Driving transformation

The digitalization and connection of the car

orange™ **Business**

Introduction

The way we use transportation is transforming. Consumer demand, new original equipment manufacturers (OEMs) and the gathering hype around autonomous vehicles are accelerating the change.

At the center of it all is the electric vehicle transition. This is the move from the internal combustion engine and fossil fuel dependency to more rechargeable, reusable, software-defined modes of travel.

But for this to become a reality, so much more than just the cars we drive must evolve. From charging infrastructure to legislation, cyber-security to connectivity, the world needs to alter how it uses and views vehicles.

In this paper, we're looking at some of the key challenges car manufacturers face today and what they need to consider when tackling them. Drawing on Orange Business' technical expertise in connectivity, networks, cyber-security and artificial intelligence, this report considers how OEMs can make the connected car a safe, efficient reality.

Industry transformation

The automotive industry is in a state of flux. Newer OEMs like NIO and Tesla are disrupting how vehicles are manufactured and distributed, maintained, and owned.

Buyers expect new transport experiences, which in turn changes their perceptions around vehicle ownership and usage. Continuing chip shortages are impacting production just as consumer demand accelerates.

This isn't just market forces, either. New regulations, tied closely to emissions targets and the climate crisis, are forcing the industry to rethink its entire model. By 2035, all new cars and light commercial vehicles will need to produce zero CO_2 emissions in the European Union as part of its plans to become climate neutral by 2050.[1]
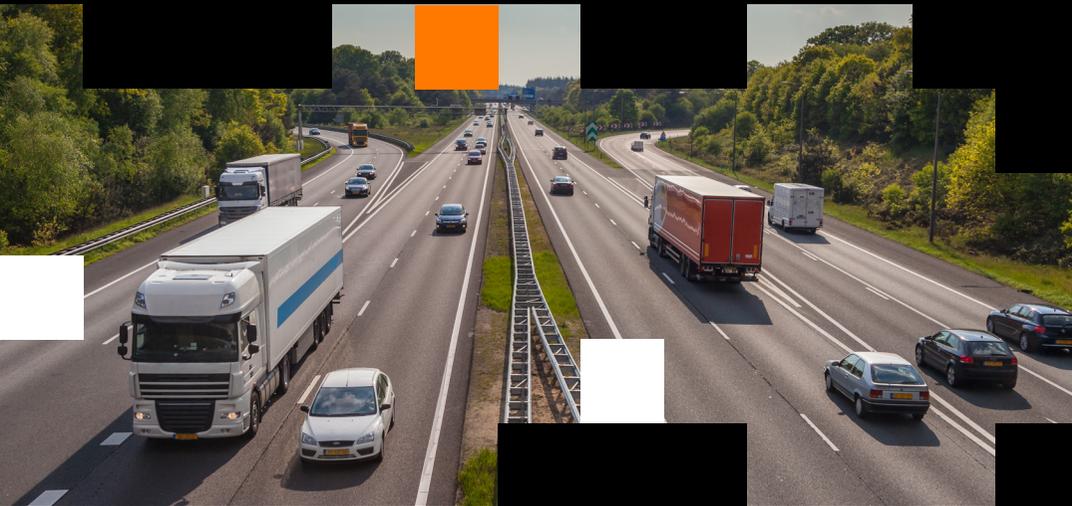
To tackle this, car makers are responding in multiple ways. They are:

- **Partnering for innovation:** as with legacy players in other sectors, traditional OEMs partner with technology leaders to accelerate innovation across all operations. For instance, Mercedes-Benz has partnered with Microsoft to improve production efficiency and Tencent to improve autonomous driving research,[2] while BMW and IBM are working on artificial intelligence in future car models.[3] Elsewhere, Renault is part of Software Republique, the mobility security and sustainability ecosystem, alongside Orange and Thales.[4]

- **Becoming mobility providers:** trends like shared mobility are revolutionizing how consumers go from A to B, with McKinsey predicting that hailed mobility only could generate revenues of up to $860 billion by 2030.[5] Traditional manufacturers are seeking to capitalize on this demand for car-as-a-service by launching new lines of business focused on delivering mobility solutions, not just vehicles. These include Renault's new brand Ampere, Audi On-Demand, a Volkswagen-led consortium acquiring Europcar, BMW i Mobility Services, and Mercedes-Benz Mobility.

