim the innovation crown, and our people get extremely frustrated."*
>
> *– Major car OEM, Asia*

The organizational (re-)structuring should be based on four main building blocks:

1. Advanced analytics capabilities. Successful digital players (native and nonnative) have already established teams and capabilities on advanced analytics. Automotive players can look to these companies as they begin to make decisions about the framework in which they will build advanced analytics capabilities. For some, a centralized team that handles platform-based analytics and predictive modeling for all business units may be the pre-

ferred operating model. For others, a decentralized or diffused approach in which data is managed at regional level or embedded throughout the organization may be appropriate.

2. Digital innovation accelerators. Recognizing the limitations of large, often slow-moving organizations, some automotive players are investing in physical spaces that more naturally foster creativity and are agile enough to keep pace with the fast-moving and complex digital development. These setups are often physically separated from the company's traditional offices, and their cultures are more aligned with Silicon Valley than with traditional international conglomerates when it comes to attracting digital/software talent and cultivating innovation. As beneficial as it may be for automotive organizations to establish these external accelerators, they would also be well advised to make sure that strong ties to headquarters remain in place. Everything that comes out of an automotive player's pseudoindependent innovation lab must be linked to clear business KPIs that align its activity with the broader goals of the parent company.

> *"We used to outsource every digital program. Now we understand the value of building some of the capabilities needed in-house, and most of our services innovation comes from the combination of our digital team and our advanced analytics team!"*
>
> *– Major roadside assistance player, Europe*

3. People-first approach to organizational redesign. Automotive players can look to digital natives for ways to redraw the boxes and lines of traditional organizational charts and create functional structures that accommodate the demands of digitization. Leading high-tech players, for example, rely on organizational structures that give their employees a home base function, but force them outside of their siloes by deploying them in virtual, cross-functional teams to work on multiple projects at once. A more relaxed hierarchy that empowers decision making at the unit level creates more organizational agility and allows talent to demonstrate their abilities early on in their tenure.

Notably, the issue of fostering talent early was mentioned as a clear success factor of start-ups and high-tech players in our industry roundtables. Instead of trying to backfill prescribed job positions, leading innovators in the car data monetization space:

- Focus recruitment on professionals with high levels of technical expertise, business acumen, and creativity and then build their digital organizations around those people
- Attract talent with the right skills, building structures in which self-standing teams benefit from diverse internal networks
- Create an innovation culture by explicitly encouraging trial and error.

4. Performance-minded processes. Automotive organizations must also build strong processes that support success. In the area of budgeting, for example, resource allocation for new products might become more dynamic (i.e., revisited and changed during the year) and hinge on product/services success. Likewise, assessing current data assets and prioritizing R&D/IT investments to build the target data assets base in the future are clear competitive differentiators for digitally-advanced industry players.

> *"The (OEM) headquarters evaluates which technologies we developed made it into new cars in five years … but platform renewals occur every seven years! They don't understand how to evaluate knowledge transfer …"*
>
> *– Technology research center responsible, Silicon Valley*

Strategic partnerships

Digitization in automotive and connected cars are redefining competitive dynamics in the industry. Innovation-based partnerships among and between OEMs and various suppliers/service providers become increasingly necessary, as trends in three areas are making it difficult for players to succeed on their own in this context:

Technology. Investments to deliver a competitive proposition on connected and autonomous vehicles are in the range of billions of dollars per year for a car manufacturer. Technical capabilities span across a broad variety of fields, from hardware integration to software design to advanced analytics. New technologies and platforms emerge, promising to significantly improve previous solutions. In this context, the cooperation between OEMs, suppliers, infrastructure operators, and other players is a necessity.

Market. Consumer preferences are changing. Notably, consumers are increasingly demanding services over products. This shift from hardware to service as the deliverable for many car data players means playing within the context of a closely-knit, cooperative ecosystem of "partners/competitors" across the value chain. In fact, customers expect a seamless connectivity experience across their devices (e.g., smartphone, tablet, car, connected home/office), positioning high-tech players as central actors in the car data monetization space. Another factor pushing partnerships (and acquisitions) is the growing importance of emerging markets, such as China, and their progressive attitude towards digital. Quickly developing an understanding of local customers and gaining credible access to the local digital gateways to consumers is an enabler to quickly scale up digital services. In this sense, the recent merger between Didi Chuxing and Uber China shows how critical it is to get access to local platforms in order to succeed in shared mobility services, in particular, and in digitally enabled offerings, in general.

