



Transport Committee

Oral evidence: Motoring of the future, HC 429

Monday 20 October 2014

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[Witness evidence](#)

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Members present: Mrs Louise Ellman (Chair), Jim Fitzpatrick, Karl McCartney, Mr Adrian Sanders, Chloe Smith, Martin Vickers

Questions 1-91

Examination of Witnesses

Witnesses: **Chris Reeves**, Commercial Manager, Intelligent Mobility and Future Transport Technologies, Motor Industry Research Association Ltd, **Professor John Miles**, Board Director, Arup and Research Chair of Transitional Energy Strategies, Cambridge University, and **Professor Paul Newman**, Department of Engineering Science, University of Oxford, gave evidence.

Q1 Chair: Good afternoon and welcome to the Transport Select Committee. Could you give your name and organisation, please?

Chris Reeves: I am Chris Reeves from MIRA Ltd.

Professor Miles: John Miles from Cambridge University.

Professor Newman: Paul Newman from the University of Oxford.

Q2 Chair: What will mass market vehicles look like by 2040?

Chris Reeves: There is going to be significant progression in two aspects from where we are today, addressing safety, efficiency and convenience. There will be a drive towards low carbon and sustainable energy vectors. There will also be an increased level of intelligence within those vehicles and an increased level of connectivity. Having that increased level of intelligence and connectivity within those vehicles will enable the vehicles to operate in a much more co-operative manner, which will then enable more efficient traffic flows. Road safety will improve because they are co-operating, and potentially so will safety towards vulnerable road users.

Q3 Chair: Would anyone like to add to that or disagree with any of that?

Professor Newman: Computing changes it all, and computing has not changed transport much at all yet. If you look at what computing has done to telephones, media and finance, you will see that in cars and vehicles, and they will be better because of computing. That is a thing that is yet to come to the transport industry in its full force. It will very much change things in computing, which I understand widely as communication. Communication is a kind of computing.

Q4 Chair: What are the benefits of these changes going to be, Professor Miles?

Professor Miles: Before I go on to that, could I come back to your first question because I thought you said, “What are cars going to look like in 2040?” If by that question you meant what are cars actually going to look like, I do not think they are going to look very much different. They might be lighter and smaller for the most part, but they will be pretty similar in that they will still provide in 2040 a lot of personal mobility. That will be a big part of our agenda. It is how they flow that will be different. That is where the computer comes in—Paul’s point—and the connectivity that Chris mentioned. It is the computing and the connectivity that will allow the flows to be much smoother and much more intense.

Q5 Chair: Will other vehicles apart from cars, such as heavy goods vehicles and buses, be different?

Professor Miles: There will be other vehicle types of course, because there will be whatever vehicles are needed to fulfil needs, but I imagine that we will still be taking quite a lot of freight by road. I imagine that we will still have people travelling en masse in buses, probably rather more in future than we do now. So, yes, there will be buses, heavy goods vehicles, light goods vehicles and cars or personal transport vehicles in some mix. My guess, though, is that we will still see a preponderance of the car.

Q6 Karl McCartney: On that point, you mentioned that you do not think cars will look very different from how they are today. They have not really changed in 100 years. Do you not think that with the advent of something like linear motion—I know this may sound a bit Blade Runnerish—you might find that cars are not actually four wheels on the ground?

Professor Miles: I do not think we will lose the wheels in that period of time, no. They may look different in the styling sense, as they always have done, because they are a consumer product and they will just change to suit taste. Basically there will be wheels underneath and seats inside. They will probably be more compact than they are now for the most part and lighter.

Q7 Karl McCartney: I am going back to Professor Newman’s point, which was that computing power has moved by leaps and bounds in the last 30 or 40 years, but not really with cars.

Professor Miles: I understand that. My point is that it would change the flow rather than the car itself, but I will let Paul speak for himself.

Professor Newman: It is not clear that we are going to have engines as we do at the moment. It is not clear that you are going to have gearboxes and internal combustion engines. We are going to make progress on batteries because we just have to. It is not just for cars. When you do not have gearboxes, and you can direct-drive and the motors are in the wheels, manufacture will be completely different; you will be printing cars by 2040. It is going to be extraordinary.

Why have computers come so far? Because of software. That has allowed you to work in a weightless way. It is a lot easier to change software than it is a metal press. When we have technology that allows us to adapt, like software, the whole thing comes together and I think it will be quite extraordinary. But I do not think we should be building infrastructure for cars to run on other than the roads that we have. Monorails and floating magnets are very expensive. There is already plenty of

tarmac; it is just that the things that drive on it are not so great and the people who drive them are not so great, but that will change.

Q8 Jim Fitzpatrick: I want to follow up Mr McCartney's question to Professor Newman. You said, Professor, that computing has not caught up with vehicles in the same way as it has done with media and phones, for example. Why hasn't it caught up? Is it because of the investment required? Is it because the technology has not been developed? Is it a lack of imagination in manufacturers? Is there a particular reason why it is now becoming much more in vogue?

Professor Newman: I think it has not been very ambitious.

Q9 Jim Fitzpatrick: Society or manufacturers?

Professor Newman: Manufacturing. We have not been very ambitious about what we would like our cars to do. We have not demanded that we do not have to drive. That is going to happen. We are going to start demanding it. This driving business is time wasting. We tend to maim and pollute. Frankly, it is really not what we should be doing with our time. That is going to come, and we are going to demand more of it, as we are now starting to demand that we do not need to parallel park. This is not a life skill we need; cars will start to do it. That will grow. It will start with kernels like that—of not having to drive all the time—and then the amount of time that you do not have to drive will increase. But let's be clear: we should not be putting in infrastructure to do that. You asked about computing. That is a hard problem to get computers to do, but we are going to do it.

Q10 Chair: When are these changes going to happen?

Professor Newman: This is the question that always comes, and it is a good question. I always answer it by saying that it is a gradient. It is smooth. I overuse the word, but there is going to be evolution. Slowly the cars will do more of the driving for you. Do I think there will come a time soon, in a year, when you will buy a car that 100% of the time for all people in all places drives all the time? No. Are there some places that a car can do 100% of the route? Yes. There is going to be commercial activity about making cars drive more of the people in more of the places more of the time.

Q11 Mr Sanders: Doesn't that mean, though, that rural areas, for example, will not benefit from this new technology? There are areas where the signal is weak so the car will not be able to take advantage. It will just be another London or major city advance at the expense of the more peripheral parts of the United Kingdom.

Professor Newman: No.

Mr Sanders: Okay.

Q12 Chair: Why is that? Why no?

Professor Newman: I am a strong proponent, and I think some of my colleagues here are, of the idea that the cars are smart by themselves. They do not need any infrastructure. You do not need infrastructure to drive; you just need there to be a road. This is where the technology will go. You do not need to have 3G or an NG signal to get out there. The cars should be smart enough to drive themselves. We have already built the infrastructure. It is called "the roads."

Q13 Mr Sanders: But surely the car itself would need to know what the status of the road is on that day in order to make adjustments to the journey. There would need to be some contact. If cars

are communicating with one another are they communicating by sight, or would they not be requiring some form of satellite in order to communicate with one another?

Professor Newman: This is very exciting. There are lots of things I could pick up there. Satellites work in the country very well anyway. That is the one place they work very well. Forget GPS and things like that. The cars are independently smart so you would hope that they could perceive their own world from themselves. They are not dependent on vehicle to infrastructure or vehicle to vehicle. If you have it, knock yourself out; that is just great and you should use it. But I question the requirement for it.

You said a really good thing. Wouldn't the car need to know about what is coming up? You can imagine a situation where it is heterogeneous: the first car goes through in the morning and autonomy is not offered, the little green light does not come on and you have to drive it yourself; five minutes later you go down the road and autonomy is offered to you because someone drove through it. In that case, you need vehicle to vehicle or vehicle to infrastructure communications, but not a lot.

