



GAD Comment

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Self-Driving Cars

Once just viewed as part of science fiction, self-driving cars, perhaps more correctly referred to as connected and autonomous vehicles (CAVs), are already here in various forms. Connected vehicles are those which are able to communicate with their surroundings providing information on road, traffic and weather conditions. The next level is automation where the vehicle uses its connection to assist the driver, examples include autonomous emergency braking, adaptive cruise control and park assist. Testing is now also well under way for vehicles that take full control from start to finish – fully autonomous vehicles.

The vast majority of road accidents relate to human error and reducing such accidents is projected to contribute £2 billion of savings to the economy by 2030. The total projected economic benefits from all sources are in excess of £51 billion. These figures highlight the importance of developing this technology. This paper summarises some of the major issues and opportunities that the shift towards CAVs poses for government, the insurance industry and the wider economy.

Regulation

At present the law specifies that the driver of the car (an identifiable individual) has responsibility for the car and must remain in control of it. Aids are possible but the car may not change lane; current technology is already capable of more than is permitted by the law.

The Department for Transport reviewed existing legislation and reported on this in their 2015 paper [The Pathway to Driverless Cars](#). The main conclusion was that the existing regulation was not a barrier to testing automation on public roads provided there was a human test driver, responsible for the safety of the car, who was alert and ready to take over control at all times. A code of practice was issued regarding the conditions for testing which specified amongst other things the continued requirement for insurance as per existing law.

The government's consultation [Pathway to Driverless Cars: Proposals to support advanced driver assistance systems and automated vehicle technologies](#) ran from July to September 2016. The overall view was that a step by step pragmatic approach to law changes should be taken rather than major changes in one go to enable adaption to the actual advances in technology that occur.

DfT proposed revisions to the Highway Code to enable remote control parking, motorway piloting and HGV platooning. There was also a proposal to include CAVs in the compulsory motor insurance framework by establishing a model where the insurer would cover both the driver's use of the vehicle and the CAV's technology.

These measures were set out in the [Vehicle Technology and Aviation Bill](#) which had reached committee stage before Parliament dissolved in June 2017. The Queen's Speech following the general election in June 2017 confirmed that the planned measures will now be taken forward as part of an Automated and Electric Vehicles Bill. The House of Commons issued a briefing paper, [Connected and Autonomous Road Vehicles](#), in June 2017.

Infrastructure

One of the most important considerations before the technology develops further is the impact on infrastructure.

At present the road network is designed to accommodate the existing 'driven' transport. The combined effects of road traffic accidents, weather-related damage and seemingly ever increasing traffic volumes continue to make both repairs and design/expansion of the existing infrastructure a significant challenge for both government and users.

At present the technology is developing to operate in an integrated manner with existing transport solutions; even on this basis once the majority of road transport is provided via CAVs it seems likely that vehicles will move more efficiently, closer together and without the same impact on the road surface. It is also suggested that CAVs (especially in the case of pool cars) would be set up to automatically choose the best route and link in with the local plans for traffic movement.

This will have implications for all aspects of the infrastructure, including the layout, the road surface and signalling. CAVs would require markings, signals and signs to be maintained to a higher standard than at present to make sure the instructions can be followed. Also there would be a greater need to maintain road surfaces as CAVs may be less able to adapt to potholes, a particular risk with platoons where vehicles travel much closer to each other than at present.

The RAC Foundation covered many of these points in their April 2017 report [Readiness of the road network for connected and autonomous vehicles](#). They conclude that the biggest challenges will be where there is mixed use between existing vehicles.

The report notes that a number of policy considerations arise, including:

- whether or not to separate CAVs from non-CAV traffic
- whether to regulate the minimum level of automation that a vehicle must have, and the speed of transition to the minimum level
- the degree of personal choice which should be allowed to drivers regarding whether to turn off some or all of the automated features on their vehicles
- the degree to which CAVs' systems are standardised or harmonised across countries

In order for the full benefits that CAVs could offer to be achieved, detailed modelling and analysis will be the key to making the correct decisions.

