KPMG

The future of the car

Who's in the driving seat?

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Contents

"The arrival of the four UK self-driving car pilots, the widespread adoption of automatic emergency braking and Apple Car Play and Android Auto platforms have moved connected and driverless cars from science fiction to reality. KPMG's report on connected and autonomous vehicles lays out the economic benefits of computers taking the wheel. We asked our automotive specialists to describe some of the benefits of a driverless future. Also, with car manufacturers, software companies, insurers, infrastructure developers and central government all invested in developing these vehicles, who is best placed to lead the way, and what might hold them back? "

John Leech
Head of Automotive
KPMG in the UK

What is a perfect driver?

John Leech

Connected cars are set to transform the driving experience in the UK in just a few years. As technology takes over driving from human beings it will dramatically cut traffic congestion, serious accidents and give people back valuable hours in their day.

Premium cars like the BMW X5 and Volvo XC90 already allow you to effectively hand over control to the vehicle in stop-start traffic on the motorway, not only taking your foot off the accelerator but also your hands off the steering wheel. Automatic parking, already a relatively common feature on luxury cars, is starting to filter down to cheaper models. Highway Pilot, a programme that looks after the driving and overtakes by itself on motorways, has already been launched by Tesla and by 2020 Intersection Assistance technology will allow vehicles to navigate junctions with traffic lights by themselves.

The head of Google's self-drive car project has gone further, telling a recent TED conference that he was aiming to develop automated cars soon so that his 11-year-old son would never have to take his driving test: "My team are committed to making sure that doesn't happen," he told delegates[1].

No jam tomorrow

Connected cars could end traffic jams. Today motorway congestion generally occurs because cars bunch together. One car slows down and, because humans overcompensate as they brake, that effect ripples back down the road, leading to a gradual slowdown and eventually ending in a jam. I see vehicle to vehicle communications linked to automatic braking systems eliminating this problem by 2020. In the same timeframe a centralised traffic management system could automatically divert cars away from congestion created by rush hour travel.

Half of all new cars sold today are connected; and by 2022 I believe 100 percent will be. Not only will all cars be connected, but incremental advances in connectivity are moving us steadily towards completely autonomous cars. Sensors and algorithms which respond to external stimuli from signs, other vehicles and the road itself will take the decision making away from the driver.

With technology that processes information many times quicker than any human brain, I envisage a nation of perfectly driven cars around 2050.

Without human error, accidents should be substantially reduced. A car that is programmed to be unable to crash and responds faster than any human, should make the road much safer for all road users. The government has a role to play here, incentivising the uptake of life-saving technology.

A new kind of owner

Autonomous cars will also enable the elderly and disabled gain further independence by removing the requirement for an able-bodied driver. Initially only the privileged few will be able to afford one of these vehicles, but traditional ownership models are also likely to change.

Shared ownership will open up a fresh wave of adoption. Driverless vehicles can shuttle to and from locations autonomously so are far better suited to this approach than cars that require a driver. I suspect we will see the arrival of electric shared-use autonomous vehicles in urban settings by around 2030. That will signal the end of the taxi industry… if Uber hasn't got there first.

Moreover, it will be much easier to link up autonomous vehicles with other forms of public transport, which makes for more cost-effective mobility.

1 http://www.bbc.co.uk/news/technology-31931914

Driverless cars offer benefits for society

Ben Foulser

The widespread adoption of autonomous vehicles on our roads will probably have far more profound implications than many people realise. Here are just a few of the possible benefits to society.

Driverless cars could restore the independence of those unable to drive, such as the elderly or disabled currently prevented from driving. The cost of keeping people in residential homes or hospitals could be massively reduced if driverless cars allowed more people to live independently for longer.

Also autonomous vehicles could help those who live in areas not covered by an integrated transport network and others, who have previously not had access to a car, would benefit from a growth in shared ownership. They would lead to shorter and more predictable journeys by integrating themselves with real-time management of traffic flow and road maintenance. Travellers' time could be used more profitably both economically and personally, increasing productivity for all.

The population would enjoy health benefits from reduced congestion which would also mean less fuel consumption and an improvement in air quality. Most importantly, there would be far fewer accidents with machines rather than fallible humans at the wheel.

Government and industry need to put the necessary common communications and data standards in place as soon as possible given the potential advantages of driverless cars. Governments, at both national and international level, are the only authorities large enough to pull together the car and technology manufacturers, local & metropolitan authorities, agencies and other relevant national and international bodies.

Given the potential advantages of driverless cars, I would argue government and industry need to put the necessary standards in place as soon as possible. To truly reap the benefits of a driverless future we need to not only build a strong base for investment now but also be absolutely clear what we are creating and how it will work.

Connected and driverless cars:
the benefits to business

John Leech

Companies that can benefit from digitally connected consumers will be particularly well placed to take advantage of these changes in the transport network.

Media and advertising are already heavily consumed in digital formats. Retail is growing rapidly online. Businesses will have opportunities to reach out to consumers with advertising tailored to local services and facilities.

