



# Connected, automated, shared

The digital future of  
transportation will transform  
the way we live and work.

The future is exciting.

**Ready?**



**Vodafone  
Automotive**

## Welcome to the new normal

The automotive industry is in the middle of a technological revolution. Ford Motor Company shunned the car shows to launch its new Kuga at Mobile World Congress.

Manufacturers like Volkswagen now run their own Silicon Valley labs. Uber is less than ten years old, but its valuation beats that of long-established car manufacturers.

Whatever your industry — whether you're a car manufacturer, fleet operator, town planner or insurer — this revolution affects you. And the time to act is now: a new kind of transportation ecosystem is being built for tomorrow, and in it nearly everything we take for granted about owning and using vehicles today is ready to be reinvented. Will you turn this disruption into an opportunity?

### Today

#### Isolated

Personal and business journeys are planned and made without considering the overall transport system.

#### Manual

Every part of every journey is distinct — from adjusting the seat to pressing the accelerator, from plotting delivery schedules to unloading at the depot.

#### Owned and dedicated

Vehicles are bought by individuals or individual companies — finance agreements, insurance policies and other related elements are structured around ownership and are hard to adapt.

### Tomorrow

#### Connected

- > Vehicles communicate with each other, and with other elements of the transportation infrastructure ecosystem — from traffic signals to public transport scheduling and parking.

#### Automated

- > Automation spreads throughout the journey — from today's lane assistance and automatic parking systems, to tomorrow's fully autonomous drone deliveries and self-driving vehicles.

#### Used and shared

- > Vehicles are used on-demand, paid for and insured accordingly. New behaviours blur the lines between individuals and even between personal and commercial use: crowdsourcing and car sharing behaviours are common.

“ We are experiencing a digital revolution that is having a faster and stronger impact than the industrial revolution. This is the new normal. It will not stop.

Audi chairman, Rupert Stadler<sup>1</sup>

”

## Three disruptive trends

In this report we explore three trends and technologies that are driving the dramatic digital transformation in automotive and transport:

### 1. The connected vehicle: Changing the travel experience

Connected car services, powered by the internet of things (IoT), help solve the diverse challenges facing transportation today — such as reducing congestion and improving fleet management. We look at how vehicles are already helping to improve users' journeys through connected car services, and how they're increasing efficiency, safety and profit in commercial transportation.

### 2. Autonomous vehicles: Connectivity is the key

Self-driving vehicles may seem like science fiction, but they're closer than you might think — both in consumer and commercial transportation. Autonomous vehicles depend on ubiquitous sensing and connectivity from the IoT, and will accelerate innovation and transformation in business models. The highly digital nature of self-driving and connected vehicles will mean automotive manufacturers look to new partners from the technology sector.

### 3. Cross-industry ecosystems: Opening up new mobility models

The IoT connected car is enabling car manufacturers and service providers to move beyond traditional ownership and leasing toward new commercial models. In the new “car as a service” era, users will have greater choice of how they buy, rent, share and pool transportation services, particularly with autonomous vehicles in the mix.

Many of the most innovative service models will involve interconnections between multiple parties from different industries. A new ecosystem of insurers, regulators, retailers, fleet owners, public transport operators and technology companies will have to emerge. Collaboration will be critical to delivering the seamless mobility experiences that people and businesses expect in their journeys across our towns and cities.



## The connected vehicle: Changing the travel experience

Everyone benefits when vehicles are connected. While millions of cars are already connected, we're only just starting to explore the possibilities ahead.

### The connected car is happening today

Although those outside the automotive sector may not know it, millions of connected cars are already on the road using factory-fitted connections, with millions more using aftermarket technologies.

The numbers are growing rapidly. As part of our 2015 M2M Barometer research, we asked respondents from the automotive sector about their view of connected car adoption. A massive 82% said that the majority of cars will be built with embedded connectivity by 2020.

It's clear why consumers might be interested. Consumers intuitively understand the value of being constantly connected. Just as we can no longer tolerate a home, hotel or office without Wi-Fi, or a moment without our smartphones, we expect our vehicles to be part of our always-on lives. Indeed, a number of operators, including Vodafone, are working with automotive manufacturers to roll out Internet in the Car (IITC) services that give vehicle occupants a Wi-Fi hotspot within the cabin, creating an experience just like they have at home. And many believe that consumers are willing to pay for services like these.