Regulation. Evolving legal frameworks, changing industry standards, and incentives are also pushing for tighter connections across industry players in order to, for example, effectively support the industry working tables currently defining technical guidelines on connectivity and autonomy across Europe, the Americas, and Asia.

Large automotive players must learn how to work with a wide range of organizations that may be fundamentally different in terms of size, working culture, and organizational agility. In our industry roundtables, executives from start-ups and tech players often mentioned a set of best practices that large players can adopt to work better together:

- *Provide a limited number of points of contact.* Given their size, start-ups cannot deal with hundreds of employees of an industry giant addressing them all at once from different divisions (and often repeating the same questions). Setting up gatekeepers and a clear project structure is critical to collaborate effectively.

- *Respond and decide quickly.* The inability to have a response for weeks and decisions delayed to the next board meeting kill smaller players' agility and often cause significant cost overruns in development programs. The ability to grant decisional rights and budget approval at project level increases the chances of a quick success for the partnership.

- *Agree upon a test-based approach to development.* Innovation, particularly in digitally enabled customer innovation, requires field testing, which implies developing apps, concepts, services, and getting the markets' reaction to fine-tune (or terminate) the service on a continuous basis. Often, automotive players have special requirements before products and services are tested, even on a very limited scale. Defining the perimeter of testing from the very start of the collaboration helps prevent endless frustrations between partners.

"Working with this global OEM slowed us down dramatically in the development of our concept service. We went from three days to seven weeks to test a new feature."

– High-tech player, Silicon Valley

Ultimately, most of the industry roundtable participants concurred that the big strategic choice they are currently involved in is the definition of the partnerships and technical arrangements around vehicle data extraction and elaboration. Gathering data from vehicles and elaborating, enriching, and analyzing it are the critical aspects in order to derive a better understanding of customers' needs and to design even more compelling products and services.

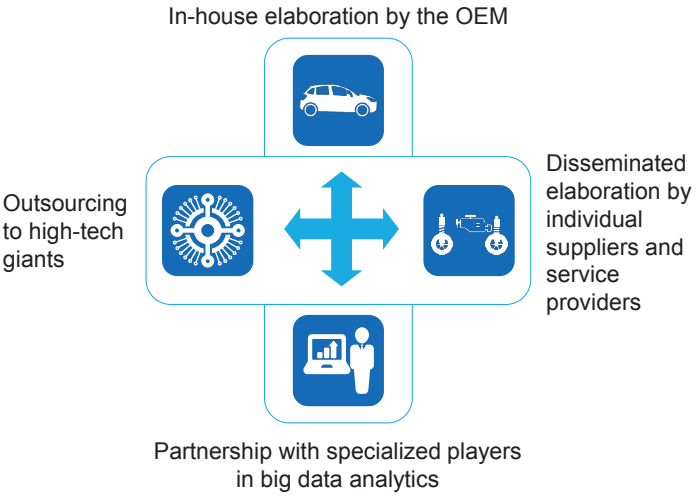
Interestingly, multiple archetypes exist and are being explored by different car OEMs and their partners across the globe (Exhibit 21).

Exhibit 21 The car data monetization ecosystem will rely on carefully planned strategic partnerships

CONCEPTUAL

Automotive players are quickly moving to **elaborate vehicle data** with different approaches and different roles for themselves and their partners

Strategic partnership archetypes on car data elaboration



SOURCE: Company Web sites; AutoNews; press

Next steps: five pragmatic recommendations for starting the car data monetization journey

There is certainly no singular, standardized approach to getting started and enabling an organization for monetizing car data. Our findings concerning car data monetization as well as our observations of the most successful players in adjacent industries with similar digitization challenges, however, reveal effective approaches and perspectives that aspiring companies in the car data space might adopt.

1. **Set the ambition at CEO level.** Car data monetization entails a profound rethinking of the value chain for industry players, potentially entailing new revenue streams, new capabilities, and potential cannibalization.