Autonomous and connected cars will produce large amounts of data which will be of interest to a number of businesses. Car manufacturers own the data but currently are not sharing or making use of it. I see this changing as consumers opt-in to data sharing.

Car or sleep pod?

Allowing the car to take the strain will also allow consumers to be digitally connected for greater stretches of time on smartphones and tablets, not only when we are on the bus or the sofa. Businesses need to make sure they are digitally prepared for this opportunity.

The advent of autonomous cars has further potential to radically change the way we use our time. Freed from the demands of driving, we can use our cars as mobile workplaces, movie theatres or even relaxation booths. Its advent could trigger a move towards rural living, with people happy to live further from work.

"Both car manufacturers and tech companies, using very different approaches, are developing driverless cars. With different stakeholders vying for their share of the market, who is best placed to take the lead?"

Winners… and losers

However, any technological advance brings disruption, and autonomous vehicles are no exception. Insurers may benefit from more data but there will also be far fewer accidents so their business will shrink. Independent repair shops may well face pressure as the cars remotely communicate with their manufacturers and franchised dealers when they require servicing (and crash less). Delivery drivers will suffer as well.

All that said, the benefits of the autonomous car revolution are so large I think we need to tolerate a certain amount of disruption. A world where we are all at liberty to travel more safely is a price worth paying.

UK can lead our driverless car future

Mukarram Bhaiji

Established carmakers face huge disruption from technology companies with the development of autonomous cars. But what is a threat to them could be an opportunity for the UK.

I co-authored KPMG's recent report for the Society of Motor Manufacturers & Traders, which lays out the potential rewards of connected and driverless cars for the UK, including the creation of 30,000 new jobs in manufacturing, design and technology.

The rewards from their development could be worth as much as £51 billion to the British economy by 2030. By being the first to trial how the connective systems actually work in real time, the UK could set the standards and develop the technology that others adopt around the world.

Britain's talent base

The UK already has a mass of technological, creative and design talent with premium brands such as Aston Martin, Jaguar Land Rover as well as over two thirds of Formula 1 teams based here. In addition to the talent base, the creation of 'Smart Cities' means the government is already marking out areas of the UK where manufacturers can actively trial driverless cars and see how they interact with their environment and each other.

Britain has a more favourable legal framework for testing and development than other countries. Already major manufacturers are looking to the UK as a test ground for their vehicles. Because it never ratified the 1968 Vienna Convention on road traffic, the UK is the only European country that already allows driverless cars on its roads. When you add world-class testing facilities, such as the Motor Industry Research Association (MIRA), the UK has an even greater advantage.

This is not to say that the UK will become a vehicle-manufacturing powerhouse. While vehicle production in the UK is expected to increase by a quarter from current levels, the macro trend of shifting of mass production to lower-cost economies will not reverse.

Rather, it is in the development of user models, infrastructure design and installing the communications systems for driverless and connected cars where the UK can lead the world.

Carmakers must rethink the customer relationship

It is in the user models that the car manufacturers need to look for their future role too. Obviously, it will take time to move towards autonomous vehicles, but rather than continuing to develop connectivity as an add-on to improve safety, I would suggest the car manufacturers need to radically rethink their relationship with the consumer. In a world where people will be more interested in the operating systems and apps that are available within a vehicle than its performance or mechanics, people will pay for a premium journey experience, not a premium driving experience.

Carmakers can respond by moving beyond the hardware production. Consumers are less likely to own vehicles in the future and instead book journeys door to door using connected cars, trains, planes or trams. Car manufacturers may well find a role leasing their vehicles as part of a connected journey. Already the more-premium manufacturers are moving in this direction. DriveNow, BMW's pay-as-you-go club, is already the biggest car sharing scheme in Germany and expanded into London last year.

The traditional car manufacturers face disruption, but not defeat by the tech interlopers. The large technology companies are well equipped to deliver apps and operating systems, but I suspect that it does not make economic sense for them to shift to becoming car manufacturers. I would see the Google car as a vehicle to test Google's in-car operating system.

Instead, I see the future as one of partnerships. The most progressive car manufacturers are already moving to link up with technology specialists who will bring the connective and interactive element to their future vehicles. The challenge is designing a new way to share revenues between the tech companies who bring the software, the car manufacturers supplying hardware, and operators providing the roads and communications infrastructure needed to run autonomous vehicles. How that is resolved remains uncertain but in the meantime, car manufacturers must future-proof themselves. It is clear that without the right partners, they risk being left for dust.

Do tech firms hold pole position in race to develop driverless cars?

Murray Raisbeck

Tech companies, software suppliers and the big car companies are mustering their forces for an assault on the connected and autonomous vehicle market. As cars change from mechanical miracles to wonders of technology, I believe the tech firms hold an edge over carmakers.

Tech firms have a history of disrupting an existing marketplace and overtaking the traditional manufacturers. Who would have thought a small computer manufacturer would overturn Nokia's dominance of the mobile phone market in the 1990s? Yet that is exactly what Apple did. Now technology companies are unleashing a new wave of creativity.