Town planning

The design of towns and cities will change. At present these are laid out to facilitate (to a greater or lesser extent) easy parking. However if vehicles are able to drop their occupants off and go away to self-park there could be significant implications for town and city planning.

It will be necessary to make sure that there is enough available parking reasonably close by, otherwise there is a risk that CAVs could drive themselves around towns after dropping off their occupants and cause an even more clogged up road network.

This raises a further consideration for local authorities. At present they receive income from car parks they own and from fines for parking offences. The first of these could be reduced under an out of town parking site; however, there could be potential benefits from putting the land to alternative use. In theory at least, parking fines should become non-existent under a system of full CAVs.

Insurance

A lot of the debate within actuarial circles has also centred around the complicated issue of responsibility and its impact on insurance. DfT has addressed the short term situation to make sure that development and testing of CAVs can go ahead.

There will now need to be a gradual shift from the current position where the driver has legal (and actual) responsibility through various stages of complexity as the level of automation in common use develops.

The Automated and Electric Vehicles (AEV) Bill, announced in the Queen's Speech earlier this year, is expected to contain provisions on automated vehicles that will be:

- amending and supplementing the provisions in the Road Traffic Act, making it compulsory for users of automated vehicles (AVs) to have insurance that covers the technical failure of the AV technology, with the Secretary of State maintaining a list of the vehicles or types of vehicles that are automated vehicles
- placing a 'first instance' liability on insurers, or the Crown and public sector if self-insuring, so that victims of collisions caused by AVs get compensation quickly, and easily, in line with longstanding UK insurance practice
- requiring compulsory insurance cover that includes 'drivers' in AVs who are legitimately disengaged from the driving task

Over time there will be a fundamental change from a responsible named driver having responsibility to a situation where the manufacturer will be held accountable. Indeed some of the largest manufacturers have already indicated that they are so confident in their technology that they will accept the liability. However, this may be bad news for independent garage owners, with manufacturers set to insist all services and repairs must be provided by their own garages.

During the transition, however, the question of responsibility will be difficult to answer.

As well as the complex legal issues (particularly during the transition from one world to another) examined in depth in the government's July 2016 consultation, which in the main relate to the liability issue mentioned above, there are a number of other issues which will face the insurance industry, notably:

1. Determining the risk

While in theory self-driving cars will be safer than driven cars, when things go wrong the associated claims may be very large. The repair costs of autonomous vehicle technology will exceed current costs of motor repair.

The impact on potential injury or death liability costs are difficult to estimate; however, one major topic being considered is the ability of CAVs to make ethical decisions in order to minimise the number of people injured or killed.

Initially the lack of data will make the actuarial risk assessment tricky. It will undoubtedly have to include significant margins for risk at the outset, which it is speculated may result in some increases to insurance premiums in the short term. However, in the longer term it is expected that costs should go down as a result of fewer incidents and hence the cost of motor insurance may then start to fall.

As technology develops, it may also be that people travel less or more and may see a switch towards or away from public transport. This will also have an impact that is currently difficult to quantify.

Over time the data available from CAVs should give insurers a more comprehensive and detailed picture of risk, enabling the margins to be significantly narrowed. However, before this data is available the skills of actuaries in interpreting limited data will be an important factor.

2. Insurance disputes

During the transition to the technology, the liability issue is likely to play a major part in claims, particularly between incidents involving driven vehicles and those that are autonomous. To settle this, insurers and other parties will need access to vehicle data but manufacturers may have a certain reluctance or may dispute findings. This may result in a number of long and complex legal cases.

The Association of British Insurers (ABI) are calling for a requirement that CAVs capture data that will be made available in the case of an accident. This would cover the 30 seconds before and 15 seconds after an accident and would record items such as the location, if autonomous mode was engaged and if a seatbelt was in use.

The mix of the existing and new technologies will also undoubtedly result in a myriad of unforeseen issues which will keep the government, the insurance market and motor manufacturers busy for many years to come.

3. Types of insurance

The motor insurance market will need to develop. The proposals put forward by DfT would see a single market covering both the driver and the automation of the vehicle. This would cover the situations where drivers choose to retain some control perhaps due to their enjoyment of driving.