Q14 Chair: Are there any key years? You said before that things would not happen all at once and that there would be a time when there were some autonomous cars and then that would change. Is there a key year when a fully autonomous vehicle will be on the public road, when there will be a lot on the road and there will be other significant changes? What should we be looking for?

Professor Newman: We will know that year when we hit it.

Q15 Chair: No predictions?

Professor Newman: There must have been thousands of people who were asked to say what year a technology would arrive, and a very small number of them got it right. It is really hard, and here is why. It depends what you are trying to do. Do you want end-to-end autonomous driving—self-driving cars—or would you like to be driven some of the time? If you give me that question, I can then start to answer questions about where you might get that kind of competency. Again it is a growing thing, and it depends on consumers. If consumers love it, it will come faster.

Q16 Chair: You could not give us a prediction of when significant change is likely to happen. Perhaps our other witnesses could say. Professor Miles, could you give any prediction? I am trying to get a picture of when there will be stages in significant change. We know about all of the developments taking place now, but we are trying to look forward and see when there will be significant change or what steps that would mean.

Professor Miles: As Paul says, some of those things have already happened and you perhaps do not recognise them as being significant. A very little example is cruise control on your car, which has been there for a long time, to the point now where you do not even recognise it as something special. The next step was adaptive cruise control, which puts the foot on the brake when the car gets too close to the car in front. Perhaps you do not even recognise that these days as being something of that nature.

Right now cars are being sold with automatic parking, and soon with lane change control and anti-collision. By the time you put these things together—if you have all the things I just mentioned in one car and you connected them together—you would be very close to a car that could drive itself. It is creeping up on us and going past us as we sit here. The answer to your question is that a lot of those things are already happening. It is not in the future; it is now. The question is just how much further up that curve we are going to go, and how fast. My guess is that it is a lot closer than most people think. It will be drawn by the customer. It depends on how much the customer demands. Technologically, all the different bits of action that are necessary inside the car will be there in top-end cars within five years. Whether it will be allowed to drive autonomously within five years is a completely different question.

Q17 Chair: But you think the technology will be there within five years.

Professor Miles: The technology is very close indeed.

Q18 Martin Vickers: Leading on from that point, the technology will exist, but, human nature being what it is, there will be resistance. What about those who, even when they feel reassured that the machine is better than them, want to get behind a wheel and drive?

Professor Miles: I see no real problem with that, because it will be necessary for a long time yet for vehicles to co-exist. I do not think we could possibly get to a stage where you would say at midnight on Saturday that at one minute after midnight on Sunday morning every vehicle is going to be an autonomous vehicle and all the others are not allowed on the road. That will never happen. We will be in a prolonged period where different types of vehicle co-exist.

If that is the case, by the same sort of argument you will find that the decision to let the car drive itself or not will rest with the driver. If you are the sort of person who does not really want the car to take over, you do not need to let it take over. You will just continue to drive as a normal person. My guess is that it will creep up on you. It is just not very pleasant driving in a traffic jam. If, after a while, you can just let the car drive in a traffic jam and you read your newspaper, my guess is that you will quickly get used to that idea and quite like it. Your resistance to letting the car drive will be eaten away by a series of small steps in what appear to be less risky environments over a period of time, and you will become used to the car driving itself.

Q19 Martin Vickers: How do you think the insurance industry will react?

Professor Miles: They will love it.

Q20 Martin Vickers: What if there is a collision between someone who is driving and someone who is in a machine that is driving?

Professor Miles: They will love it because they are very objective people. They will know that, although there will be some incidents such as you described, where the machine is the cause of the problem, overall the statistics will show far fewer accidents and far fewer payouts.

Professor Newman: And you will know exactly what happened if you ever have a crash.

Q21 Martin Vickers: Are you forecasting lower premiums as well as a result?

Professor Miles: Yes. That would be a logical outcome, but whether they will give them to us is another matter.

Karl McCartney: Or more importantly less profit for the companies.

Chris Reeves: There is a major transition that will take place, and that is where the human in the loop is taken out of the loop. As you go through the progressive levels of automation, you will get to the point where you have a fully automated system and then ultimately the vehicle will be making the decisions. There is a progression of automated technology to get to that point. There are well-defined levels and the SAE documentation will refer to those. The real challenge for the industry will be how it can go through the point where it takes the human out of the loop. It will require not just technological development, but changes in regulation and legislation to enable that to happen.

Q22 Chloe Smith: That perfectly leads into my question, which is, what is any of this to do with the state in your three opinions?

Chris Reeves: I think the state needs to keep pace with the technological developments. That is clear. It falls into two camps. One is having the regulation and legislation in place, and predicting where it needs to go and what needs to be done. There is also forming the correct environment through large-scale demonstrations to enable these technologies to be viewed by the public and then enabling the use cases to be clearly proven out and the safety cases justified. If you look at what is happening globally, the UK is quite a way behind some other nations. If you look at what is happening in the US around co-operative driving, they have conducted a very large exercise; it was something like 2,800 vehicles using co-operative ITS technologies. There are a number of European programmes, not least things like Safespot, COOPERS and the Car2Go communications community, which are really driving some of this technology forward.

Q23 Chloe Smith: Just unpacking your point—I would love to hear from the others as well—you stated that there is a set of regulations required, and I am sure we would be interested to hear what your points are within that. Secondly, is it your assumption that the state would need to run such large-scale programmes as opposed to, for example, those trying to sell the technology?

Chris Reeves: I think it would be a joint undertaking between both—those trying to produce the technology and I think it also needs state intervention to kick-start that process.

Professor Newman: I think the state needs to decide if we want to be inventors and users or just users.

Q24 Chloe Smith: If the state needs to be that or if—

Professor Newman: Yes. Does this nation want to be the inventor and user of this kind of technology, or do we just want to be a user?

Q25 Chloe Smith: But haven't we already missed the invention opportunity as per Professor Miles' argument?

Professor Newman: No.

Professor Miles: I did not mean to make that point, if I did.

Q26 Chloe Smith: You said it was already happening, so we have already missed the beginning, haven't we?

Professor Miles: It is already happening. I did not mean to imply that we have missed the opportunity to be active in participation. It has a long way to go yet and I think that the UK is extraordinarily well placed to be prominent among the places where this stuff is developed, because we have natural attributes: a first-class R and D track record and a good deep understanding in that area of research, in vehicle design, in computing and information systems and in gaming. Gaming is a very good example; there are some very creative technologies in the UK that could be applied to the sort of environment in which you need to interact with your car, instead of interacting with your Playstation.

There are lots of natural attributes in the UK, and lots to win if we care to put ourselves out, but unless the state takes an enabling position at this point, we are quite likely to lose the race. The reason is that the very largest part of the activity in this area will almost certainly be driven by the established vehicle manufacturers or by people coming into the field, like Google, Tesla, Apple and players like those—people who have very deep pockets. They will choose to do their research in certain limited places around the world, often in the far east, in the far west and sometimes in Europe as well. There is competition among those geographies to attract the places where the investments get made. The UK has a very good opportunity to be such an attractor, but it needs something to make that happen.

Q27 Chloe Smith: In your view, what are the ingredients of being an attractive place on that question?

Professor Miles: Apart from the natural ingredients we have anyway, at this point in time there is a need for enablement from the state, because you can only develop these technologies if you have the right environments in which to do it. They do by their nature take you into areas you have not been before, so legislation is fundamental. To create spaces in which these vehicles can be demonstrated on the road requires legislation to be moved. We need to be early in the game with getting the legislation in place, and supportive to manufacturers who want to demonstrate their equipment.

Q28 Karl McCartney: I am heartened to hear what Professor Newman, Professor Miles and Mr Reeves have had to say so far about where we are placed within the global market. But my experience with Denby Transport, which is a company in my constituency and which the Chair knows as well, is that they have a computer-controlled trailer on one of their lorries but cannot even get permission from the Department for Transport to test it on our roads in this country, so my—

Professor Miles: That makes our point, doesn't it? The state has to enable.