Software advantage

Their chief advantage in the driverless car market derives from their software. It is this element, above all others, that makes a car driverless and the tech firms have more technical ability, programming skills and understanding than any other sector to put a computer behind the wheel. We have already seen Google trialling a driverless car in California and many commentators believe that Apple is not far behind.

Traditional car manufacturers know they must respond to a major threat to their market. A recent KPMG report indicated that by 2030 all new cars on the road would have some element of connectivity, and a quarter would be fully autonomous. Yet the carmakers are a step behind tech companies before they even begin. Despite snapping up skills from Silicon Valley, carmakers have old supply chains and a way of approaching development that will be difficult to shake. As a result, they are forced to adapt their existing vehicles to include a driverless component, rather than having a free hand to create.

By contrast, tech companies can be much more agile and start from scratch on greenfield sites. They also have much greater cash reserves for investment. It may be that consumers are more comfortable with an Apple or Google autonomous car than one by Ford or Volvo, since the quality of the software is the key to safety.

Established carmakers have to innovate while still developing and producing conventional vehicles. That will require significant extra investment for years, perhaps decades, to come and so strain balance sheets further.

Already customers

Tech firms have the upper hand in terms of the operating systems for driverless cars too. We are already seeing the convergence of multiple applications into handheld devices and people will want to be able to use their existing smartphone or tablet to communicate with their cars.

Consumers will also want to use their own, familiar technology to fulfil the real promise of driverless vehicles: the time to shop online, work, watch films or video with friends. Since most people already use the Android or iOS operating systems, car manufacturers will struggle to compete with their own versions.

It is undoubtedly true that the car manufacturers will have lessons for the tech companies to take on board about vehicle safety gained from their experience. Collaboration is essential for the creation of these futuristic vehicles. It will happen more effectively if each stakeholder sticks to their area of expertise. Software development and by extension innovation belongs to the tech companies.

Carmakers, tech firms, infrastructure operators, government, insurers and others will all have to work together to get driverless cars on to the roads. Insurance companies will need to adapt their policies, moving from insuring drivers to elements of the software, manufacturing process or against cyber-attack. Government will need to set standards and ensure effective communication between vehicles and infrastructure operators. Car manufacturers want to take the lead but it makes more sense for the tech firms to take control of innovation.

What is the role of the telco?

Chris Woodland

Telecoms operators have long been fascinated by the prospect of selling more connections to 'machines' as a new market to augment their installed base of connections/handsets to humans.

Attracted by new subscriptions and a chance to beam entertainment, information and other high bandwidth video/film content to cars and fleets, many telcos already participate in the value chain of the connected car.

KPMG believes that today connectivity providers capture around 15% of the spend on the telematics-focused value chain. Telematics Service Providers (TSPs) and Applications/content players take nearly half of retail revenue. AT&T is working with Nissan and General Motors, for example, to supply wireless communications and entertainment services in-car.

Telcos can extend their presence and enter the TSP market, offering wider services to end-users – Usage Based Insurance (UBI) for instance is an attractive area, as well as more consumer-focused video and music-based services beamed into cars to handsets, back-of-seat screens, or the dashboard.

Perception

There is currently a real difference in how car manufacturers perceive a telco partner, when compared to an Internet-based major like a Google or Apple into their car.

Being part of the Car Area Network (CAN) through enabling security and safety and other sensor-based services is the key route in for telcos, with manufacturers having an established, accredited ecoystem to support their brands.

There is likely more resistance to letting an Internet giant into the CAN – impacting the current environment of hardware and software relating to safety, as well as the core manufacturing business as whole.

Telco providers have an 'in' to the ecosystem of the services offered by each car brand by virtue of the inclusion of security systems, telematics services and other sensor-based devices in the trusted CAN. Their offerings become an integral part of what each car brand offers to their customers.

Telcos can buy into this market - think Vodafone's recent acquisition of Cobra Telematics or Verizon's acquisition of Hughes – and build new services which can benefit the manufacturer and driver.

Connected cars will require access to operators' low-latency 4G and emerging 5G standards for safe direction, insurance and wider services – both for private owners and fleet managers. This will be required using licensed and unlicensed spectrum – both of which are allocated across different markets according to a range of market and public policy actors.

How Internet-based players make in-roads and where today's manufacturers move their valuable brands is yet to be determined. Working with telecoms operators in range of partnership models will be critical either way.

KPMG's report on autonomous vehicles indicates that all new cars will have some aspects of connectivity built in within the next 15 years. Given that much of the technology is already available, what is holding back the development of the connected vehicle market?

Telematics – is there a privacy problem?

Ellie Barlow

Drivers have been slow to warm to the connectivity offered by telematics, despite insurers best efforts to push its take-up. Drivers dislike the idea of being monitored and are distrustful of what insurers might do with the data.

It is difficult, given this feeling of mistrust, to reassure customers that telematics won't punish them for slightly exceeding their declared mileage or having an accident after going to the pub, even if they were drinking orange juice. The government has a role to play here in clarifying how people's data might be used if they have committed an infraction.