Aside from IITC, our research found that the most popular services today are navigation, vehicle relationship management and security. Each of these has clearly defined and well understood use cases. They are a natural next step for existing services such as car alarms, service reminder lights and offline sat-nav units, making them an easy sell for consumers. As the market matures, the range of services will expand and become more tightly integrated with each other, with other vehicle systems, and with urban infrastructure.

### A new in-car architecture

Conventional in-car electronics architectures were never designed with today's connected services in mind. Today's technologies, like the controller area network (CAN) bus, lack the throughput and, critically, the security needed as the number and sophistication of services increase. Car manufacturers will need to learn from the IT world and accelerate their adoption of new car network architectures based on faster technologies like Ethernet, and more resilient models, like clustering.

GM already claims it has

**1 million**  
connected cars on the road<sup>2</sup>.

Juniper Research forecasts

**one in five**  
passenger vehicles will be  
connected by 2019<sup>3</sup>.

**13%**

of people would immediately rule out buying a new car without internet access, while more than a quarter already prioritise connectivity over features such as engine power and fuel efficiency<sup>4</sup>.

## Connected vehicles will deliver value for everyone

Ultimately both consumers and car manufacturers will see a range of mutual benefits:

- **Better services, deeper relationships:** We surveyed automotive industry figures in our 2015 M2M Barometer: 79% said that connected cars give them a way of offering customers better services. Crucially, these are ongoing services: like periodic maintenance reminders, anti-theft tracking or monthly subscriptions for streaming entertainment. This is an opportunity to build a relationship with customers that previously disappeared the moment they drove off the forecourt.
- **Data-driven quality improvements:** Factory-connected cars generate a comprehensive flow of data into vehicle performance and real-world user behaviour. Some estimates suggest 25 GB of data can be generated per hour<sup>5</sup>. Car manufacturers can use this data to improve their products and services, for example by using real-world driving data to develop more fuel-efficient engines.
- **Better reliability:** Issuing over-the-air (OTA) updates to vehicle systems can correct faults while avoiding the huge cost associated with traditional recalls. 83% of automotive respondents in our 2015 M2M Barometer said that "minimising the impact of recalls is a compelling reason for connected cars". The impact of this is hard to overstate: BMW managed to bug-fix 2.2 million vehicles over the air<sup>6</sup>.
- **Improved servicing:** Connected cars can inform dealers and drivers about problems and book vehicles in for upcoming services. 81% of those we surveyed said that "retention by the car maker of aftermarket repairs is a compelling reason for connected cars". Consumers benefit from greater convenience.
- **Safety and compliance:** eCall in the EU, ERA-GLONASS in Russia, and other regional regulation is requiring that new vehicles come with connectivity to alert the emergency services in the event of an accident or breakdown. While many of these initiatives have been delayed, many OEMs have introduced their own schemes to get ahead. Standards bodies like the NHTSA in the US are actively setting standards for Vehicle to Vehicle (V2V) communications and autonomous vehicles.

### Local needs versus global strategies

Most commentators talk of "connected cars". In fact, we're seeing some of the fastest growth in connected two-wheelers, both motorcycles and bicycles (as well as other vehicle types like golf buggies, boats and light aircraft). Given the pressure of congestion and the dominance of two-wheelers in some of the fastest growing world economies, motorcycles, scooters and bicycles will become a major part of the transportation mix.

This is just one example of why manufacturers and service providers must take care to build their strategies to meet local needs. While broad global trends are driving connected vehicle adoption, regional differences are critical. There are differences in customer preferences, regulation and government policy, the commercial environment and economic factors. While automotive manufacturers may strive for a truly global "one size fits all" solution, that's not realistic. The technology infrastructure for the connected vehicle may be universal, but the implementation will have to be tailored at a local level.



## Connectivity delivers clearly measurable ROI for commercial operators

For all the talk of connected private vehicles, commercial vehicles are poised for even more fundamental transformation. Commercial vehicles are everywhere: trade vans; courier bikes; haulage firm and retailer lorries; plant equipment; company cars; taxis; rental fleets; and buses and coaches. Estimates are that 40% of vehicles on the road are commercial.

Many of the same connected services that are relevant to consumers will be relevant to commercial operators too — such as usage-based insurance or remote vehicle diagnostics. But there are also some unique challenges associated with running fleets of vehicles that can be overcome by connecting vehicles.