Q29 Karl McCartney: My question to you is, with your experience of where you are and what you are looking at, do you find that you condemn or commend the Department for Transport and their dead hand, which is what I am seeing most of the time? I am worried that where you say we might be is where we might end up in 2040, which is well behind the rest of the world.

Professor Newman: I have been working with the Department for Transport for three years on this. I have to say that they have been outstanding in helping. We have the robot car on the UK's roads and we have driven it autonomously. We have worked with them on that, and it has been great. We are going to go again soon, so I have had no problem working with the Department for Transport. They have managed to get behind us and understand that this is research, that we want to get into this and that we can take a leadership position. They have been very supportive. What worries me is that we now start to drift into worrying solely about legislation and preparing for others to invent. We have to have a long-term strategy.

It is like saying, "Hey, someone made a telly and there will be no innovation in tellies again because the first telly has been made." It is obviously rubbish. This is a huge market. It is okay if other people get there first in a spectacular way. Some of the first tellies were great, but there is still innovation in tellies now. Pick any kind of mass product that many citizens on the planet want. That is a big market. Why would you ever say that it is started and done?

Q30 Karl McCartney: Again I am very heartened to hear that, but are the people who are working with you on passenger vehicles—smaller vehicles and cars—the same people who are looking at freight, or are they, as I suspect, completely different people and one hand does not know what the other one is doing?

Professor Newman: I cannot speak wider than that, but I can speak to the people I have met in DFT who have helped with the vision for what the UK could be for intelligent transport. It has been fine.

Professor Miles: I would like to echo Professor Newman's words. I have also worked with the DFT for the past two or three years in my particular area of interest. I have found them generally speaking to be very creative, very enthusiastic and very up for it. Where there is a problem, and this is not of their making, is in funding being available. There are some very bureaucratic rules about where funds can and cannot be deployed. It takes them an awful long time to work within those rules and release relatively small sums of money.

When I was saying earlier that this is an international game and there are very big motor manufacturers, computer systems and information suppliers playing in this space, big sums of money are being spent. It takes a long time for DFT and others to release small sums of money at the moment, so we are not geared to playing the supportive role that is critical at the moment. We will lose the race if we do not create spaces for things to happen.

Q31 Chair: Which things need to happen? Let's not just stay with the Department for Transport. You both made comments about how you found the Department in the work you have done. It might be another Department or it might not be a Department at all. You are obviously all keen to see the opportunities taken up here; you say that inventions can come from here and it can be UK-led development, but what else needs to be done? It might not be one Department.

Chris Reeves: One of the things that can be done is to learn from something that has happened in the past. It relates to OLEV, with the introduction of low carbon electric vehicles, and it was to establish a cross-department working group. In the aspects of intelligent and connected vehicles, and indeed in intelligent mobility, which is looking at seamless transportation, establishing a cross-Department activity would be a major step forward. That could then concentrate both the amount of funding and the rate of change required to keep pace with this rapidly changing scene.

Professor Miles: That is a very good point. Some of the points I was trying to make a few moments ago really have to do with the demarcation lines between different Departments. If you take those demarcation lines away by having a cross-departmental function like OLEV, it makes a big difference. I think OLEV has made a big difference. If the same difference was made for intelligent vehicles, that would be a good thing.

Professor Newman: I think you should think bigger than transport. You should understand that a technology that is going to help these cars does not just appear in cars; it appears in logistics and in factories. In fact, the self-driving car community largely came from the robotics community in academe. That is important. If you think about robotics and autonomous systems as the overarching thing, of which intelligent mobility and self-driving cars is a facet, you then start talking about BIS interest. It is a wider picture about autonomous systems and leading in autonomous systems in the UK, of which transport is one kind of autonomous system. You have a much wider brief then. You can fold in many more aspects where the UK can commercially lead if you think more broadly than just transport.

Q32 Mr Sanders: This is all quite exciting stuff this morning. I am no luddite, but I have a little issue you might be able to help me with. The embryonic start of this is something like cruise control, yet cruise control is not fitted as standard so there clearly cannot have been a great demand for it. Can you explain why that might be? It seems to me that you are discussing the next stages on from some form of cruise control.

Chris Reeves: One element of that is consumer choice. Currently, there are systems where there is a relatively low level of automation, but there is a creep effect. As has already been discussed, it is moving now towards automated parallel parking, and valet parking is now in the advanced development stages. It is down to consumer choice. A consumer will pay for these technologies when they see there is either a safety and efficiency or a convenience improvement to the product that they are going to purchase.

Q33 Mr Sanders: But you would think with speed cameras and motorway patrols something like cruise control is ideal.

Professor Miles: Your criterion might be questionable. The criterion is not whether or not you pay for it as an optional extra but how many vehicles have it. Automatic gearboxes are still an optional extra, having been around for nearly 100 years. A very large fraction of cars now have them. If you

look at the fraction of cars that have cruise control now, the majority have cruise control and the minority do not. These things happen.

Q34 Mr Sanders: It is the majority now, though.

Professor Miles: Of new cars that are sold. It is unusual now not to have cruise control, but it is still an optional extra on many of them.

Professor Newman: What drives you nuts the most? Is it driving on a freeway at 50 km or 50 miles an hour or start/stop traffic that is trickier? That is not where you will use cruise control, as understood from 10 years ago. It is not getting you back any of your day, and that is a really big point. Self-driving cars are going to give you part of your day back in a way that cruise control does not. If you still have to drive, that is different. You might pay an extra 100 quid to have 15 minutes of your commute to yourself. You can do something while you are stalled in traffic, creeping forward. You are not cognitively loaded. That might be the place where the car says, "I can do this traffic jam for you. I am going to need you back in a kilometre, but I can do this for you." There's your 15 minutes and your pay for your day back.

Q35 Mr Sanders: Shouldn't our aspiration be not to have a traffic jam in the first place?

Professor Miles: We can help you there, too.

Professor Newman: Maybe it will.

Q36 Chair: Could you have autonomous, semi-autonomous and fully autonomous vehicles all on the same road?

Professor Newman: I think we are going to have to.

Q37 Chair: Could that work?

Professor Newman: We have to make it work, otherwise it is not going to work. That is a truism.

Q38 Chair: Are there any measures that need to be taken to make it work? Is it a problem?

Professor Miles: I think it is the other way round. The manufacturers will have to introduce systems that can work in that mixed environment, so they will.

Q39 Chloe Smith: Can you give us some information on the fuels involved? Are there different avenues for different fuels? My follow-up question is going to be, what does that mean for, among other things, our foreign affairs in 2040?

Professor Miles: Those are two completely different subjects. The fuels the vehicle is using and the intelligence in the vehicles are not necessarily related. Are we deliberately now moving on to a different subject area?

Q40 Chloe Smith: No. I am asking a technical question. Can you enlighten us as to whether they are related? If they are not, fine, my question falls.

Professor Miles: My view is that they are not related. All the discussion we have had so far could apply to vehicles that are powered in any fashion. It is very likely that we will have much more electric power and less internal combustion engine, but I would not rule out that there are other forms of moving vehicles around that would also be more popular. Generally we will decarbonise. My view is that electric vehicles will play a much bigger part in the future.

Chris Reeves: As we progress through this, I think the number of fuels will actually increase and those fuels will be appropriate to different use cases. There is a lot of leading research taking place in the UK currently around alternative fuels, or indeed new energy vectors. For example, there is a lot of work on solid sources of hydrogen, and also looking at cryogenic fuels, including liquid air and liquid nitrogen as new energy sources. They all have their own use cases. For me, where the intelligence in the vehicle comes in is not necessarily related to the fuel but to the efficient use of that fuel. If we can get intelligence and co-operation into the system we can increase efficiency, whether that be a reduction in dwell time, a reduction in journey time or indeed a reduction in CO₂ or the fuel used to complete the journey. That is where the real benefits can be derived from some of this technology.