Many insurers have trumpeted the advantages of location-based services available via GPS in telematics but these offer nothing new to consumers. Alerts from local garages offering cheap petrol or nearby points of interest have been available on mobile phones for years. While telematics offer the driver information about maintenance, efficient usage and the ability to alert the emergency services about a serious impact, by themselves these benefits are unlikely to overcome the resistance of the privacy conscious.

Carmakers can tempt drivers

For all these reasons, insurers have parked mass market telematics in the 'too difficult' box. Although the development of connected and driverless cars has reignited their interest, they are still not the best placed to drive their adoption.

Car manufacturers can bundle digital infotainment channels streamed to the kids in the back, top of the range audio receivers in the front or in-car communication systems to add another dimension to incentives about fuel economy and getting the insurance details right. This combined package goes some way to reducing consumer anxiety around allowing their movements to be monitored.

It is unclear exactly what customers will demand in exchange for their data; whether that be a connected audio system or a price incentive. This value exchange is currently being explored and will form the bedrock of any connected data proposals to consumers in the near future. Until consumers can place a tangible benefit on handing over their data, the use of telematics may well falter.

Although the Alliance of Automobile Manufacturers have signed up to a voluntary code not to share the data gained from connected cars, manufacturers will be able to use it in-house to help with their own product development, including driverless cars.

It is certainly not just insurers who can gain hugely from the data gathered through telematics. The data on traffic flow, people's journey patterns and physical movement around the UK could help with planning around where to add additional motorway lanes, or provide public transport. The resistance to data sharing needs to be overcome to unlock these benefits.

"Many insurers have trumpeted the advantages of location-based services available via GPS in telematics but these offer nothing new to consumers."

How will the UK set rules to fulfil connected car ambition?

Ben Foulser

The government's recent naming of three Smart Cities to help develop connected and driverless cars and the associated £9 million investment represents a fantastic opportunity for UK plc. This is a welcome and promising start; however, without further intervention there is a significant risk that this initiative will not deliver to its full potential.

Completely free development could result in incompatibility, putting at risk the potential economic and social benefits that should be delivered by an autonomous transport system. Failure to articulate a unifying standards framework will increase uncertainty amongst suppliers and could discourage innovation and investment. Government must find the right balance between over and under-legislating.

Autonomous vehicles won't work if their technology doesn't match up with infrastructure developments such as connected car parks and traffic management systems. Setting standards that will provide a base from which to develop all smart and connected infrastructure with the ongoing development of connected vehicles would be an invaluable first step.

Driverless cars could deliver significant benefits to society and the economy but before they do, government and industry must overcome a number of barriers.

Bring agencies together

First, there needs to be significant investment in infrastructure. Initially this will mean working with mobile operators to deploy 4G to create better communication in and between cars and to revisit the roadmaps for the rollout of the Highways England traffic management systems. We also need better road layout and better road design, particularly during the transition phase where both driven and driverless cars are sharing the road.

There is no coherence in investment across Highways England, Local and Metropolitan Transportation Authority agencies such as Transport for London. Only the government has the authority to bring these big agencies together to create a consistent approach.

Second, the government has a role to play in stimulating public demand for the technology. Although it's unlikely in the short-term, we may reach a tipping point where it makes sense for the government to encourage driverless car uptake via scrappage allowances or other similar incentives to speed up the move towards autonomous vehicles. Furthermore, while connected cars are a step towards driverless vehicles, even if the car is 'driving', the driver remains liable and legally in control of the vehicle. In the future, with a completely autonomous vehicle, who or what would be liable in the event of an accident? If it is still the driver, would they need a driving licence and the ability to control the vehicle? If it's not, is it the car manufacturer? The software manufacturer? The map providers? The contractors supporting the highways infrastructure? Until this issue is clarified and resolved many of the benefits of autonomous cars will not become a reality.

Third, there is a potential stumbling block around the creation, storage and use of personal data. Some flexibility around data sharing will be required to reap the benefits of autonomous vehicles. We all recognise that we are traceable already via mobile phones and many people already share vast quantities of personal data via social networking sites and social media.

The Price of Privacy

People are prepared to trade in privacy in return for services, like in-car monitoring leading to lower insurance premiums and future sharing of location and driving conditions to enable better traffic management; however the extent of this privacy versus benefit trade-off has yet to be fully tested. Regardless, I do think the carmakers will need to put in place data security measures, as well as having shared data protocols so that connected cars and Smart Cities can all talk to each other securely.

Developing a single set of development standards will be complex at first but, ultimately, no more difficult than creating health and safety, or building, standards. Once some of these issues have been resolved we can start to realise the promise of driverless cars.

Liability – who is to blame?

Murray Raisbeck

The motor insurance market faces huge disruption with the development of autonomous vehicles. As software and sensors increasingly take control, liability in the event of an accident shifts from driver to maker of the car and the systems steering it.