- **Investing in autonomous driving (AD):** with one study predicting that autonomous-driving systems could create between $300 and $400 billion in revenues by 2035,[6] interest in autonomous vehicles remains high. Ford and Volkswagen exiting Argo AI and challenges with Audi's AV efforts demonstrate that there is a long way to go,[7,8] but OEMs recognize that AD will transform transportation.

What these trends all point to is an evolution in how the world consumes vehicles. From changing approaches to acquiring cars, to what dictates individual purchasing decisions, the way customers will use not just vehicles but mobility solutions is going to transform every aspect of the automotive industry.

Nowhere is this revolution more apparent than in the electric vehicle (EV) transition. As OEMs accelerate their move towards EVs, the opportunities to transform not just how cars are powered but how they are differentiated, owned, delivered, funded and supported changes as well. And with these new approaches come new demands, for data, artificial intelligence, machine learning, cyber security and high connectivity.

EV transition and the Connected Car

When talking about electric vehicles, many people automatically start thinking about sustainability. Certainly, contributing to zero-emission targets is a major factor in the focus on the EV transition.

Many major businesses with significant fleets are tying their vehicle emissions to overall corporate Environment, Sustainability, and Governance (ESG) goals. The International Energy Agency (IEA)'s Net Zero Emissions by 2050 Scenario requires an electric car fleet of 300 million in 2030, with EVs accounting for 60% of new car sales.[9]

Yet, while EVs are critical to climate change efforts, they offer more to drivers and passengers than a reduced carbon footprint. The overall driving experience is an increasingly important differentiator. This ranges from purchasing and how the vehicle is owned, to personalization and ongoing maintenance. More than three-quarters (78%) of consumers in a survey rated the customer experience as either somewhat or very important when choosing where to buy a vehicle.[10]

And it is newer, EV-focused car makers that are meeting that need. Unhindered by dealer networks and aftermarket organizations, these manufacturers offer the same digital-first buying experience consumers are used to receiving in other parts of their lives. NIO and Lynk&Co offer physical retail spaces that are more like members' clubs than traditional car showrooms. The likes of Sony-Honda and Tesla are tackling challenges such as charging time by focusing on in-car entertainment (see box out for more details).

EV OEMs are also using a challenge – the cost of the battery and the impact it has on the overall price of the vehicle - to come up with new ways for customers to use EVs. That might be battery-as-a-service, where the user effectively leases the battery and pays a monthly subscription, or working with governments to provide financial incentives.

Uneven progress

But while the electrification of driving is gathering pace, progress overall is uneven. Affordability remains a barrier, evidenced by countries with lower gross domestic product having lower EV uptake. The number of EVs on the road is growing faster than charging points, while investment in charging infrastructure is uneven.[11] In the EU, nearly half (49%) of all charging points are in the Netherlands and Germany, with the former accounting for more than 90,000. This starkly contrasts with the bottom five EU countries, which have 1,100 between them.[12]

Charging time remains a problem. Stations are occupied longer than their fossil fuel counterparts, but currently drivers lack the means to see where space exists.

EV transition and the Connected Car

Again, some OEMs are being proactive, identifying that offering either charging infrastructure or ways to find available charge points can be a key differentiator. Tesla's charging network is one of the largest in the world, while Porsche Destination Charging combines luxury EVs with high-end hotels and other destinations to allow drivers to recharge for free.[13]

However, while regulation is helping shape the market for EVs, governments have yet to work out how to tax them. A drop in fossil fuel consumption from passenger cars will have economic implications, and until this is resolved, we are unlikely to see full government support for the EV transition.