Professor Newman: I don't know anything about that. I only say things I know about.

Q41 Chair: Do we need to develop a different transport communications infrastructure? I mean communication between different vehicles or from a base to a vehicle. Does something different have to be done?

Professor Miles: I think that the system of the future is going to be much more vehicle-centric than infrastructure-centric. In that sense we will not need to invest huge sums of money in infrastructure-based systems. More and more, the vehicles will decide for themselves. I am not quite sure what your question was though, if it wasn't simply "Do we need bigger infrastructure-based systems?"

Q42 Chair: Or different types of infrastructure. One example is platooning—a method of linking vehicles that the freight industry is very interested in. Do we have the right infrastructure to be able to do that?

Professor Miles: Physical infrastructure, yes, we do. We already have the roads, as Professor Newman said before. The systems need to adjust to our existing infrastructures rather than demanding changes to the infrastructure. Platooning, for example, can be delivered through vehicles that make the decisions themselves, or by relation to an infrastructure-based information system. If it is the second one, I think it is not the best way of doing it. It would be very expensive. If it is the first one, I think it will not be very expensive from an infrastructure point of view.

Chris Reeves: For platooning, if there is a human in the loop, the vehicles themselves can have their own sensor suites on them. If you want those to have a much wider electronic horizon so that they can operate more efficiently, they will require some level of communication between them. There are co-operative road trains where vehicles can communicate between each other using vehicle-to-vehicle communication protocols. That allows them to form intelligently into much longer road trains and potentially enables you to have some element of that without a human in the loop.

Q43 Chair: Is there enough mobile network coverage to deal with eCall, for example? Is that a problem?

Professor Miles: I think you might say right now that there is not. As was pointed out earlier, there are parts of the country that are not properly covered, but the rate of roll-out of coverage is so swift that, in my view, it is inconceivable that those gaps will not be closed within the foreseeable future. It takes time to develop everything, so by the time these things develop, for other reasons the actual coverage will be there. If you look backwards 10 years at the amount of mobile coverage we had, look at what it is now and guess what it might be in 10 years' time based on that progression, I do not think we are going to have a serious lack of coverage at that time.

Q44 Chair: Is cyber-terrorism likely to become more of a problem?

Professor Miles: I think that is going to be an embedded part of our lives in all respects, not just in mobility. There are no questions that I can see posed by mobility that are not already posed by a number of other things that we do in our everyday lives.

Professor Newman: I am going to say something strong. It would be a monumentally bad idea to build bespoke infrastructure, electronic software IT systems to support specifically transport in the UK.

Sitting suspended for a Division in the House.

On resuming—

Q45 Chair: Professor Newman, you were in the middle of saying something.

Professor Newman: I was saying that I think it would be a spectacularly bad idea if we thought that the only way to get smart cars was to spend a lot of money on an IT system to support smart cars. That would have to work globally, and it won't. We do not have a good record on large-scale IT projects, so don't do one. Have the cars smart by themselves.

Chris Reeves: I want to come back to the question relating to the cyber-security aspects of this. There is a real need for the road transport area to be very aware of those aspects and to look at how they can manage the risks associated with the increasing vulnerabilities related to communications in the vehicle. That is the process that needs to be managed as this increased connectivity takes place.

Q46 Jim Fitzpatrick: I want to follow up a point that Professor Newman just made, and to a certain extent Mr Reeves as well. Your comment about the obstacles between vehicles communicating with each other was in the light of different countries internationally doing different things. What about different manufacturers? Are they co-operating with each other in the development of all this new technology? If we are going to have vehicle-to-vehicle communication, there has to be compatibility. Equally, they want their own competitive advantage to be able to market the best product available. How do they overcome the obstacle of competitiveness and at the same time co-operate? Is there evidence that that is happening out there in the private sector between manufacturing companies?

Professor Newman: I do not think I am the person to talk, as an academic, about how companies do this. Very quickly, the point I was making was vehicle to infrastructure—if the nation decides to put infrastructure down. That is a bit different from vehicle to vehicle. I imagine that, just as car manufacturers can agree on motoring standards for manufacture, they would be able to do that for vehicle-to-vehicle communication. My colleagues know these things.

Chris Reeves: There are levels of communication taking place around vehicle to vehicle, and indeed on some aspects of vehicle to infrastructure. There are a number of activities that take place. Indeed, in the US, NHTSA are just conducting a review so that they can potentially put in place regulation to start the process of vehicle-to-vehicle communications within the US. Similarly, in Europe there are things like the Car2Car Communication Consortium, where multiple manufacturers are looking at standardisation of vehicle-to-vehicle communications or dedicated short-range communications.

Q47 Jim Fitzpatrick: There is the additionally complicated area of vehicle to other road users—for example, cyclists or pedestrians. I guess the technology is not quite so advanced. In terms

of vehicles one would understand a radar reading in terms of proximity, but for pedestrians and cyclists?

Chris Reeves: I think there is a considerable amount of work required for what I would call vulnerable road users, including pedestrians, cyclists and other users of our public highways. There are some technical challenges as well as co-operative challenges to be addressed in that space.

Q48 Chair: Does current transport policy take enough account of available technology? Are we really using all the technology that is now available? Can you think of any areas where we could make better use of existing knowledge?

Professor Miles: I am not sure I can answer that question directly, but I was going to try to answer your previous question, “Is enough account being taken of?” I think no, because if we look at the medium term—2020 to 2030, that sort of time—we are likely to see, from all of our projections, very significantly increased congestion on our roads. Now is the time to think about what we are going to do to alleviate it. One obvious way is to try to build more infrastructure. I happen to think that would be completely the wrong way to deal with it. The other way would be to look at increasing traffic flows by having more intelligent vehicles. I think that would be a much cheaper and better way of looking at it. That sort of long-term thinking needs to be embodied in our transport strategy right now, because it is a solution that will present itself by the time we get 20 years hence. It takes that sort of time to plan and build infrastructure, so it is of a similar wavelength. Yes, it should be influencing our thinking now.

Q49 Chair: Do you think we have enough strategic leadership to develop the technologies that you have spoken about, so that the UK could be in pole position to develop new ideas and new products using advanced technology?

Professor Newman: Yes. The UK science base is strong. The UK science base needs a strategy, and that is developing. We need to remember that you cannot turn it on and off. You need a long-term strategy to really push the fundamentals that turn into things like cars and self-driving cars. Who would know that robotics research of 10 years ago is now going to make self-driving cars? It is hard to know those things, so you need to take a strategic view, to say that funding core science at universities is extremely strategically important. You do not know what you are going to need it for. No one sat down and said, “Let’s fund robotics research so that we will have self-driving cars,” but they came out of it.

Q50 Chair: Is there a need for common European or worldwide standards or frameworks to develop all of this? Is that necessary?

Professor Newman: What is the “this”?

Q51 Chair: In terms of infrastructure.

Professor Newman: Do you mean standards for smart cars?

Q52 Chair: For anything in this area. I am trying to think of where the blocks might be in developing the technologies we have spoken about to their maximum use.

Chris Reeves: For things like communication standards—dedicated short-range communications for things like vehicle to vehicle—we need to be very aware, and to try to standardise, particularly around communications protocols, with other nations. That is important because it is a global industry. It needs leadership and a co-ordinated approach. That is a very important thing.

Professor Miles: There is a good parallel in telephony. Telephony has largely become universal through the pressures of the market, but there have been some very important enabling decisions

that were made en route and opened up the opportunity. There are certain areas of regulation that need to be thought of at international level, but the decisions that need to be made are not the Big Brother type of decision. It is much more a Wikipedia approach that we are seeing these days, with lots of players getting together. They do their thing and it either appeals to the market or it doesn't. It is a very Darwinian process. The role of the state is to enable with a relatively small number of proper interventions. Some of those are in the areas that Chris just mentioned, but I do not think we are in a position where we have to have a Big Brother move first before everything else can happen.