But is it really that straightforward? Except in obvious instances of manufacturing fault, such as the 2012 Toyota sticky accelerator pedal case, will it be the driver or the systems who are liable? If a human being is still literally 'in the driving seat' but not controlling the vehicle, who or what is to blame?

Technology may provide part of the solution through improved monitoring of both the car and 'driver'. We could also see the emergence of specialist niche companies to manage claims attribution. They would determine whether the logic, or manufacturer, of the autonomous vehicle itself caused an accident, or if it was a result of bad data or information sources.

Undoubtedly, there will be incidences in which drivers retain liability, for example, if the car is not effectively maintained or systems updated. So what happens if the car is not on its latest update when its driver ploughs into a bus queue? How is this liability to be priced into insurance?

Then there are questions around operating parameters. In a vehicle with multiple occupants, does somebody need to nominate him or herself as the driver? How does this issue sit with the anticipated benefit of opening up transport to the elderly or disabled who would not otherwise be able to 'drive'? Do they have to pay a higher premium because of their reduced capability?

> "As software and sensors increasingly take control, liability in the event of an accident shifts from driver to maker of the car and the systems steering it."

Bad part of town

There are issues around the relative risk of different routes or areas. Would the car itself warn the driver they are increasing their liability, or charge extra for making that journey? Perhaps the car would refuse to move until the requisite insurance was in place. But what happens in an emergency?

The benefits of automating driving are so compelling that we have to address the liability question early in the evolution of autonomous vehicles. The general principle of liability shifting from the human to the machine as it assumes control is sound, but it is never going to be entirely straightforward.

Manufacturers operate globally and many liability issues will require a global consensus. While we would prefer to answer all these questions rather than merely pose them, the insurance industry and legislators around the world need to precisely define exactly what "liability" means.

"We know that people's personal data is most exposed while it exists in the Cloud or on public networks where processing is performed extensively by third parties."

A deadly development? The cyber threat in autonomous vehicles

Jano Bermudes

Hackers and developers are locked in a perpetual duel. One lunging forward; the other trying to parry the blow. It is a fight that is moving into the automotive domain as cars become more connected and technologically advanced. Adopting appropriate controls alongside the technology is essential to protect drivers of the future from cyber threats.

Greater connectivity gives hackers more targets to attack. Jammers can disrupt wireless or Bluetooth networks today, but only in a small area. Connected cars will interact with the road, other vehicles, and road-signs over a 4G network, which opens them up to a cyber-attack from a remote internet platform. While this could give rise to scenarios that are a Hollywood scriptwriter's dream, the reality is that the theft of data is a greater motive for hackers than mass disruption or carnage.

Once the public is convinced the technology is safe, fears around privacy and the unauthorised access to users' personal information is likely to be the greatest barrier to adoption. This could range from location services data being logged for insurance purposes to theft of account and payment information similar to the prolific attacks on large retail networks such as Target, Tesco's and Sony.

The industry can overcome the challenge but it does require careful management. Telecoms companies are already looking to provide extra levels of security. We know that people's personal data is most exposed while it exists in the Cloud or on public networks where processing is performed extensively by third parties. So providing effective security in the supply chain for example, could prove to be a differentiator when carmakers are choosing between IT suppliers to partner with or in marketing these services to consumers.

We also need the right rules and regulations. Any new technology that becomes mainstream needs to exist in a legal and regulatory framework. This is especially true where public safety is concerned. But this framework does not currently exist. In an ideal world, government regulation would head off any security issues, but experience teaches us that regulatory controls and guidance are more likely to come in reaction to an incident than as a far-sighted and proactive measure.

Learning past lessons

Manufacturers and software developers also need to learn security lessons from the past. They should take on board the example of insecure web browsers and unpatched vendor software causing untold business impact as more and more businesses have gone online opening the door to hackers.

Designing security into products from the start and developing adequate layered defences should help prevent or at least limit unauthorised access to data. As in the aviation industry, safety functions such as braking or steering will have to be based on consistent and universal standards and should be separated from other connected features – effectively unplugging them from the internet.

While none of this may reassure a nervous public, it is worth stressing one important point: whatever the cyber threat, it will still be safer to let the car drive itself than let a human behind the wheel. The safety record of semi-autonomous trains and aeroplanes have already proved the case.