Changing customer relationships

Traditional OEMs have another issue: how the EV transition radically alters the profitable aftermarket business and what that means for ongoing customer relationships. The software-based nature of batteries means that maintenance can be as required, rather than the calendared annual service internal combustion engines should go through. When combined with an increase in online vehicle sales and over-the-air software updates, contact with the customer becomes less consistent.

The renewable nature of EVs, with automated software updates and replaceable batteries, also means that the practice of exchanging older cars for newer models could well change. When everything can be updated, why buy a new car? Without that regular contact, OEMs will need to find new ways to establish, build, and maintain customer relationships.

Opportunities are available. In-car voice services, chat and video bots, hyper-personalized advertising, avatars, and streaming services all offer ways to digitalize customer relationships and protect revenue streams.

Alongside these in-car services lies another solution for automotive manufacturers looking to strengthen relationships; to support the demand for new travel modes based on mobility. In other words, viewing cars as-a-service.

Streaming

As highlighted, one of the drawbacks to EV adoption is the amount of time spent charging the vehicle. While charging can often be done overnight, there will be times when that's impossible, and a stop to charge the vehicle is required. Even the fastest charging stations are unlikely to be able to fully refuel an EV in less than 30 minutes for a long journey. Keeping passengers entertained is critical to delivering high-quality, in-vehicle experiences.

As such, being able to deliver the sort of entertainment services consumers enjoy at home in the vehicle could be a significant differentiator for OEMs. Tesla, for instance, has added access to gaming platform Steam to its central console on the Model X and Model S vehicles, allowing users to play games in the car.

5G becomes imperative, but car makers need to realize that cellular connectivity is not perfect, so back-ups, such as non-terrestrial networks, will also be needed. Another challenge is funding the connectivity required: one solution could not only make it commercially viable but also open up new revenue opportunities – hyper-targeted advertising, using a combination of data gathered from the vehicle and its location to deliver relevant, personalized communication. To find out more, take a look at our fact sheet on streaming.

Car-as-a-service

Purchased outright, part exchange, hire-purchase, leasing, company cars; there have long been multiple ways for people to acquire vehicles. Now consumers are looking at car-as-a-service.

For the last few decades of car ownership, the focus has been on having a car for a significant time, with little flexibility. However, the demand from a more transient, urban-based customer base is changing: many, particularly younger generations, want to be able to acquire vehicles depending on their needs, which can evolve rapidly.

Catering to this is the rise in car-as-a-service (CaaS). These subscription-based services prioritize delivering all-in-one monthly prices. While similar to lease and HP models in that regard, CaaS differ in two main ways:

- They provide customers with the ability to give shorter (30 days) notice to change or return vehicles; and

- They are more digitally focused, with both management of the subscription and the vehicle itself handled through smartphone apps.

Lynk&Co, for instance, allows users to control, monitor and share their vehicle via an app and can be bought outright or used via a monthly subscription. Whichever way the driver acquires the car, they can access live music events, film screenings, and other experiences at Lynk&Co clubs, adding to the overall experience.

Connectivity at the core

To achieve this experience, vehicles need to be connected, with everything from the internal environment (including seat position, starting radio station, and vehicle temperature) to the engine manageable through an app. This model lends itself to EV and hybrid vehicles where the battery and the software running it can be remotely controlled via the app.

It requires the right technology infrastructure to manage data and ensure the right level of personalization is pushed to the right vehicle, at the right moment, for the right person. Dedicated cloud computing environments, supporting AI and ML tools that can predict when personalization is needed, have to be deployed to deliver appropriate levels of service.

The model isn't perfect: traditional approaches to car insurance don't fit naturally with more flexible ownership, so CaaS providers have to incorporate specialist products into their services. Plus, while the potential to generate income from the car through sharing schemes is often widely touted, the reality could be different.