Q53 Chair: Finally, is there anything that you would like to say to us? Is there anything we have missed out or anything you would like to say to reinforce any points?

Chris Reeves: I would like to make a comment on something that Paul raised earlier—the alignment of the academic mission with the industrial mission so that there is a complete exploitation path for these technologies. There is a very large market potentially for the taking, or certainly to make a major intervention. It needs a seamless approach where we look at our academic excellence and then at how we can create wealth as a result of that excellence and transit through industry.

Q54 Chair: Professor Miles, is there anything you would like to add?

Professor Miles: I would like to underline the fact that it is a time of extraordinary opportunity for the UK. We have three things which come together and which are very good for us. We have a really strong R and D and technology base in this country. We have a resurgent automotive industry in the premium sector, which is the place where all of this stuff is going to start and then trickle down. Thirdly, we have a real national need, which is the pressure on our infrastructure. We are a congestion laboratory; the whole nation is a congestion laboratory, world class. We have a real problem to solve. We have these three things. We have a terrific foundation in R and D; we have a resurgent automotive industry in the premium sector; and we have a very pressing national need. Those three things together are a perfect storm.

Q55 Chair: Professor Newman?

Professor Newman: No; I have nothing else to add.

Chair: Thank you very much, all of you, for coming.

Examination of Witnesses

Witnesses: **Gerry Keaney**, Chief Executive Officer, British Vehicle Rental and Leasing Agency, **Neil Greig**, Director of Policy and Research, Institute of Advanced Motorists, and **Mike Hawes**, Chief Executive Officer, Society of Motor Manufacturers and Traders, gave evidence.

Q56 Chair: Good afternoon and welcome to the Transport Select Committee. Could we have your name and your organisation, please?

Gerry Keaney: I am Gerry Keaney, Vehicle Rental and Leasing Association.

Neil Greig: I am Neil Greig, director of policy and research at the IAM, the Institute of Advanced Motorists.

Mike Hawes: I am Mike Hawes, Society of Motor Manufacturers and Traders.

Q57 Chair: How will new technology affect future patterns of car usage and ownership?

Gerry Keaney: I will kick off from the leasing and rental viewpoint. We are already seeing technology really start to transform the usage of vehicles. When I look at my own sector, we rent vehicles from one hour to 10 years—from car clubs to truck operations. We can see that technology is really a key enabler to deliver that degree of flexibility in terms of the usage of a vehicle. That in itself is enabling a quite mega trend within our sector. It is transforming how consumers look at vehicles. Consumers want to pay to use rather than pay to own. That mindset, and that consumer demand, is transforming the whole utilisation of vehicles in the UK.

Q58 Chair: Does that mean less ownership of vehicles and more leasing?

Gerry Keaney: I think it means increased utilisation. If you look at examples like car clubs, London has the second largest car club in the world today after New York.

Q59 Jim Fitzpatrick: How big is that?

Gerry Keaney: Currently it is about 2,500 cars, but if you look at estimates for between now and 2020 we think it will grow by probably 75%. There is significant growth in terms of car clubs and car sharing schemes. They would not exist today without the technology in and surrounding the car—apps and smartphones and whatever else.

Q60 Chair: Would anybody else like to give me a view on what is going to happen?

Mike Hawes: I would tend to agree. There will be increasing diversity, both in types of vehicle—powertrains—or the fuel or propulsion unit that the vehicle has, and indeed in ownership. You still cannot get away from the fundamental principle that people depend on the vehicle for mobility, and that dependence is going to remain. The offers that manufacturers and other stakeholders in the market provide will be more tailored to individual needs—the needs of users. Some of them may be urban based, some may be rural based and some want a combination. It is a matter of offering that utility to consumers that will change.

Neil Greig: From our point of view—a user perspective, if you like—the fundamental concerns will remain: the cost of motoring, reliability and consumer protection. All these things will remain and, while they will be interested in the new technology, and they will want to have the latest technology in many cases, they will fundamentally want a vehicle that they recognise and understand how to use safely, one that they can rely on and one where they know what the future costs are going to be so that they are not going to get caught out by a sudden change in policy that may make their particular method of propulsion suddenly more expensive.

Q61 Jim Fitzpatrick: Without compromising any of the questions that we discussed, was there anything you heard from our three previous witnesses—I think you were all listening—that you thought fundamentally was wrong or that you disagreed with, or wanted to add something to? It is not quite the direction we are travelling with yourselves, but obviously it is in your area of expertise.

Gerry Keaney: The question was asked early on in the session about whether there was going to be a key date when things will change. I think the reality is that there is no key date. There are 33 million vehicles on the road today, all of varying shapes and sizes. Those 33 million vehicles are getting older as we see it today; they are being kept for longer because the new car market has been reduced in recent years. In a good year—this year is a very good year for the UK car business—2.4 million new cars will be registered. Simple mathematics show that to change those 33 million is

going to take a long time in reality, unless something is done to promote faster change, like the scrappage scheme, which was very successfully launched a number of years ago.

Mike Hawes: I would take issue on a couple of things. I generally agreed with Professor Miles in particular, but there were two points he raised. One was the nature of vehicles. He said that vehicles will tend to get smaller. I think there will be more smaller vehicles and individual mobility vehicles on the road, especially in urban areas, but there will perhaps be a greater range. For many people the demand for a family to travel as one means that you need a vehicle of a certain minimum dimension to get two, three, four kids, or however many, in there. I think there will be that variety.

Secondly, there was the suggestion that computing has not yet hit the automotive sector. I have to take issue with that. Having been involved with car manufacturers who spend huge amounts of money developing new vehicles, I can reassure the Committee that the level of lines of code that goes into a vehicle is getting ever greater, into ever more millions. A lot of the technologies that you talked about in the earlier session, like adaptive cruise control, need that degree of processing capacity to be able to operate. It is a linear development. You will see increasing application of information technology within cars, but it is already happening.

Neil Greig: I would not be completely dismissive of intelligent roads and electronic infrastructure in the actual road itself, which was discussed by one of the contributors. Ultimately, in terms of pace of change and so on, the car manufacturers are going to be far quicker and far more flexible. There is big scope for roads that feed back to the vehicle in terms of traffic lights, street lighting, warnings and that kind of thing. Again, as was mentioned, it would be difficult for that infrastructure to be provided by local authorities or highway authorities, but certainly don't dismiss intelligent roads; I think intelligent cars need an element of intelligent roads, as well as intelligent drivers.

Q62 Chloe Smith: I would like to go to the point about data. I noted Mr Greig's comments on behalf of IAM: "The Connected Car of the future works on data and who owns that data and to what use it is put is an important part of the debate on the future of motoring." You go on to say that it will not be acceptable to hide data sharing agreements in the depths of the small print. Can you tell us more about what data you have in mind in these comments and, indeed, what you think the answers are to the questions you posed? I would welcome the same from the other witnesses as well.

Neil Greig: This is something that has come to us through our involvement with Brussels and with the FIA, which we are members of—the world body for motoring clubs. It is something they have highlighted. It has been mentioned that the computing power in a modern car of today means they have 10 or 20 SIM cards in them. They are sending information all the time and the owner of the car knows nothing about that. It is mainly things like the service status of the vehicle, whether it requires a service and if it is about to break down. They are all potentially useful things but, if that information is only going to one manufacturer and is not being shared with other people, there may be issues around data protection and who owns that data. If you then move that forward to cars which are monitoring the environment, the weather, traffic congestion and also sending that back to a central point to be used as traffic information, again that is valuable data and at the moment the owner of the car does not know that is happening, does not have any control over it, does not have any input to it and is not making any money from it.

I have no answer in terms of how we get traffic information shared by 32 million cars and everybody gets a piece of the action. I do not know how that could be done. Certainly at the moment a lot of people don't realise how much information is being sent from their car to the local dealer or the head office all the time. I think people need to understand that, if we are going to get trust in the long term when you are dealing with a lot more visual information, up-to-date traffic information and that kind of thing.