Specialised connected fleet management solutions have been popular with commercial fleet operators for a number of years. They give controllers up to date insight in order to optimise the utilisation of drivers and vehicles; monitor safety, security and compliance; control running costs; and deliver a more responsive service to customers.

As with connected cars, the range of features offered by connected fleet management solutions varies and is evolving over time. But even just basic reporting of vehicle location and status often produces significant ROI.

“ We have seen 40% fewer accidents and those that unfortunately still occur have cost significantly less to the business and are far less likely to result in injury. Our maintenance costs have also reduced and we are now using fewer tyres and spares and the overall 10% saving in fuel is a very significant cost saving in a fleet this size.

Iceland, home delivery fleet<sup>8</sup>.

”

## Fleet operators must work to overcome barriers to adoption

Despite the benefits, there are barriers for businesses to overcome:

- **Culture:** Drivers often resent the intrusion into their cabs, particularly where driving behaviour is monitored in-depth and where cameras are involved.
- **Economics:** The purchases of fleet management solutions can be delayed by lengthy vehicle replacement cycles, and the business case for investment may be weakened or deferred by periodic economic slowdowns or temporary drops in fuel costs.
- **Integration:** To get the full benefit of investment, fleet management solutions need to be integrated into supply chain systems, ecommerce, HR systems, ERP, and business processes across the business. This can be disruptive, like any major integration exercise.

Berg Insight estimates that in Europe and North America alone

9.1 million commercial vehicles

were being tracked at the end of 2014<sup>7</sup>.

## Autonomous vehicles: Connectivity is the key

Self-driving cars and trucks are the next step in the evolution of transport, building on connected car services to make journeys safer and more efficient.

### Connectivity underpins autonomous vehicles

In principle, “self-driving” cars are distinct from “connected” cars. The kinds of autonomous safety and convenience assistance features available in consumer vehicles today — such as push-button parking, automatic emergency braking or lane assist — involve no outside communication. Even a fully autonomous vehicle of the kind being trialled by Google isn’t necessarily “connected” — the sensing and decision-making may happen entirely within the car.

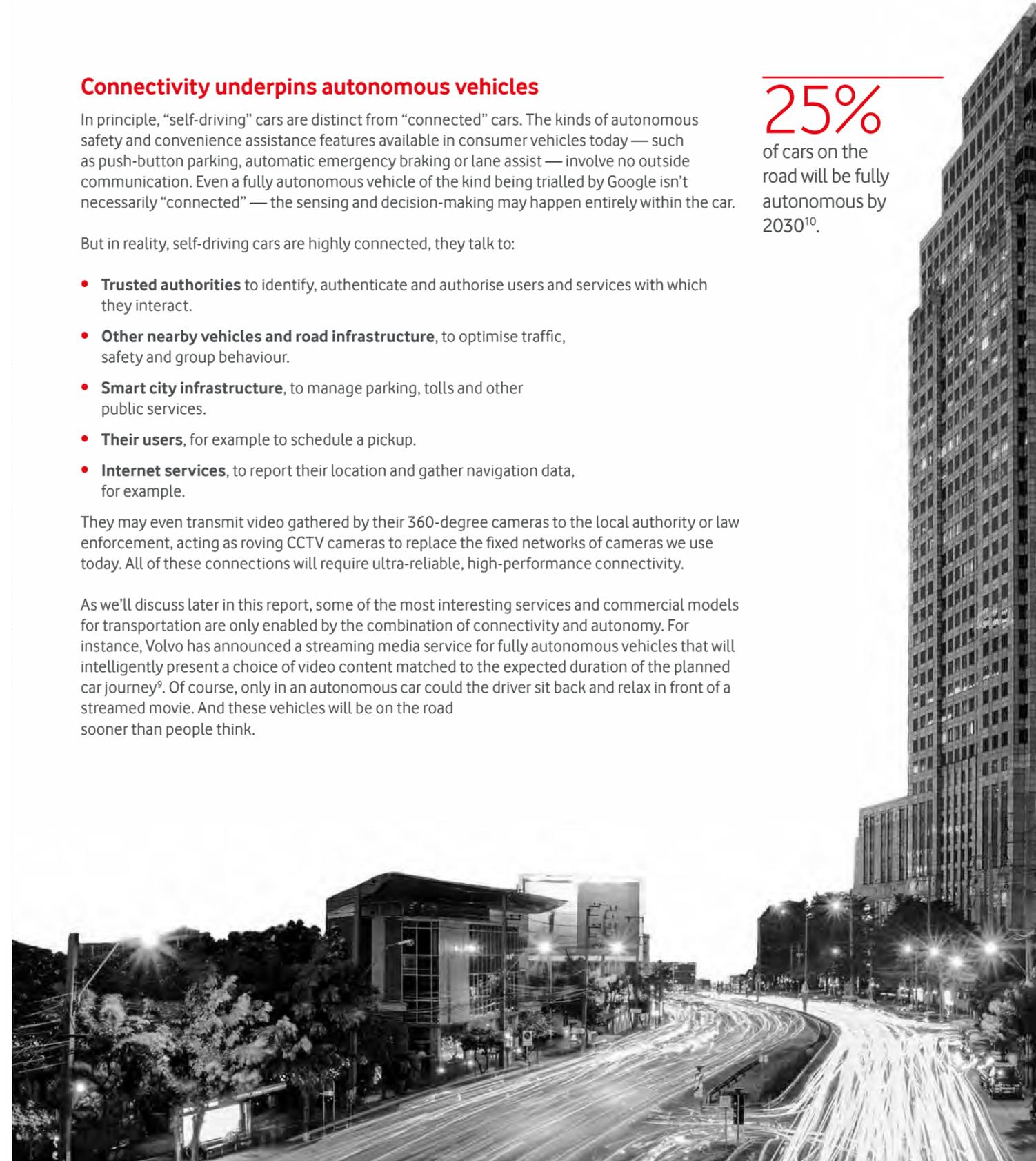
But in reality, self-driving cars are highly connected, they talk to:

- **Trusted authorities** to identify, authenticate and authorise users and services with which they interact.
- **Other nearby vehicles and road infrastructure**, to optimise traffic, safety and group behaviour.
- **Smart city infrastructure**, to manage parking, tolls and other public services.
- **Their users**, for example to schedule a pickup.
- **Internet services**, to report their location and gather navigation data, for example.

They may even transmit video gathered by their 360-degree cameras to the local authority or law enforcement, acting as roving CCTV cameras to replace the fixed networks of cameras we use today. All of these connections will require ultra-reliable, high-performance connectivity.

As we’ll discuss later in this report, some of the most interesting services and commercial models for transportation are only enabled by the combination of connectivity and autonomy. For instance, Volvo has announced a streaming media service for fully autonomous vehicles that will intelligently present a choice of video content matched to the expected duration of the planned car journey<sup>9</sup>. Of course, only in an autonomous car could the driver sit back and relax in front of a streamed movie. And these vehicles will be on the road sooner than people think.

25% of cars on the road will be fully autonomous by 2030<sup>10</sup>.



## Self-driving vehicles will shake up commercial transportation

Autonomous commercial vehicles are nearing the market, too. Already Daimler has demonstrated its “Inspiration” self-driving truck in the US<sup>11</sup>, and China is piloting self-driving buses<sup>12</sup>. Many, including General Motors, are betting that driverless taxi and rental fleets are the future<sup>13</sup>. And delivery giants like Amazon and DHL are trialling autonomous drones.

We believe that the adoption of autonomous commercial vehicles will be extremely rapid, starting with the largest and most specialist vehicles. That’s because all commercial vehicles (including scooters, cars and vans) have to demonstrate ROI, but large commercial vehicles like trucks, buses, plant, mining and agricultural vehicles in particular are expensive assets that can’t sit idle. Self-driving vehicles are:

- Unhindered by requirements for rest, pay, shift restrictions, union negotiations or the other hassles of employing scarce and expensive drivers. Operators can charge customers less while making more profit.
- Already proven to be safer in difficult driving conditions, with no concern about fatigue. Long routes on motorways, which make up the bulk of haulage routes, are simpler environments for autonomous vehicles than busy urban streets.
- Free of the sentimental attachments that may hold back the adoption of personal self-driving vehicles.

In ten years, it may be a very rare thing to be a truck, taxi or bus driver — and since today in the US alone there are 8.7 million trucking-related jobs, the economic effects of that disruption will be far-reaching<sup>14</sup>.

## Car companies must become technology companies to succeed

We know first hand that manufacturers are taking connected and autonomous vehicles very seriously, because we’ve worked alongside some of the world’s biggest car makers to develop and implement their strategies. But these digital concepts are alien to the usual manufacturing model. The technology lifecycle is many times faster than that of a traditional vehicle, and connected car services require a whole different set of capabilities and competencies. As part of offering a connected car, automotive manufacturers will need to consider the user interface, the pricing model, billing, contracts and service management, and processes for onboarding, support and user management. Autonomous cars multiply the complexity.