Road vehicles are far from unique in their vulnerability to cyber attack. A whole raft of industrial operations, IT environments and other consumer devices are potential targets. That does not mean we should not use them, but rather we must be aware of the dangers posed and remain vigilant in protecting ourselves.
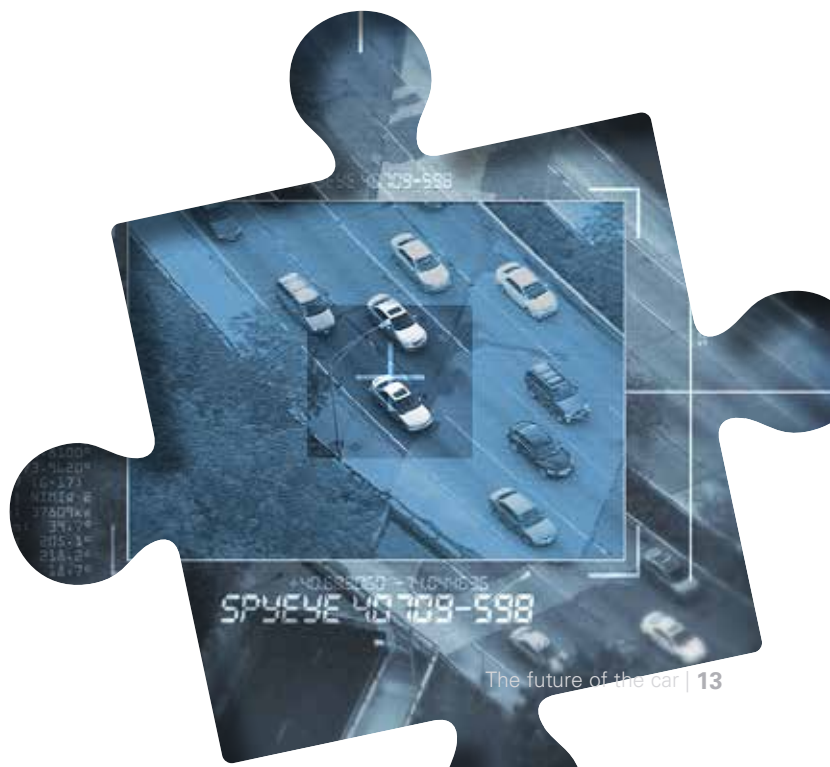
What is the distance between possibility and reality for the future car?

Simon Cook | System Driving

Driverless cars are set to remain science fiction, at least for the immediate future. The trail left by failed tech start-ups shows us that technical possibility is not the same as consumer demand. My experience as a police driver and an advanced driving trainer leads me to believe that the proponents of driverless vehicles ignore what drivers really want.

Computer-designed junctions, airbags and ABS installation in vehicles have led to road deaths halving from 3,409 in 2000 to 1,713 in 2013. Greater connectivity can continue this trend, with telemetry assisting in implementing regulations. For example, cars could be unable to travel beyond the speed limit or transgressions could be logged triggering automatic fines. Police drivers would welcome the ability to control other vehicles.

Connectivity in the name of safety is uncontroversial. But the idea of handing over control entirely to a computer is alarming, particularly to people of my generation. Younger drivers may embrace the technology but the rest of us will need convincing of the safety of autonomous systems. Particularly when we are faced with daily stories of computer glitches, data loss and cyber crime.

Leaving aside the safety concerns, autonomous cars would not be much fun to drive. Millions of people love motoring. The popularity of Formula 1, Nascar and World Rally all reflect this. Many drivers will not forego the opportunity to "jump the traffic queue" when running late.

Admittedly, I can see an argument for autonomous vehicles in dense urban areas. Inching down cramped city roads can be joyless but this is not the reality of driving for much of the UK.

Connectivity in cars will continue to develop, but I question the timeframe of adoption suggested by some enthusiasts. Even the most straightforward technology will take decades to filter through the market. ABS, for example, was first installed in premium cars in the early 1970s but an EU law ensuring all new passenger cars are equipped with it was only passed in 2007.

Driver training will have to adapt to changes in technology as new systems and processes are involved but the pace of change is slow here too. The newly merged Driving Standards Agency (DSA) and Vehicle Operating Standards Agency (VOSA) are remodelling the driving test to include the use of SatNavs in two or three years. But SatNav was invented in 1981 and has been widely available in the UK since the mid-1990s.

The idea that politicians will rush in new legislation to facilitate the use of autonomous vehicles in the UK is also out of step with reality. I can remember when I was a traffic officer in 1985 there was talk about tailgate and middle-lane driving legislation. These laws did come into existence – eighteen years later, in 2013.

Driverless cars have the appeal of futurist technology but the realities of legislative and driving standards change mean there is some distance between the possible and the actual for the immediate future. New drivers are going to need to learn the basics and take control for some time to come.

system driving

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Why does China demand a 'when in Beijing' mentality?

Huu-Hoi Tran | KPMG in China

China's car market represents a huge opportunity for global car manufacturers, thanks to unrivalled population growth and a strong consumer appetite for new technologies. However, in order to succeed, I think foreign companies will have to take a 'when in Rome' – or indeed Beijing approach and form partnerships with Chinese IT companies to develop country-specific technologies.

Many of the biggest Western technology companies have a limited presence in China. Baidu and Haosou are the search engines of choice, not Google which has only a 1.7% share[1] of the local market. The home-grown technology players and internet services companies' unique knowledge of China's many distinct provinces has already led to working relationships with foreign car makers.

Volkswagen, General Motors, Hyundai and Audi are now all selling vehicles with Baidu's in-car infotainment systems[2]. The Chinese search engine's superior map coverage will be an important asset, especially as inbuilt satellite navigation with apps and voice or gesture-led controls become more common.