Q63 Chloe Smith: Do you think there is such a thing as a default in this? In the list of examples that you just gave, do you think the driver should own those items?

Neil Greig: Yes, we think the driver should own them. They should have the choice. Rather than being sent to manufacturer A's garage they should have the choice to go to manufacturer B, and garage B should be able to interrogate their car. There are long-standing issues around the ability to fix cars, mend cars and share information in a modern car, which at the moment is okay, but this is taking it a step much further.

An example I have come across recently is that this could change the whole way you investigate accidents. If the vehicle is recording what is happening on either side of an incident, it could change the way the police and the insurance industry investigate accidents. Some manufacturers apparently share that information quite well. I have heard of other cases where local police forces have had to go back to Japan to get permission to interrogate a car to find out what speed that car was doing prior to a crash. In the end it made their job much simpler in terms of accident investigation and blame, but it was not easy to get the information.

Q64 Chloe Smith: That hints at perhaps creating an environment for a "Big Dataset." Is that the intention, with the driver owning their bits of that data?

Neil Greig: I think the driver has to have a say in that, because at the moment they do not know what the data are being used for. They are the ones who are creating that data by driving round, so they should have a say in it.

Q65 Chloe Smith: Are there any other views?

Mike Hawes: The key issue as far as the manufacturer is concerned is maintaining the safety and integrity of the vehicle. One of the earlier questions was about the openness of that data, which inherently creates an opportunity for people to hack into it. With the manufacturer producing a vehicle there is a duty of care; obviously, that goes not just for the life of the warranty, which can be three, five or seven years now. We need to maintain the integrity of the vehicle and ensure it can maintain its safety and delivers on that, so we have a vested interest.

We recognise that there are other stakeholders in this area—clearly fleet operators, and having an independent after-market, which promotes competition within the service arena as equals. There are a number of players in there. For manufacturers, the importance is to maintain that integrity. We would certainly want to ensure that in terms of data ownership the manufacturers have the right to ensure that they have access to the data, given that they will have a clear impact on the delivery of the product that they are offering and the future development of products.

Gerry Keaney: This is a very complex area.

Q66 Chloe Smith: That is why I am asking about it.

Gerry Keaney: The issue of who owns the data can become very emotive and it gets in the way of really good discussion. What is important is who has access to what data and when.

Q67 Chloe Smith: Is that different from ownership?

Gerry Keaney: It facilitates a discussion that will crystallise that there are a lot of times when it will be absolutely in the interest of the driver, the owner of the vehicle and the manufacturer to be able to get to a car in an emergency situation as soon as possible. That data should be open. It seems to me that somebody has to agree to that; the driver has to agree to it, of course.

Today it is quite possible with a vehicle—again, drivers do not know—that at any one point in time somebody knows exactly where that car is, how it is being driven and how it is being used. Does the driver actually agree to that? I do not think they do. Is the driver willing to make that data available? I

am not sure that they are. I think those sorts of discussions need to be had. It is an area that is moving a lot faster than current legislation or guidelines, or the Data Protection Act. It is a debate that needs to be had more widely.

Q68 Karl McCartney: I want to pick up on a couple of things. You were disagreeing with some of the things that the previous witnesses said. I will go straight back to Mr Keaney and say I am not an anti-modernist, but some of us do not think that the taxpayer got a very good deal from the scrappage scheme. I will leave that one there. I just wanted you to know that certainly this member of the Transport Select Committee does not think it was a good thing. It might be because I like historical vehicles, but there are other reasons as well.

What you have just said is very interesting. We have an XC90 which is now seven or eight years old. It has an SOS button that you press if you have an accident and then obviously Volvo know where you are. Has any person who has bought a car in the last seven, eight, nine or 10 years—however long it has been happening—ever signed anything saying that the data you have just been talking about can be shared with either the emergency services or anybody else?

Can I ask this second question? You got to the nub of data protection. Do the police or any security services to your knowledge speculatively ask for information that motor manufacturers give them about specific vehicles in this country? If you do not know now, can you let us know?

Gerry Keaney: I cannot comment on behalf of manufacturers, so I have no answer to that. My understanding of the SOS button on your XC90 is that when you sign up to buy the product, and if the SOS button is activated, you sign up to that data being used.

Q69 Karl McCartney: But it is only when it is activated. What I am trying to find out is if the police speculatively look for that information currently, or have done in the past and no drivers are aware of that.

Gerry Keaney: Before my current position I had 25 years working for Volvo. I can only speak for Volvo and in that time I was never approached by any arm of the police.

Q70 Karl McCartney: But times have changed.

Gerry Keaney: I am not in that position any more to answer the question.

Q71 Karl McCartney: Do either of you know?

Mike Hawes: I am not aware of any speculative approach but I will make inquiries and come back to you.

Neil Greig: There is a whole system called eCall, which is being promoted by the EU in Brussels at the moment. It does not have the blessing of the UK Government at the moment.

Karl McCartney: That sounds good.

Neil Greig: Basically it is a European-wide SOS button, but at the moment it is about who answers the call. The button is there, the technology works, but the key thing is who answers the call. That still needs to be agreed at a national level.

Q72 Karl McCartney: But I think it needs to be agreed on a very personal level; it is for people buying new vehicles, surely.

Neil Greig: I think it was mentioned as a premium. In the past a lot of these services were add-ons, so when you signed for the car you were being asked to pay for the initial Trafficmaster early. You paid a separate annual fee for traffic detection systems. Now it is all being packaged together, so

people don't realise it is all in there because it is being given away free. It has become much cheaper for them to provide.

Karl McCartney: Nothing is free in this world.

Q73 Jim Fitzpatrick: I want to go back to a point that Mr Keaney made in terms of ownership of the data, which is obviously hugely sensitive. We see a parallel issue at the moment in the health service where data is available for medical purposes and for clinical purposes, to identify trends and so on, but people are so precious about their own personal data that the conspiracists and scaremongers are putting a big block on that. Sorry, that was a personal point of view. It might be entirely in line with Government policy or opposed; I am not sure.

For the Rental and Leasing Agency, Mr Keaney, your evidence, as you mentioned a moment ago, was that 3.3 million vehicles are in your control. Therefore, that is surely your data. Although you are leasing the car to the driver, it is your data. Are you not in a position to say, "We have ownership of a lot of data which could be anonymised and could be yours for the purposes of feeding into the development of products and so on"?

Gerry Keaney: Again, I think at this stage the debate about who owns what data is something that could run and run. The examples I gave are very real. Our sector totally supports something like eCall provided it is an open system, so that it is not just brand or manufacturer specific; it should be common across all manufacturers. It makes a lot of sense in the event of an accident. The most important thing is that the driver is taken care of as soon as possible. That data should be made available, if there has been an accident, to whoever as soon as possible. We would totally support that.

There is then the other extreme, which is about very driver-specific data that could be seen as an infringement on that driver's personal liberty. I can see that a driver, even if it is a car owned by one of our members, would not want to sign up to the fact potentially that somebody knows exactly where they are 24 hours a day, how that car is being driven, every time they break the speed limit or if they drive in a dangerous way or a safe way, irrespective. Those are very personal data, and there has been no discussion about how widely they should be shared and who with. What our sector is trying to do is to say, "We don't want to get into any wasteful argument about who owns the data." It is who can access what data when, so that there is a real value-added process.

Q74 Chair: Could the Government do more to incentivise the take-up of new technology?

Gerry Keaney: Yes, of course.

Q75 Chair: What could be done?

Gerry Keaney: The Government have enormous influence in this area. For example, over 20 years ago the car market in the UK was almost 95% a petrol car market—petrol engines. Now in my sector 95% of the cars that our members buy every year are diesels. That did not happen by accident. It happened because the Government decided they wanted to support diesels to drive down CO₂ and they made changes in the benefit-in-kind taxation system to encourage company car drivers to move from petrol to diesel. So of course the Government have a great opportunity to drive technology and to guide investment decisions.