The logistics of peer-to-peer sharing could be challenging, with issues such as car cleanliness, location and liability being potential barriers to widespread adoption. At best, it could be a niche option: McKinsey, for example, suggested that the potential for the car-sharing market might reach $15 billion by 2030, paling in comparison to the $860 billion upper limit it predicts hailed mobility could reach in the same period.

Cementing relationships

As well as meeting the needs of drivers for greater flexibility and personalized experiences, car-as-a-service offers OEMs an opportunity to build an ongoing relationship with customers. Continuous subscriptions allow manufacturers to keep in touch with both user and car. They can add new services, manage software updates and gather data on performance. This is all much easier

Fleet management

The increasing digital connectivity of the car has the potential to generate a major shift in the individual driver experience; it also has significant implications for businesses, with a majority of new registrations being made by fleets, leasing, and short rental companies. With the need to manage assets effectively and keep control of the total cost of ownership, fleet managers have the opportunity to gather and analyze data on a variety of metrics.

This gives fleet managers the intelligence needed to develop relevant services for company employees. So, rather than make a blanket decision on the transportation needs of entire job roles (with the attendant impact on tax and benefits packages), companies can develop solutions that meet the needs of the driver, improving the overall experience.

Rather than retrofitting thousands of vehicles with black boxes to gather these insights, fleet managers, when working with the right technology partners, can tap into OEM databases directly. To find out more, take a look at our fact sheet on fleet management.

to do when the vehicle in question uses a battery, whether fully electric or hybrid. Income generated from these recurring services could boost revenue by around 30% in the next decade. It also provides a route for vehicles at the end of their lifecycle to be returned quickly and recycled as required.

Managing this requires high levels of connectivity, the ability to gather, analyze and use data effectively, and the technology infrastructure to turn OEMs from car manufacturers into software-defined businesses. It is all achievable but requires significant expertise. It also requires extensive securing. Car makers are rapidly expanding their digital surface area and increasing their exposure to cyber-attacks.

Cybersecurity

Cyber-attacks on vehicles and OEMs increased by 225% between 2018 and 2021, driven by the interconnected nature of cars and OEMS.[17]

There are three areas of focus when it comes to automotive cybersecurity:

- **Onboard the vehicle:** the actual software, sensors, and systems in thephysical car that control everything from access to ignition, infotainment to environment.

- **Connectivity and third parties:** the services connecting the car to the OEM and other service providers, including smartphones used to manage the vehicle.

- **Offboard the vehicle:** the clouds, systems and infrastructure that run entire fleets.

The implications for failing to protect any one of these are significant. When a car-sharing service in North America was hacked, with 100 cars stolen, the company had to pause the whole service.

They're also far-reaching. An OEM that's suffered an attack that affected cars on the road could suffer from long-term reputational problems, covering everything from insurers increasing premiums on its models to corporates declining to include its vehicles in their fleets.

Meeting regulations

It's an area regulators are concerned about, with the European Cyber Resilience Act having provisions for and UN Regulation No. 155 covering cyber security in vehicles.

Yet, while automotive manufacturers must ensure that they protect all three areas of concern, they have to balance it with delivering the experiences drivers seek. Any protection impinging on the service's usability is likely to push individuals to employ workarounds or use an alternative. The most secure vehicle in the world will not have many customers if protecting them affects their use of the car.

So, OEMs need to factor in how they, in effect, protect the user experience without exposing the vehicle to unnecessary risk. One way to do that is to look at an area that underpins the experience: the third-party apps that many car makers rely on. While manufacturers are developing apps for their own services, for areas outside of their expertise (such as mapping, voice messaging, payments and entertainment), they're turning to third parties with experience of working with common operating systems such as Andoird.

These apps are usually developed with minimum input from the OEMs. If not managed properly, they also offer a way into otherwise secure systems for attackers. It's not a one-and-done process; even once developed, OEMs must keep apps updated. With more than 70% of vulnerabilities not patched within 30 days,[18] a proper regimen of ongoing updates and patches is critical to keeping bad actors out of the three areas of concern.