2. **Focus efforts on a limited number of use cases.** The players most likely to achieve sustainable success in the area of car data monetization will be the ones who focus on a limited number of use cases – instead of trying to target each of the 30 use cases described above all at the same time.

3. **Do not be afraid of workarounds today, while laying the IT foundations for a more robust solution tomorrow.** The organizational capabilities for long-term car data monetization success are many, but achieving excellence in each area is not a prerequisite for getting started. Automotive players should move early in the areas where they are most prepared, create interim solutions to address current gaps, and also work on building more permanent capabilities that allow them to achieve even greater success in the future.

4. **Build an ecosystem of business and technology partners.** As described above, part of the capability building needed will require working relationships with a wide array of external players and institutions. Companies should begin thinking about which aspects of car data monetization they want to "own" as well as which are best addressed through outsourcing, long-term collaboration or other types of partnerships. They should then start identifying who those partners might be and engaging them pragmatically.

5. **Build a strong internal team with an agile mindset.** To fully capture value from car data, companies need to build up strong internal capabilities and establish a dedicated cross-functional team that drives innovation based on a culture open to change and experimentation. This team must be located outside the current performance of the organization if its processes are not agile enough to allow for development and field testing of car data-enabled use cases at "high-tech player" speed.

□ □ □

The monetization potential of car data is massive but still in its early stages. Use cases are already emerging, and the business models that facilitate them are being designed. As these digital ecosystems are being shaped, each industry player should develop a clear vision around the four main points we discussed in this publication:

- Which value proposition can be offered to convince customers to share their data and preferences?

- Which data-related business models and use cases would maximize the returns for the company? What is the related value at stake, in terms of revenue and profit? What the expected timing to develop the market?
- Which technical enablers should be put in place? What is the optimal level of investment in technologies and services deployment?
- Which capabilities and partnerships should be built to succeed?

"I realize we just embarked on a major transformation driven by what can be done with car data, much more radical than we anticipated. New offerings, monetization models we never adopted, new competitors entering the arena … these are exciting times to be in our sector!"

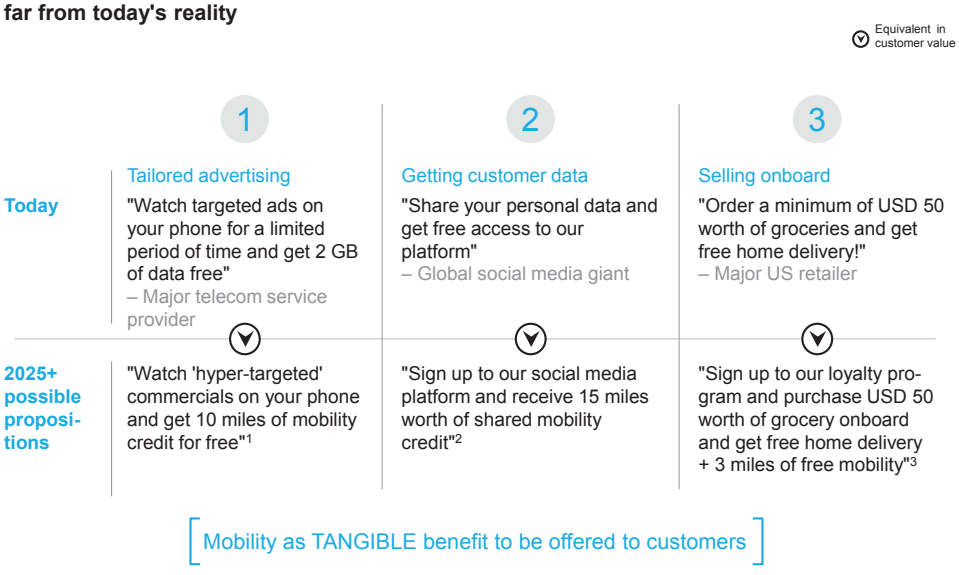
– CEO of a major automotive supplier, North America

Appendix: "Free mobility" as customer benefit – utopia or business opportunity?

Car data-enabled business models have the potential to transform transportation into a service. Could mobility be offered for free to end-customers in selected environments as a benefit in exchange for their data, time, and attention?