When we talk about the technology in vehicles now, we can also see that with OLEV, which was a very good initiative in terms of a multi-Department investment in low emission vehicles. Again, if such a view or joined-up thinking approach is taken to technology, there is a great opportunity to move really quite quickly in terms of getting the technology incorporated into vehicles. In the previous session you asked a very good question: why has cruise control not got the penetration that you might expect it to have? It is because it is an additional cost. These things do not come cheap. From my time

with a manufacturer, I know a lot of investment goes into these things. I know from my time with Volvo that developing safety features does not come cheap. There is a cost to it, but consumers are extraordinarily reluctant to pay for it. For example, you only ever need a full combination of safety features in a car in the most disastrous situation, when you have an accident. Most people never think they will have an accident, although 70% of accidents on roads are driver error.

There is a whole communication point and then there is a whole incentive possibility. If we really want to get technology on to the road quicker we must think about how we incentivise it. I think that was one of the approaches that had some success but could have had even more success with OLEV and low emission vehicles—getting the right sort of incentive around those cars.

Q76 Chair: Are these developments a threat to motor manufacturing? Could motor manufacturing companies be giving way to Google as a technology expert if these developments go ahead?

Mike Hawes: Motor manufacturers are fundamental to the solution effectively. You asked about the Government support that is in place. If you look at the development of the Automotive Council and the technology workstreams, all of which have road maps that set out the development of the various technologies—be they powertrain, intelligent mobility or lightweight structures—each of them over a period of time have been the evolution of technology. That requires the input of the motor manufacturers.

We see the development of Google cars and so forth, but there is a big difference between just having technology that allows a vehicle to navigate and applying that technology on a matter of scale so that every consumer who requires a car has that availability of technology and of the vehicle to get them from A to B. We certainly see the motor industry as fundamental to the future rather than an increasingly peripheral part of that.

Q77 Chair: Does it need more support from the Government?

Mike Hawes: We could always do with more support to encourage research and development and investment in applied development as well. The framework is in place within the UK. What has been noticeable in my role is the level of interest that has been taking place in the UK over the last six or seven years, and the shift. We talked about the strength of the British motor industry in terms of attracting inward investment and design and development, which we are particularly strong in. Match that with the innovation that is already taking place in academic institutions and so forth, and the conditions are right. That said, greater support for research and development will always be welcome.

Q78 Chair: Do you feel that this is being driven by anyone or by any Department—anyone at a Government level or indeed elsewhere?

Mike Hawes: In terms of the policies?

Q79 Chair: The whole thing. We heard from the first panel about the major opportunities for the UK in taking these new technologies forward, making change and being the centre of manufacture and design innovation, but it was not clear if anyone, or any one Department, was driving this whole process forward.

Mike Hawes: I do not think it can be one single Government Department. There was talk about the need for cross-Government working. Yes, the Department for Transport is one element of it. The Department for Business, Innovation and Skills is another. In terms of academic institutions, Education is obviously another one. There needs to be that single cross-Government working.

Q80 Chair: Is that happening?

Mike Hawes: It could be improved, but if you look at the Auto Council it does draw in support from the relevant Government Departments. That is the model that the industry likes because it is a forum, not just for the industry and Government, to talk together and address some of these issues. There are academic institutions, the banks and financial, and the unions are also involved. It is a multi-stakeholder approach when you are addressing some of these big issues.

Q81 Chair: Mr Greig, do you want to add anything?

Neil Greig: I think the structures are there. From our point of view, sometimes the end user does not get the chance to have an input and perhaps it is almost too late. By the time they are presented with a vehicle, the manufacturer is not going to stop making that vehicle—they may stop making it by going out of business because they don't sell any. We would like to see a bit more user input at an early stage. That is all I would say. At the moment, in terms of research and technology, as far as we can see it is all working quite well.

Q82 Chair: Can these new technologies go into older vehicles?

Neil Greig: Not often. It depends what level you are looking at.

Gerry Keaney: It is very hard to retro-fit these things.

Q83 Chair: How much training is needed so that people can use the new technologies safely?

Mike Hawes: In terms of the current technologies, certainly when you purchase a new vehicle you will have an extensive handover, whereby they walk you through the different aspects of the various different technologies, some of which we talked about earlier but others as well. The whole purpose of these technologies is to try to make them as intuitive as possible, but you still need an understanding about how you turn on your adaptive cruise control or an awareness of autonomous emergency braking—that the car may brake for you in the event of a collision which you were unaware of. There is an awareness issue. There is a degree of training that is given when you hand over the vehicle. There is no ongoing training thereafter, though. That is up to the individual.

Neil Greig: That is fine in theory, but these days sometimes the handbook comes with a CD and no one even bothers to view it. We did some research and asked people if they would like to do shorter courses with us. One of the most popular options was, “Tell me how to use my modern car.” We do motorway driving, night driving and parking, but, “Tell me about the gadgets on my car” is one of our modules, so there is demand out there.

Q84 Martin Vickers: Going back to the level of Government support, Mr Hawes, you said quite understandably that it could be more. I appreciate that, although they may be based in Britain, we are often dealing with foreign-owned businesses and worldwide companies. Is Britain actually falling behind Japan and America? Is there anything specific that could be done to combat that possibility?

Mike Hawes: Ensuring that the research and development that takes place in the UK have the right conditions to flourish and, secondly, attracting inward investment. That is not necessarily a vehicle manufacturer setting up shop in the UK. A lot of these technologies are developed by supply chain companies. Some very big ones will develop a technology and then license it back to a variety of vehicle manufacturers. Getting them involved in the UK and what is taking place in the UK could be critical. We had the creation of the Automotive Investment Organisation. One of their challenges is to attract inward investment, and certainly research and development is an area where they are having some initial success.

Gerry Keaney: I would like to expand upon that. I think the manufacturers in this area are doing a tremendous job. The rate of investment and the progress that manufacturers are making in

technological development for the car is not very well understood. It was very well explained in the earlier session that it happens over a period of time because you have one feature and then another feature and then another feature, and surprisingly they all link up. What the UK should think about, as well as supporting R and D, is how you get more cars with more of this technology on the road quickly, because then you go through a lot of learning very quickly and drivers start to learn how to use the technology. The benefits are seen, the manufacturers get scale, the prices come down and suddenly the whole thing becomes very much more attractive from a consumer point of view, in terms of buying the product.

This is one area where we have been slow in the UK with the launch of low emission vehicles and electric vehicles into the marketplace. My members buy almost 50% of all of the new vehicles registered in the UK every year—over a million vehicles. With the right level of incentive/support, we can put a lot of vehicles with that technology on the road very quickly. Then you start to see a difference, both in terms of how it is being used and in terms of the practical benefits that accrue to society at large. It will help reduce congestion and emissions and make driving safer. There is a whole series of benefits, but we need to move quickly to get the technology on the road and into cars currently being driven.

Q85 Chloe Smith: One of our previous panellists finished by saying there were three reasons why this technology was the right thing for Britain now. The three reasons were that we have great R and D; we have manufacturers on the button; and we have the need. I would like to explore the concept of need. The debate, as it stands on the page and as we have heard this afternoon, jumps out in terms of benefit, but benefit is not necessarily the same as a need that would be damaging if it went unfulfilled. Can you each talk me through your conception of the need for this technology?

Gerry Keaney: The point was made in the earlier session that in the UK we have acute congestion issues in all of our metropolitan cities. That is not going to get better soon. Because of that congestion we have a build-up of emissions, we have a build-up of particulates and we have cancerous effects of those emissions, so there is a human need to reduce the level of pollution in our major cities and more generally across the UK.

There is a huge cost associated with accidents in motor vehicles, the vast majority of which are human-related. The car itself does not make mistakes but humans do, for all sorts of reasons. Again, this technology allows us to reduce significantly the human cost and the economic cost associated with those safety issues.