Manufacturers are already on the way to developing these capabilities through recruitment, acquisition, investment, and organic upskilling. But becoming a software and services company is a long process. And it’s already clear that technology companies like Uber, Google and Apple, with their mastery of software, data and their intimate consumer relationships<sup>15</sup>, are set to play a big role in the future of transportation. While the car makers adapt to the new world of connected transportation, new startups and intermediaries are coming in to erode car sales and capture customer revenue flows<sup>16</sup>.

U.S. auto sales may drop about

# 40%

in the next 25 years because of shared driverless cars ... Large-volume automakers “would need to shrink dramatically to survive.”<sup>17</sup>



## Partnerships will be critical

Even relatively simple and isolated connected car solutions may be beyond the ability or desire of automotive manufacturers to offer on their own. What manufacturer will find it economical or successful to offer its own app store, its own streaming music or video service, or its own breakdown recovery service?

We have seen car manufacturers try these things — Audi, BMW and Daimler purchased Nokia’s Here mapping assets for €2.8 billion<sup>18</sup>. But it will be impossible to keep all elements in-house as the functionality involved in the car proliferates, not least due to intense market competition for IT talent<sup>19</sup>.

The whole car feature stack will unbundle, with third parties contributing (and owning) much of the value of the in-car experience.

For automakers, what KPMG calls the “dethroning of the OEM”<sup>20</sup> may be a painful transition. Car manufacturers will need to get used to working shoulder to shoulder with possible competitors, and deepen their alliances with tech-industry players to create mutual value.

No doubt this will involve some negotiations about revenue splits, data ownership and customer relationships, but those issues are surmountable.

Technology companies may seem like competitors, but there are huge barriers to entry to becoming a true auto manufacturer, and partnerships are the most logical approach for both sides. Giants like Google and Ford are already working together.

# € 2.8 billion

spent by a consortium of car makers acquiring digital mapping assets from Nokia<sup>18</sup>.

# “

We don’t particularly want to become a car maker ... [Google recognizes there are] “a lot of amazing companies in the Detroit area and internationally that know how to make cars ... it would be goofy for us to try to replicate [their expertise].

# ”

Chris Urmson, Google<sup>21</sup>



## Cross-industry ecosystems: Opening up new mobility models

The greatest opportunities in the new connected world of transportation will depend on multiple sectors working together to offer seamless services through radical new business models.

### Connectivity is opening up new business models for “car as a service”

Using the foundation of the connected vehicle, and the autonomous vehicle after it, there is enormous potential to innovate in the business models that underpin the transportation system.

We’re seeing the beginnings of these developments today. Anyone that has ever tapped to order an Uber instead of flagging down a cab, or chosen a usage-based insurance policy instead of a fixed annual premium, is relying on connected cars and the IoT to change the way they interact with transportation services.

Indeed, these are variants on the idea of “car as a service”. This is the ultimate solution for societies that are seeing the traditional model of one person owning one car as unsustainable due to congestion, cost or other pressures.

Such models depend on vehicles being connected to the network in order to report on where they are, who can access them, and how, where and when they’re driven and billed accordingly.

### New business models are all around

Tap-to-call services like Uber, car-pooling services like BlaBlaCar, and self-drive on-demand rental services like ZipCar are now familiar. And they are just the beginning. As more vehicles get connected, and more of the infrastructure and services around transportation gets connected too (and as self-driving vehicles enter the mix), the possibilities are endless. They include:

- **Freemium funding:** Consumers could opt for a discount on their ride in a self-driving taxi if they interact with advertising on the dashboard.
- **Crowdsourcing commercial driving:** Retailers, taxi firms and other operators could pay consumers to carry goods or passengers with them in their owned cars, mixing personal and commercial journeys. Amazon Flex already does this in a number of US metro areas<sup>23</sup>.
- **Community rentals:** Using usage metering and remote unlocking, individuals could rent out their cars during the day while they’re at work, instead of them sitting idle in the office car park or on the driveway.
- **Variable pricing:** City authorities could charge variable prices for use of the city’s transport during peak traffic volumes — even allowing drivers to pay more in return for faster passage through congestion.



## One out of 10

new cars sold in 2030 may likely be a shared vehicle<sup>22</sup>.