Cyber-security is a concern for OEMs today and needs to become embedded in their organizations. Why? Because they will be unable to deliver the promise of autonomous driving if customers do not trust the vehicles they are travelling in.

Diving deeper into cyber

Imagine you're driving, when suddenly your vehicle is taken over by an invisible adversary that demands you pay a ransom, while increasing the speed of your car. It's a terrifying prospect; now imagine what happens when the same attacker does it across an entire fleet. The ramifications would be catastrophic, from drivers to OEMs.

Understanding how to prevent these attacks and protect drivers is critical – to find out more, take a look at this fact sheet on cyber security.

Autonomous driving

Autonomous driving, whether fully self-driving vehicles or manually operated with some assisted features (such as parking), continues to excite interest. But how can OEMs ensure the safety of all road users?

The thought of how autonomous vehicles could transform travel through decreased congestion, fewer accidents and more efficient use of time has undoubtedly captured the imagination. Yet mainstream adoption is some way off.

One report noted that the "hardware, software and infrastructure of automated driving are improving, but still not reached the level necessary for scaling up."[19] Realistically, the EV transition needs to be complete and car-as-a-service commonplace before autonomous vehicles reach the mainstream. Consumers need to be comfortable with cars actively gathering data and personalizing their experiences, and OEMs need vehicles generating that data to inform the AI running the AV.

Consumer attitudes vary

At the moment, attitudes towards AVs vary. Studies show that customers would accept some aspects of AD, but perhaps not all; according to Bain and Co, 60% of consumers in China and 25% in the US would be open to robotaxis.[20] This suggests using AVs for one-off trips has appeal, while other data indicates that 26% of consumers would choose an advanced AD feature when purchasing their next vehicle.[21]

The same study said consumers are less open to driving fully autonomous cars, with just 26% saying they would switch to an AV. Respondents said that safety, wanting to test AVs themselves, and a requirement for more information from OEMs were all factors that would increase their confidence in AVs.[22]

Legal questions

The need for more regulation also scored highly. The lack of legal guidance for Level 4 and 5 driving makes even testing AVs challenging. This gap also raises questions regarding who would certify software to drive – giving a machine a driving license. Insurance liability is also an issue that needs to be tackled.

What are the AD levels?

Not all AD activities are equal. To understand how mature the technology is, the Society of Automotive Engineers defined six levels of driving automation, which are:

1 **No driving automation**

2 **Driver assistance:** the human is in full control, but has some guidance from an advanced driver assistance system (ADAS) for tasks like acceleration, cruise control or braking.

3 **Partial driving automation**: the human is still in full control, but the ADAS can perform multiple tasks simultaneously. So, it could potentially control both steering and accelerating at the same time.

4 **Conditional driving automation:** the vehicle can operate on its own in certain circumstances, but the driver has to be ready to step in.

5 **High driving automation**: the car can perform all driving tasks and intervene in the event of an incident, but can only work for restricted trips, i.e. driving from point A to point B.

6 **Full automation**: the vehicle can do all driving tasks in all circumstances, and the human is no longer a driver, but a passenger.

In the event of a crash, does the blame lie with the vehicle's passengers, the owner (which could be a leasing company, corporate entity or CaaS provider) or the OEM?

Then there's the obstacle of what happens when vehicles manufactured in one country enter another. A recent review by the Law Commission of England and Wales highlighted the industry's problems. It recommended banning the remote driving of vehicles from overseas until "appropriate international agreements are in place".[23]

AVs, V2X and Europe

It's also important to consider the current state of driving in Europe. The average age of the EU car is 11 years old, with more than 50% older. This means most of Europe's current fleet is not connected and is unable to handle vehicle-to-everything (V2X) communication, a basic requirement of AVs.

In addition, much of the EU's road infrastructure is made up of historic and old routes, many of which have complex traffic obstacles and are used by a variety of vehicles.