The DfT proposals were designed such that the insurance companies are free to develop the products that they best think fit the market. Under a situation where only CAVs operate it is likely that there would be a switch towards product liability insurance covering all aspects of the third party risk.

There will still be a demand for insurance cover for damage to vehicles where the technology is not at fault. Vandalism, theft and windscreen damage are all examples.

There may still remain an element of dispute over who is liable. Where a vehicle manufacturer uses technology provided from a third party, they are likely to dispute who is ultimately responsible.

There will need to be changes to the insurance proposition and if, as is widely expected in the longer term, the level of motor premiums drops there will be a need for insurers to reassess their priority markets. However, to date most insurers are being very supportive of the move towards automation.

4. Evolution of new types of risk

With new technology comes new risk, with hacking providing a threat. If used maliciously claims could be huge, but this could also be small scale, where a hack could simply render a vehicle unusable. This would still be a very real risk to be covered by insurance and would be open to dispute where the latest updates to the system had not been applied. Analysing and developing models to quantify new risks will challenge the insurance industry, and actuaries in particular, over the coming years.

5. Fraud

On the positive side, the availability of the clear data requested by the ABI would vastly reduce the ability to make fraudulent insurance claims, which will be a very positive move forward given the major issue that this is at present.

Cost of road accidents

Statistics for the UK in 2015 equate 86% of accidents to human error. No technology can be 100% fool proof but in a world with only autonomous vehicles this would imply that the majority of these accidents would be eliminated. A report produced by the consultancy firm KPMG in 2015, [Connected and Autonomous Vehicles - The UK Economic Opportunity](#), suggested that by 2030 there would be a £2 billion benefit to the economy from reduced road accidents. A significant amount of this saving would be likely to benefit the NHS.

It would be foolish to conclude that road accidents would be completely eliminated in a world where CAV technology predominated (as evidenced by a recent fatal Tesla crash where neither the driver nor the vehicle noticed the plain white sided van against a bright sky). Nevertheless it seems safe to say that they would fall considerably. Investment is required in detailed modelling to help with the evaluation of the benefits to enable more informed decision making.

Benefits (and costs) to the economy

KPMG's research estimated the potential overall economic benefits to the UK at £51 billion per year by 2030.

There will be many wider issues to consider and here we consider just a few examples.

- Wider access to education, employment and social activities for people who currently have restricted mobility is estimated to provide a benefit of £8 billion
- Environment – CAVs are increasingly likely to be electric, shared use vehicles which may have environmental benefits, and may substantially reduce both noise and particulate pollution in urban areas
- Traffic jams – the average British driver spends 30 hours a year in traffic jams. A significant reduction in this time could boost output for the economy and benefit the environment
- Parking – A report in 2013 showed that the average driver in the UK spends 106 days of their lives looking for parking spots. CAVs might drop people at their destination and then head off to the nearest free parking slot. This would be another boost to leisure and work time
- Motoring offence revenue – At present there is a significant income generated from fines for speeding and drink driving. Under a full system of CAVs this should in theory disappear. However, the loss of these revenue streams should be considered against the potential savings that would be achieved for infrastructure and enforcement

The extent of the benefits will depend on the take up of CAVs within the UK. It is projected that by the mid 2020s the driver may be able to hand over to the vehicle altogether. The rate of transition from the current situation to the entirely autonomous vehicle is an important factor with some concerns over the period of mixed use. A mix of self-driving and driven cars can actually worsen the situation with the impact of traffic delays expected to worsen if only 25% of the vehicles are fully automated. However, significant benefits are expected if this reaches 50%, the actual figures varying with factors such as the quality of driving.

The skill sets of actuaries include the ability to analyse data, evaluate financial risks, and communicate to non-specialists. The limited data and the uncertainties surrounding CAVs is certainly an area which presents actuaries with opportunities

If you would like to discuss any of these issues in more detail or have any questions please email Nick Clitheroe at nick.clitheroe@gad.gov.uk or your usual GAD contact.

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