The Chinese are typically early adopters of new technologies as proved by phenomenal penetration rates in mobile internet and smartphone usage over the past few years. Tech-savvy consumers expect the integration of their connected world into the car connectivity. This will open up huge potential for platform providers as well as innovative IT start-ups to provide disruptive solutions that can enrich consumers' connected life.

The more open attitude towards data sharing in China – unlike the west – will allow manufacturers to create new revenue streams, such as in-car software packages, pay-by-demand infotainment services and other customer insights that might be valuable for other service providers. Being the master over this data will be especially important, as it will keep consumers locked in to the car brand and future product offerings.

Revenue streams

These revenue streams will become increasingly important. Better connectivity provides an enhanced ability to co-ordinate established trends such as car-sharing and pooling schemes, which make better use of space in densely populated areas. As urbanisation grows and the Chinese economy and car sales experience slower growth, I believe that customer data could become more lucrative than selling vehicles.

Foreign carmakers must recognise these trends in order to continue to succeed in the Chinese market. After all, local car brands have enjoyed $700 million of government subsidies[3] and will find it easier to collaborate with other Chinese software firms. Manufacturers will need to continually reassess their IT strategy and build up their capability to manage new technologies. They will also need to strengthen R&D collaboration with their Tier 1 and 2 suppliers and focus more on using data and analytics to anticipate trends and disruptive developments. If they can adopt a "when in Beijing" philosophy for the Chinese market, carmakers can build on their strong brand credibility to succeed as the future of the car is revealed.

1 http://gs.statcounter.com/#search_engine-CN-quarterly-200803-201502
2 http://www.valuewalk.com/2015/01/baidu-teams-up-with-hyundai-to-launch-connected-cars/
3 http://www.wsj.com/articles/SB10001424052702304422704579571863054872766

A creeping technology

John Leech

The UK's driverless car pilot schemes may have attracted the headlines, but many other aspects of automated driving have already inched out quietly onto our roads. Sensors that alert us to nearby objects have been around for well over a decade. Several of today's vehicles offer hands-free parallel parking, while others have introduced traffic jam assistance and adaptive cruise control, where the car controls your speed, braking, and, in some cases, your steering. Dramatic TV adverts demonstrate cars screeching to a halt thanks to automated braking.

More advanced intersection controls are on the way, enabling cars to sense road signs, traffic lights and approaching vehicles from any direction, and adjust speed accordingly.

The technology is in place for many aspects of a fully autonomous vehicle, and we're now seeing real life testing. Volvo has announced that its Drive Me trial, involving 100 autonomous vehicles operated by regular commuters in Gothenburg, will be completed by 2017, and electric carmaker Tesla will release an over the air upgrade enabling its cars to autosteer on the motorway in the next few months.

In the commercial sector, a number of countries are testing 'platoons' of driverless trucks in convoy formation, travelling at the same speed, which could ultimately generate huge manpower savings for haulage companies.

> "Whereas in the past, car owners were attracted by speed, performance and luxury, tomorrow's owner/passenger — who, after all, will not be doing so much driving — may be more interested in the tech specs such as fast broadband and in-car entertainment."

Safer, cheaper and more efficient

Of all the potential benefits from driverless cars, perhaps the greatest is a reduction in accidents and associated fatalities and injuries. According to the most recent World Health Organization figures, around 1.25 million people a year die as a result of road accidents worldwide, with millions more injured. Most collisions are caused by human error, but an automated vehicle won't fall asleep, lose concentration or fail to spot that small child crossing the street.

Freed from the need to drive, workers become productive passengers able to phone, email or work on the laptop, while those with more time on their hands can read, surf, watch their favourite film, listen to music or chat with friends. Social inclusion would also increase, opening up cars to the blind, disabled or elderly.

With a car of your choice just a click away, ownership levels may dramatically reduce, ushering in an era of sharing or renting. Rather than sitting in driveways or parking lots, cars could become roving taxis ready to transport anyone to any place at any time, with potential 24/7 utilisation. Such efficient usage would cut the number of vehicles and, therefore, reduce congestion and air pollution.

The combination of automated driving and connectivity will bring some incredible transformations. By connecting all vehicles to a grid, centralised traffic management will control flows and minimise jams, provide instant diversions in the event of accidents or road works, and release lanes to let emergency services pass through.

Connected cars could also become an extension of your home and office, acting as personal organisers that can sync with your diary to schedule appointments, and inform clients and friends of your whereabouts. Any concerns over sharing a vehicle could be partly allayed by instant personalisation for each passenger, such as screen shots of your family, and all your favourite music instantly available.

Legal and insurance challenges

One of the big questions to be resolved is liability in event of a crash. A new legal framework will be needed, including a revamping of the entire insurance underwriting process, with liability shifting from individual car owners/users to manufacturers, software suppliers and possibly even to those running the roads or managing the traffic.

Consumers should be the main beneficiaries, with premiums coming down, especially as accidents will be far less frequent. Cars fitted with automatic emergency braking already entitle the policyholder to a cheaper policy, and the improvements in safety have led to calls to install this technology as standard on all new vehicles.