Once autonomous driving and car connectivity combine, customers might be offered mobility services in exchange for watching targeted advertisements, providing product feedback, or making purchases while in the car. Alternatively, multiple businesses might decide to offer free rides to the store (or venue), as vehicle automation would significantly reduce the "cost per kilometer" of personal mobility, and next-generation connectivity and digital technologies might turn the car into the "first step into the store."

Exhibit 22 **Free mobility could be offered to customers through 3 different models that are not far from today's reality**



1 Maximum free mobility range equivalent to potential profit on a sale of 2 GB of data
2 Free mobility equivalent to the value of 1 extra customer acquired on social media platforms for leading players
3 Maximum free mobility equivalent to an operating profit on a USD 50 grocery sale

SOURCE: McKinsey

Exhibit 23 **Businesses might increase store visits by providing free customer transportation**

Equivalent in customer value

Today: free parking and public transport

Soccer stadiums in Minneapolis offer **free public transport to the stadium** on game day to ticket holders which typically costs USD 3 - 4

Restaurants in Milan's city center **pay up to EUR 6 - 10 per parked customer**

Premium designer outlets in the UK **offer shuttle buses for free upon presenting a sales receipt** and reimburse parking worth minimum GBP 20 for a total purchase above GBP 100

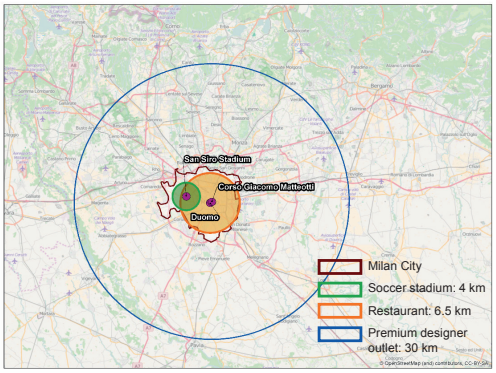
2020+: free mobility to the store → What could this mean in a city like Milan?

Reaching San Siro stadium for free from a driving distance of 4 km

Getting for free to a restaurant in Duomo from Bocconi University – driving distance of 6.5 km

Reaching a premium designer outlet in Corso Giacomo Matteotti from the outskirts of Milan for free – driving distance of up to 30 km

Potential maximum free mobility radii for soccer stadium, restaurant, and designer outlet in Milan



A large section of the population could be reached by free mobility

Location around	Population reached, millions
San Siro stadium	0.2
Duomo	1.1
Corso Giacomo Matteotti	4.5

SOURCE: OpenStreetMap; LandScan

In this scenario, the car might become what we defined as a "control point" for retail (see Exhibit 14); a critical space that leverages tangible benefits (e.g., convenience, safety, time saving) and a tailored user interface (e.g., large touch screens, high-quality audio) to become effectively a new point of interaction with customers.

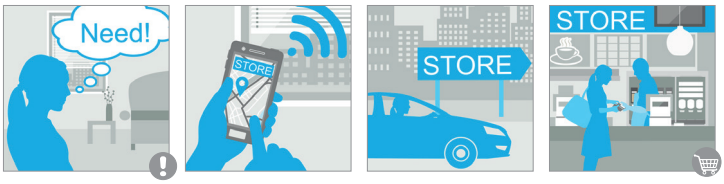
Exhibit 24 **Car data could enable in-car advertising, allowing for decision making or purchasing online while driving**

ILLUSTRATIVE

Point of purchase decision — Point of actual purchase

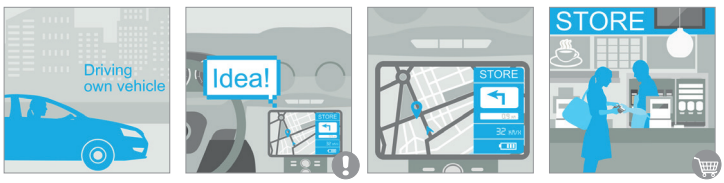
Today

Car as vehicle to **carry the customer** to a shop after the decision to purchase has been made