Plus, there's the issue of data sovereignty – AVs require huge amounts of data to be generated in and out of the car, and shared between AI and ML tools operating in cloud environments. This demands low latency, high connectivity, and regulations that allow the sharing of data potentially across borders.

Realizing an autonomous future

Significant work must be done, from standardizing connectivity and ensuring blanket network coverage to having the appropriate laws to support the development, testing and implementation of AVs. It is useful, in some ways, to see AV and AD as the culmination of the work being done to facilitate the EV transition, deploy CaaS and embed automotive cyber-security. Each must be in place, with their learnings and advances integrated into AV development, for an autonomous future to be realized.

5G

5G and Internet of Things

Connectivity and network coverage are critical to the enablement of AVs. Many OEMs don't understand that the 5G they're using on their smartphones is not the same as the 5G needed to support AV and AD activities. Being able to support the driving hundreds of thousands, if not millions, of AVs, is not automatically available because 5G rollout is accelerating.

What the right 5G networks can do is support OEMs in delivering phenomenal driving experiences today. That might be secure and instant in-car payments and accurate traffic information, it could be high-quality infotainment for passengers. As OEMs accelerate their EV transitions and adopt CaaS, the right 5G coverage can deliver greater levels of connected car capabilities.

In short, 5G has value to OEMs now, as well as helping them realize their AV ambitions. To find out more, take a look at our 5G and IoT factsheet.

Big Data, artificial intelligence and machine learning

Data is at the heart of the Connected Car. The value of the EV transition and CaaS will not be realized without OEMs unlocking the potential of their data, and deploying AI and ML tools effectively.

And they need to be used in the right way so they can learn how we use vehicles and inform the development of autonomous driving. Innovations such as hyper geolocation capabilities, where positioning can be calculated to within four centimeters, need data, and lots of it.

But to support this gathering, processing and storing of data requires something else as well. Public cloud environments that can hold data and make it available to AI and ML tools deployed both in that environment and in the vehicle.

It is a huge opportunity, but one fraught with challenges covering everything from capacity and latency to data sovereignty. To find out more, take a look at our fact sheet on Big Data, AI and ML.

Conclusion

OEMs are navigating a way through significant industry disruption. From new entrants upending the car-owning experience to regulations forcing an overhaul of everything from production to distribution, how the world buys and uses vehicles is changing dramatically.

What's more, the next steps are becoming increasingly interconnected. AVs catch the headlines, but mainstream adoption is potentially decades into the future. While OEMs invest in driverless tomorrows, they must be servicing and protecting their customers today.

The EV transition is the center of every other innovation and business model. It enables the car to move from primarily hardware to predominantly software-based. CaaS solutions meet the needs of consumers looking for flexibility and more digital-first means of using and managing transport. And with this increased software, digital, and ultimately highly connected footprint comes a greater risk of cyber-attack.

These are all areas that need to be addressed. Most OEMs have begun their journey with increased investment in EVs, the evolution of CaaS offerings, and much-heralded investment and initiatives into AVs. Some will likely falter; those that succeed will be the ones that can integrate each part successfully to deliver genuinely connected cars.

About Orange Business

With more than ten years of experience working with industry leaders, Orange Business is uniquely positioned to support traditional and newer OEMs in developing and deploying new business models. We have the ability to help them connect, store, analyze, learn and secure every aspect of the automotive future. In short, to realize their connected car ambitions.

The Orange Group companies, including Orange Cyberdefense, Ocean Fleet Management, and Fluxvision, give us access to the knowledge and skills of experts in the areas covered in this report. Our heritage as one of Europe's leading telecom companies ensures our network coverage is unrivalled. Our 5G rollout gives us a future-proofed backbone to support cutting-edge automotive innovation deployment.

Our global presence not only ensures we can support OEMs in any continent but that we can help them enter new markets.

Put simply, Orange Business is the digital connectivity partner for the automotive sector.

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