The future for automakers

Although manufacturers are all taking part in the race for automation and connectivity, the destination is highly uncertain. Should autonomous car sharing take off in a big way, then consumers may want a choice of different brands, putting greater power in the hands of the rental/car share companies.

Mobility solutions, where a single provider meets all your transport needs, raise further questions over the position of the car in society. If a simple smartphone app can connect you to an integrated transport service covering road, rail, air and sea, then the (driverless) car is in danger of becoming just another, generic stage in the journey, rather than a cherished personal possession.

There is also no clear, dominant partner in the marriage between the technology and automotive industries. Whereas in the past, car owners were attracted by speed, performance and luxury, tomorrow's owner/passenger – who, after all, will not be doing so much driving – may be more interested in the tech specs such as fast broadband and in-car entertainment. It is quite possible that today's premium brands become mere vessels for the likes of Apple and Google.

As vehicles become more and more reliant on software, cyber security raises its ugly head. The recent case of hackers accessing the Jeep Renegade's steering and braking systems forced a major product recall. Sadly, this will not be an isolated incident, and manufacturers face a constant battle to stay one step ahead of criminals and pranksters. Data security and privacy is another concern, both in terms of the personal information stored, and the constant tracking of the vehicle's location.

Like many new technologies, autonomous driving tends to emerge initially in premium brands. With the UK home to many upmarket marques such as Jaguar Land Rover, Mini, Rolls Royce, Bentley, Aston Martin and McLaren, it is not unfeasible to imagine these companies spearheading innovation in this field. Add to this the fact that the UK is currently the only country that allows testing of driverless cars on public roads nationwide, and there is a golden opportunity for Britain to punch above its weight and become a global pioneer for autonomy.

Caution

Despite the apparent, relentless march towards automation, consumer acceptance of such vehicles is by no means guaranteed. Accidents can, and will, happen, due to technical glitches or malicious hacking, and the way that the industry responds will play a major part in determining the future for driverless cars. The story of GM crops is a sobering reminder that a technology favoured by scientists and economists can fall by the wayside in the face of damaging PR and public scepticism.

If society is to enjoy the safety, convenience and efficiencies that autonomous driving can bring, then automakers, technology firms, government, regulators and consumer groups need to produce measured responses to accidents and cyber crime, and keep in mind the huge benefits of this exciting technological development.
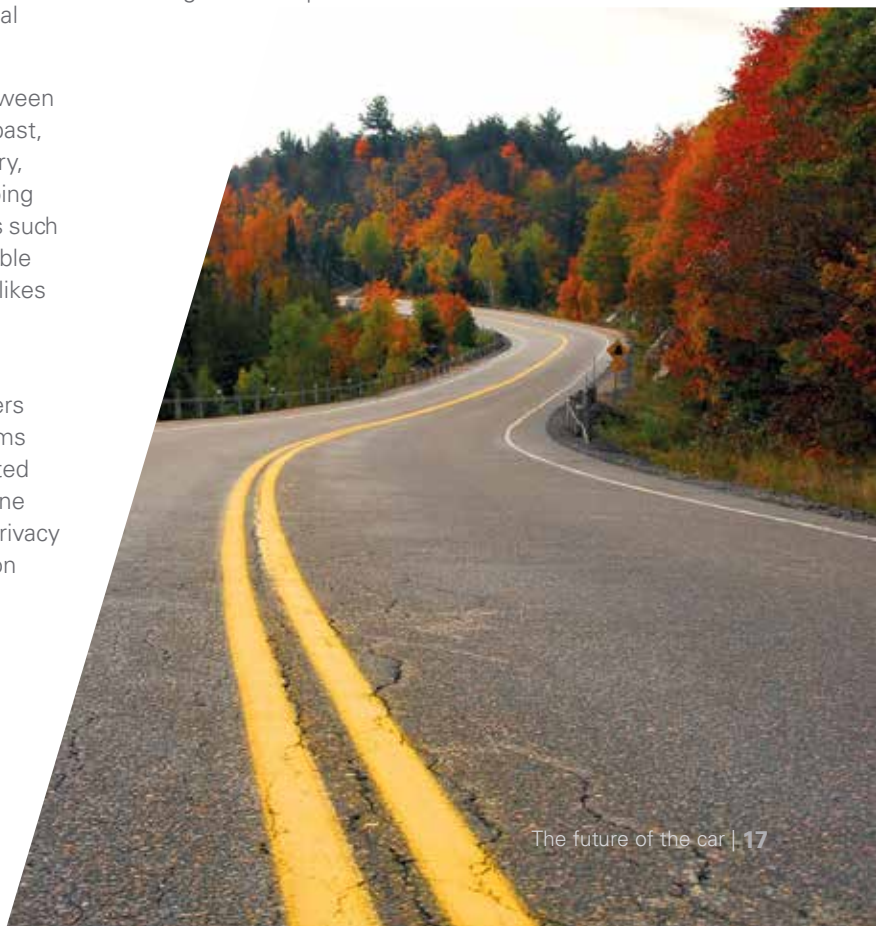
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