Tomorrow

Car as touchpoint to **recommend to the customer** where/ what to buy



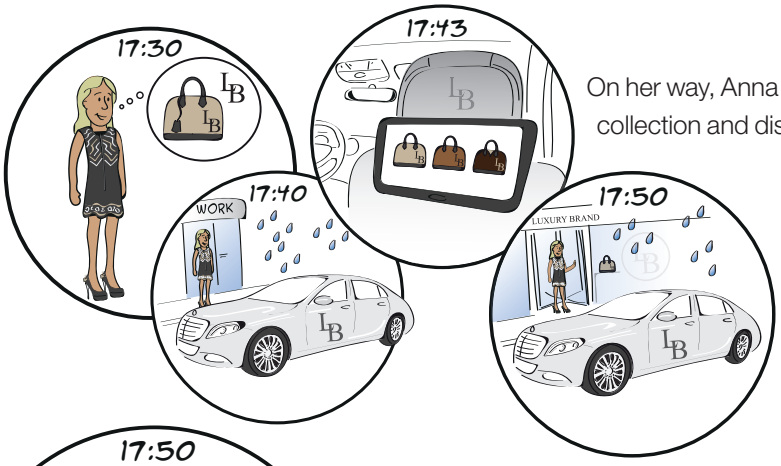
Car as service to be provided to **support the customer** in either buying onboard, reaching the store or enjoying the brand experience

SOURCE: McKinsey

New mobility offerings in exchange for data and customer loyalty could facilitate a unique brand experience and intensive brand exposure ...

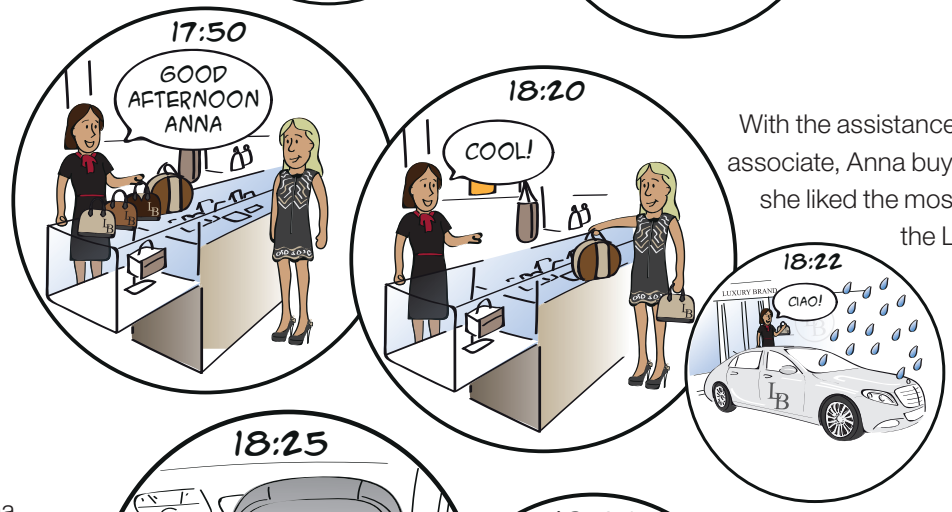
The “value-creating mobility” experience

Anna wants to buy a Luxury Brand (LB) handbag and orders the LB courtesy mobility service for loyal customers.



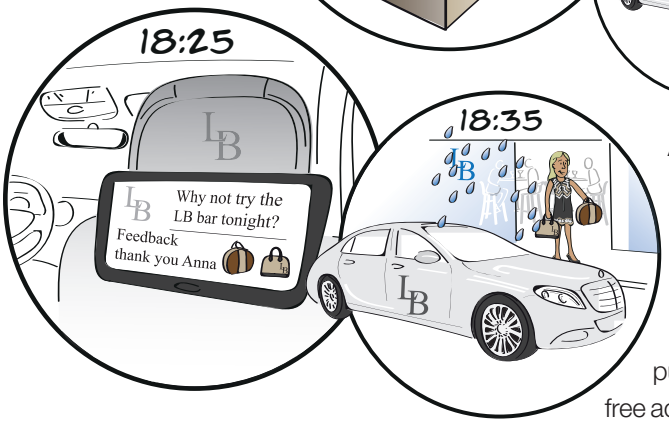
On her way, Anna can already browse the collection and discover the new items on the “in-car” screen.