For me, there is a huge need in terms of our reliance in the UK on freight transport. There was a reference in the earlier session to platooning. There are other markets in the world where they are more advanced in putting trucks, buses and cars on the road in platoons and testing it in real-life situations on real roads. There are huge opportunities to reduce cost in terms of moving freight around the UK, which will flow all the way through to the consumer, because at the end of the day the consumer is picking up all that extra cost. For me, there are three really very specific needs: emissions and pollution, safety and in terms of freight and reducing cost.

Neil Greig: I certainly cannot argue with the emissions and the congestion arguments, although I do not think there has been set out, in terms of a vision, exactly what impact a driverless car will have on congestion. What difference would it make on the M25 at five o'clock of an evening? Will it generate a few more spaces and a few minutes less time? What does that mean?

Gerry Keaney: Let me clarify. I was not talking just about driverless cars. We are talking about technology in particular.

Neil Greig: It has not been said that we will only meet our target for congestion reduction by x technology. It has not been laid out as clearly as that for the average user. As I say, on environment we need the low emission cars. We have an issue with safety; 95% of accidents are due to human error. There seems to be a very quick leap of faith: remove the human and you remove all the

accidents. The trouble is, those 95% of human beings don't recognise that they are the problem. "I am a good driver; I don't need technology." If you ask anyone face to face, they all say the same thing. How do you get the message over to people that they might be the problem?

Certainly from our point of view we need technology that delves into that in more detail and looks at the main causes of crashes—things like failed to look and close following. These have been coming out in some of our surveys. People would like specific technology to address specific problems rather than just saying that everybody is a bad driver. Of course, as a training organisation we would like to think that at some point in this whole debate the impact of better training and better coaching could improve the driver. As has been mentioned before, if we have five star cars and five star roads, we need five star drivers. You need to train those drivers as well as offering them technology in modern cars. There has to be a role for training and coaching as well as for new technology. Certainly one of the fundamental issues is that most people don't recognise that they are the problem.

Mike Hawes: I would just add a couple of points. On the M25 question, clearly the application of some of these new technologies around connectivity allows you to maximise capacity. If you currently work on the basis of, say, a two-second rule in terms of distance, when you are platooning you are able to bring those vehicles a lot closer together and also reduce emissions, so there is a double benefit.

Q86 Chloe Smith: To be clear, reducing emissions is from less stop/starting.

Mike Hawes: Less stop/starting, but also you are operating a car much more efficiently if you are in a drag—you get a pull. If we are to believe forecasts, the population of the UK is going to grow and the demand for housing, as we all know, is particularly acute. That housing is not necessarily going to be in urban areas; it will be more dispersed so there is going to be increased demand for transport. While we do not advocate massive road building exercises, you need to maximise the capacity of the existing network. Some of these technologies offer you that ability.

The other issue I would raise is that as you move towards, and achieve, more autonomous vehicles it opens up mobility to a lot more people who are currently denied individual mobility and who may depend on public transport—people with particular disabilities that prevent them from driving. Whether that is a need or a benefit I am not so sure, but I don't really care, to be honest. It would deliver the right thing.

Q87 Jim Fitzpatrick: I would make an observation, if I may, on the language in terms of accidents. It is very much part of the discussion that is going on at the moment. Most collisions and crashes are caused by failing to look, driving too close or playing with mobile phones and so on, and these are human decisions. It implies that it could not have been avoided and it was just something that happened, whereas with crashes and collisions somebody did something to cause it. It is a very small point but it gets on my brain every time we have these discussions.

I want to ask about two points. Mr Keaney, you said that London has the second biggest car user club in the world. Was it 2,500 vehicles?

Gerry Keaney: Car sharing car clubs, yes.

Q88 Jim Fitzpatrick: That is out of 33 million vehicles nationwide. The question is, do you collectively think there is going to be a big expansion of this in the immediate future? Coming from east London—sometimes my classic cockney accent confuses people—we know car clubs because of the congestion charge in London, and there are car-free zones because of new developments and people do not have anywhere to park, so they are becoming more popular. Are you saying they will become hugely more popular, or is it just going to be an urban thing? To follow on, if we have an expansion of car clubs, and going back to the points that you were all making about driver familiarity

with the new technology and wanting to make it attractive and appealing to the buyer, how are you going to do that with car clubs when people are just buying into a vehicle now and again, which might not be the same vehicle?

Gerry Keaney: Every trend you see in terms of urbanisation tells you that our cities are becoming more congested and more densely populated. Every demographic study you read about young people living in the major cities shows that they are increasingly less motivated to learn to drive. They are less motivated to take their driving test and, where they do learn to drive, they are less interested in owning a vehicle. For my generation, the only thing you ever wanted to do at the age of 17 was to pass your driving test and get a car. I have three daughters who are not at all interested in owning a car. They live in London and they subscribe to car clubs because they only use a car once a week, once a month or whatever, but they can use it at their convenience, when they want to, and they can pay 10 quid or whatever it is going to cost them for that one journey rather than buying a car and having it sat outside their flat.

There are trends. We quote them in our paper from Frost & Sullivan, who are a very well respected research and consulting company in this whole area. I believe that car clubs are going to develop quite quickly. Part of the reason why there are only 2,500 cars in London, although there are 170,000 users, or members, signed up to these car clubs, is that sometimes it is extremely difficult to set a car club up, particularly in London. If you have to do it borough by borough by borough, it takes a long time and a significant amount of investment by the car club operators, who are now either rental companies or small start-up operations, or they can be manufacturers. A car club now is many different things and many varied things. All those lessons are now being learned and I think we will see quite a rapid application of that learning in terms of how car clubs start to develop in London and more widely in metropolitan areas outside London. Data is very hard to get in this area, but there is some data that suggests that every single car that goes into a car club can compensate for between 15 and 17 new car purchases. I suspect that manufacturers will get increasingly more creative in finding new markets for their cars elsewhere, outside the urban areas.

Q89 Jim Fitzpatrick: Do you see familiarity with the vehicle as a potential problem for people who are members of the clubs, or is it not really much of one?

Gerry Keaney: In terms of?

Q90 Jim Fitzpatrick: Being able to understand the technology. There is the jokey comment about somebody telling them how to drive the new car. If these people do not own the car, and may not get the same car each time, is that going to be a problem?

Gerry Keaney: This is an area that our members feel increasingly strongly about. I totally agree with Neil Greig here and the comments he made. I think this is a good example of an area where the technology is way ahead of the training. What you have to do to pass a driving test today probably does not include the use of adaptive cruise control, autonomous braking devices or the various radar appliances in the car itself. Our members feel that they have quite a job to do before they let somebody rent a high-end car today because that high-end car is going to be, shall we say, packed with technology. Our members have a duty of care in terms of, "Before we let you rent that car do you understand how this works and how that works?" Autonomous braking is a really good example. If you use autonomous braking in the wrong way it can be very dangerous. If you use it in the right way it is an absolutely fantastic feature.

Q91 Chair: Do we need a new driving test for the new technology?

Neil Greig: I think we will in the long run. At the moment it is probably covering the basics. We do not really want to add to the cost and complexity of passing a test, because that would put a lot of people off, but we need to cover some of the new technologies, which will be in every single car in the next few years. In fact, many people learn to drive in a fairly modern car and then can only

afford to buy an eight or 10-year-old car that does not have these things in it. One of the things about the scrappage scheme—Mr McCartney has left now—is that the people who need the modern technology most are the ones who are least able to afford it at the moment. If you talk about incentives, we would like to see incentives to get young people into cars with traction control and emergency braking, because they are the ones who really need it.

Mike Hawes: There is a very good article by an ex-pat American based here who described the British driving test as a PhD in driving compared with what he is used to in the States. Let us not underestimate that it is ever tougher to pass as it is.

Chair: Thank you very much.