## Cross-industry partnerships take innovation further

New business models need not only technical integration, but regulatory, cultural and commercial changes. To achieve all of these changes will require broad participation from both private and public sectors in a truly interconnected transportation ecosystem.

While automotive companies have an opportunity to play a leading role, there must be close partnerships between organisations that may never have worked together before, to make genuinely new experiences possible and forge whole new markets. Many groups will be involved: the public sector, as custodian of the smart city; the insurance sector, developing usage-based insurance products; public transport providers; company fleets; and that’s just the start.

That’s because the most innovative services are necessarily not just about the in-car experience, but the broader view of connectivity can help consumers and enterprise users in the wider context of their lives and journeys. For example:

### End-to-end journey planning

An individual consumer’s commute to work might span multiple modes of transportation. A transport planning service should integrate public transport schedules and ticketing, parking booking and road journey planning, all seamlessly accessible from both the driver’s dashboard and their smartphone. To do this will require public transport and city authorities to share data via application programming interfaces (APIs) — as the **City of Westminster** has done with its parking bays<sup>24</sup>. **DriveNow**, the on-demand car rental provider, is working closely with the public sector to negotiate access to resident-only parking bays for its vehicles, making sure that its customers can more conveniently find a vehicle near to them and a parking space to return it to.

### Smart home integration

Consumers’ journeys often start and end at their homes. Tightly integrating the vehicle with the smart home enables apparently trivial but convenient features like automatically locking the doors, turning off the lights and arming the house alarm when the driver pulls out of the driveway. **BMW** has already integrated its ConnectedDrive car services with Samsung SmartThings smart home services, enabling consumers to activate their burglar alarm and adjust their heating from their vehicle dashboard<sup>25</sup>.

### Retail services

Services might look at particular driving “occasions”, such as a shopping trip. **Volvo** is piloting a new In-Car Delivery service in Gothenburg, Sweden. It’s partnered with PostNord to enable couriers to drop parcels in the boot of a customer’s On Call-enabled Volvo<sup>26</sup>. Anyone who has struggled around the shops with a parcel, or missed a delivery while out at work, will immediately see the value.

### Smart cities

Put the journeys of millions of people and millions of vehicles together and what you have is a large part of the smart city. The data from the connected vehicle will be a large part of what makes the smart city function. Millions of vehicles could concurrently share data with traffic signals, with other cars, with emergency services and with smart parking bays to help overall traffic flow around the city, to the benefit of all.

## Break down car-centric structures to open up new possibilities

All parties in the transportation ecosystem will need to look beyond their usual service area and take an end-to-end view of how people, businesses and cities function. While the individual car is a big, important and expensive asset, it is just one part of a person's lifestyle and activities.

This people-centric perspective forces a reconsideration of the structures that we've built up around the automobile. The insurance policy, for instance. Today, a consumer may have an annual insurance policy that covers a particular vehicle with a particular driver for a static modelled set of risks and behaviours. Instead, a new kind of policy could follow the user across their different transport types, locations and activities, using a wealth of different data sources — measured, shared and possibly purchased — to track behaviour and assess risk step by step. The insurer gets to offer a more holistic service that the consumer values. The consumer gets greater flexibility to change their life and know that their risk is covered.

## Data is the unifying thread

When services follow people, not cars, data becomes the most important asset. Individuals may not have a traditional ownership of a single car, and their mobility world extends far beyond it. So transportation ecosystems will pivot to focus on the digital footprints — or tyre tracks — left by a user's journeys.

This is where the future role of the car is brightest, as one of the richest sources of data. Cars obviously gather data about their health and usage that automotive companies need to improve vehicle quality. But data will become a more widely monetisable asset that flows between organisations across the ecosystem.

- **Media and entertainment** companies would pay to learn which music tracks people tend to sing along to or which radio adverts they're exposed to.
- **Retailers** could learn where people park and which other shops they tended to visit in their cars or on foot.
- **Local councils** would value getting thousands of real-time data points about how much pollution is in the air and what the weather is, or how bad the potholes are on different roads around towns and cities.
- **Insurers** want a clear picture of under which conditions people tend to have accidents, including where, when and how they drive.

It's data that is the key to building direct, long-term relationships with customers. For automotive companies that are used to building and selling expensive one-off assets — albeit via hugely profitable finance arms<sup>27</sup> — adapting to derive value and ultimately profit from information is quite the culture shift. But we believe automotive companies are ready for the challenge.