Anna is welcomed by her LB relationship manager who is expecting her and already made all the preparations.



With the assistance of the sales associate, Anna buys the 2 bags she liked the most and orders the LB car again.

Back in the car, Anna provides customer feedback and prebooks a LB car to take her to the presentation of the new collection.



As the car is synchronized with Anna’s calendar and she is still free for this evening, an invitation to visit the newly opened “LB Bar” pops up on the “in-car” display: the purchases of the day grant her a free admission and a welcome drink.

Customer perspective

- **55 minutes** of fun and VIP treatment
- **No stress** from parking, driving, getting to the store
- **An exclusive invitation** for a free evening

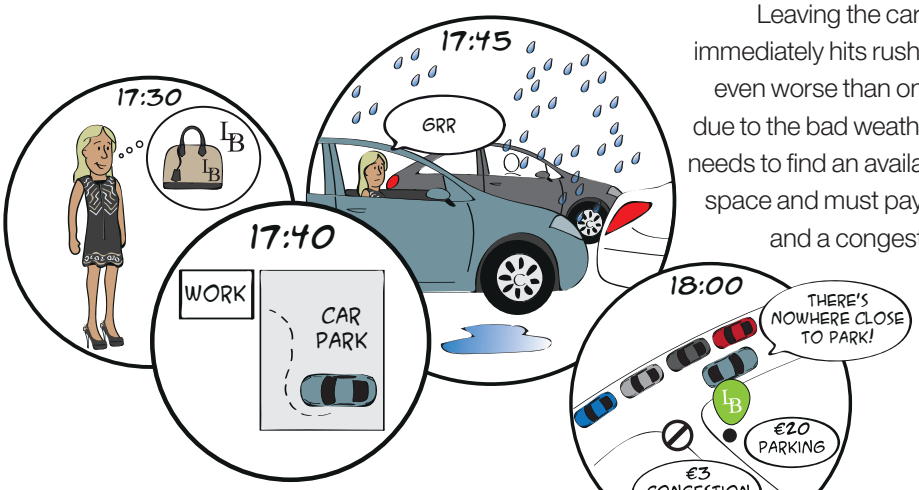
Business perspective

- **55 minutes** of brand exposure in a highly controlled environment
- Efficient, targeted retail processes resulting in **higher sales**
- **Customer feedback**
- Extension of the brand experience as a result of **cross-selling**

... which were previously not available.

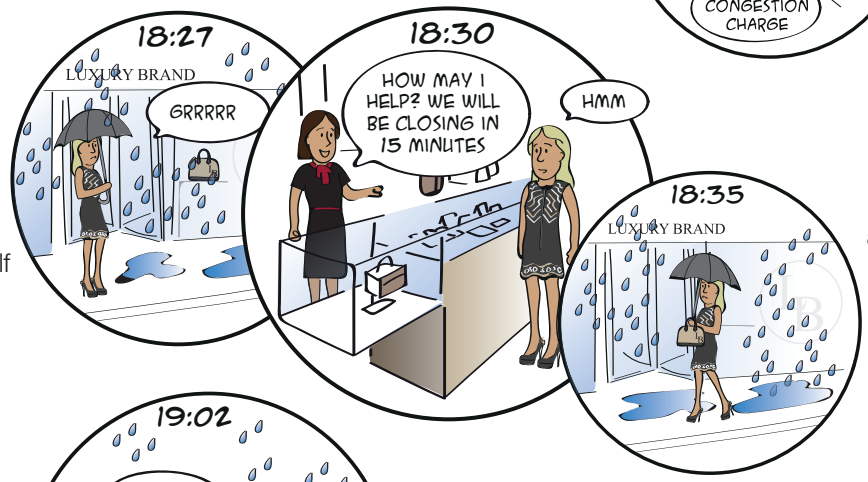
The “traditional mobility” experience

Anna would like to buy a Luxury Brand (LB) handbag and decides to take her car to visit the LB boutique downtown.



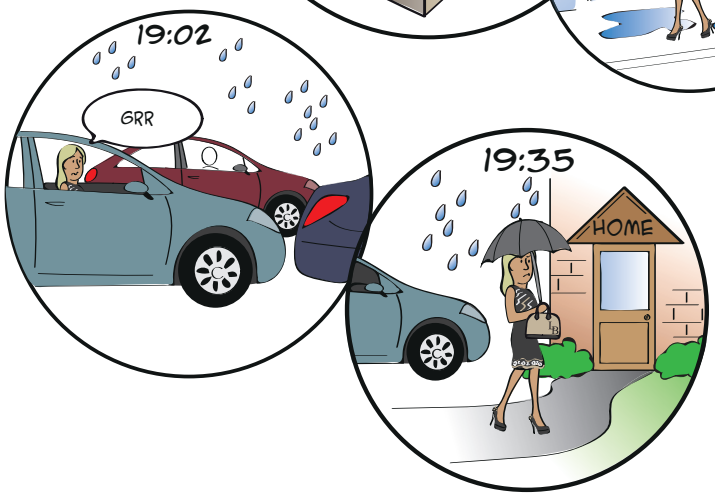
Leaving the car park, Anna immediately hits rush hour that is even worse than on usual days due to the bad weather. She also needs to find an available parking space and must pay for parking and a congestion charge.

When Anna finally arrives at the store, she first has to wait a few minutes before a sales assistant is available – and then suddenly finds herself in a hurry.



Pressed for time and feeling a bit tired, Anna decides to buy the one bag she came for and leaves the store immediately afterward.

On her way home, traffic is still terrible and the rain hasn’t stopped. Not a great start of the weekend at all.



When Anna finally is back home, she’s lost the mood to go out and party with her friends. Instead, she prefers to stay at home and will showcase the new purchase another day.

Customer perspective

- Almost **1 hour** of stressfull driving back and forth
- **Only 8 minutes** in store, and some of these were waiting time
- **Tiring, non-inspirational** shopping experience

Business perspective

- **Only 5 minutes** of targeted brand exposure
- **Suboptimal** customer experience, ultimately leading to lower sales
- **No customer feedback**
- **No cross-selling** or experiential elements beyond the in-store sale

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Other publications

Our latest insights into automotive industry trends are also available on McKinsey's Automotive & Assembly Extranet and on the McKinsey Insights app, our flagship digital publishing platform.

For further information on the future of mobility, please also refer to the following McKinsey publications:

Urban mobility at a tipping point

Global automobile sales are expected to increase from about 70 million p. a. in 2010 to 125 million by 2025, with more than half forecasted to be bought in cities. The existing urban infrastructure cannot support such an increase in vehicles on the road. Solving the mobility challenge will require bold, coordinated actions from the private and public sectors. In this report, we lay out a framework that describes the evolution of urban mobility. We also highlight a set of urban archetypes, defined by population density and the maturity of public transit; each archetype can be expected to take a different path to mobility. Our analysis suggests that a mobility revolution is on the way for much of the world. As a result, we anticipate big improvements in the quality of life for city residents.

Finding the fast lane: Emerging trends in China's auto market

After years of double-digit growth, China's auto market is slowing down. A cooling economy is one of the primary factors in the deceleration of what remains the world's largest market for automobiles. But other factors such as changing consumer behavior and attitudes towards cars are also at play. To better understand what China's auto buyers think and how they behave when making one of the biggest purchases of their lives, McKinsey conducted an extensive survey of over 3,500 consumers in March 2016.

Automotive revolution – perspective towards 2030

The automotive industry will change dramatically over the next years. Four concurring trends – autonomous driving, connectivity, electrification and shared mobility – will create opportunities for traditional OEMs and new players alike. Our report provides scenarios concerning what kind of changes are coming and how they will affect the industry.

An integrated perspective on the future of mobility

(coming in mid-October)

Mobility is the something we take for granted in today's world. Our desire for mobility has its own constraints, however, as we cannot escape the resulting air and sound pollution, and in most urban cities car drivers already spend too much time sitting in traffic. The Future of Mobility whitepaper, jointly developed by McKinsey and Bloomberg New Energy Finance, seeks to answer the eminent question of how the various trends in electric/autonomous vehicles, shared mobility, sustainable energy storage, etc. can be expected to impact the future of mobility systems.

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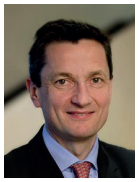

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