Already, automotive firms are ahead of the curve in recognising the value of data. Our **2015 Barometer** found

# 79%

use analytics on the data they collect, compared to 75% across all sectors.

## Consumer trust depends on addressing security and privacy

Securing the connected and self-driving vehicle is a hot topic for manufacturers, regulators and insurance companies<sup>28</sup>. Connected car security has already been the subject of a US lawsuit against Toyota, GM and Ford<sup>29</sup>, research company SBD identified 50 distinct attack points in the connected car ecosystem<sup>30</sup>, and there have been several proofs of concept in controlled conditions that show attackers able to control core vehicle systems like braking<sup>31</sup>.

A breach of connected car systems could also give hackers access to private data, including payment details, users' journey metadata, and personal information, plus potentially sensitive intellectual property from the car manufacturer. Data privacy, compliance and data sovereignty are issues that must be considered very seriously.

While automotive manufacturers and their component suppliers have a significant role to play in securing the car as an endpoint, all participants in the interconnected transportation ecosystem must contribute to securing the data as it flows. If cars are connected to other vehicles, to road infrastructure and to dozens or hundreds of third-party services, every one of those connections should be secured.

Thanks to our consultations with car makers and their technology partners, we know that the industry is taking important strides in managing security and privacy risks. Even while true connected car security standards are in the early stages of development, we are seeing manufacturers and their partners follow general IT security best practice more rigorously: for example, segmenting service zones within the car, encrypting data end to end, authenticating devices at each connection, and employing white-hats to test for vulnerabilities.

In our **2015 M2M Barometer** we asked automotive firms about the barriers to them adopting M2M technology. Security actually ranked lower for automotive than other sectors — it was cited by 22% of respondents compared to 33% in other sectors. But privacy was cited by 36% of respondents, making it the biggest concern.



## Conclusion

**From the foundation of revenue-generating connected car services, the way consumers and enterprises use vehicles is poised for a dramatic shift.**

### A vision for interconnected transportation

In the near future every individual and every company will have the freedom to experiment with a vast array of business models to move around their cities. Far from isolating drivers from the world around them, connected — interconnected — cars will link people seamlessly to their homes, phones, workplaces, stores and the infrastructure around. The data that people and their vehicles generate through every action will be used by many different public and private sector organisations to keep them safe, and to make their lives and interactions more convenient.

### Planning the journey

Between today and this vision of the near future is a continuum of change. Before it becomes commonplace for cars to communicate autonomously with each other, they're already sharing traffic data with Google and Waze. Before cars drive themselves, they're already stepping in to do emergency braking. Before cars become truly shared communal assets, many young urbanites are already renting cars by the hour using their smartphones.

It's a long, complex and exciting journey for everyone involved, across industries and across the world. But in many ways strands of this new journey-centric ecosystem already exist, and given the long development cycles associated with cars, urban infrastructure and social change, all players in this new world need to start work on shaping it today.

Connected car services are an important first step, but just as critical is working to forge non-traditional partnerships that benefit all parties, from the driver to the automotive company to the media, insurance and public sector bodies. These interconnections are fundamental to establishing the data flows and commercial models that will underpin a truly customer-centric mobility ecosystem.

“

The auto industry is in a process of upheaval. The car will become part of the internet of things and we want to be part of that.

Karl-Thomas Neumann, CEO, Opel<sup>132</sup>

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## About Vodafone

Many of the world's top vehicle manufacturers already choose Vodafone as their partner for connected cars. Today we have more than 1,300 experts working alongside manufacturers including BMW, General Motors, Porsche and Volkswagen Group to shape the future of the automotive sector.

Through Vodafone's specialist Automotive division we are uniquely positioned to provide end-to-end services, such as stolen vehicle recovery and usage-based insurance. Our capabilities include designing and manufacturing in-car hardware, plus delivering global connectivity, applications and round-the-clock monitoring from our service operations centres. We have built security in at every stage, meaning we can offer customers an unrivalled level of protection and privacy.

We are also a leading player in the broader connected transport ecosystem. Our vision is to be the hub that connects a multitude of industries. Already we are helping public transport companies, car insurers, fleet operators, car-sharing schemes, advertisers and public sector organisations work together to create new journey experiences.

To find out more about our work in the connected car and the automotive industry, visit [vodafone.com/iot](http://vodafone.com/iot).

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