HOUSE OF COMMONS

Transport Committee

Oral evidence: Mobility as a Service, HC 590

Monday 23 April 2018

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Watch the meeting

Members present: Lilian Greenwood (Chair); Steve Double; Paul Girvan; Huw Merriman; Grahame Morris; Luke Pollard; Graham Stringer; Daniel Zeichner.

Questions 77 - 141

Witnesses

I: Dr Steve Cassidy, Managing Director, ESP Group; Johan Herrlin, CEO, Ito World; Sampo Hietanen, CEO, MaaS Global; and Dr Sarah Owen-Vandersluis, Head of Trade Strategy, KPMG.

Written evidence from witnesses:

- ESP Group
- Ito World
- KPMG LLP
- MaaS Global

Examination of witnesses

Witnesses: Dr Cassidy, Johan Herrlin, Sampo Hietanen and Dr Owen-Vandersluis.

Q77 **Chair:** Welcome, and thank you very much for coming along today to give evidence to the Committee. Please would you introduce yourselves for the record of our proceedings?

Dr Owen-Vandersluis: I am Dr Sarah Owen-Vandersluis. I am a partner at KPMG LLP and head of trade strategy. As you are probably aware, KPMG is a group of independent member firms providing global advice, as well as tax and audit services. I am here in the capacity of our advisory practice that does a lot of work for transport clients around the world on their future mobility strategies and needs.

Sampo Hietanen: I am Sampo Hietanen. I am founder and CEO of MaaS Global. I am also called the father of the Mobility as a Service concept. We are the first, but not the only, Mobility as a Service operator in the world.

Dr Cassidy: I am Steve Cassidy. I work for a company called the ESP Group. We are three companies. One is called Journeycall. We are a transport specialist contact centre, so if you lose your Oyster card, for example, you ring us up. We are in the Santander bike scheme as well, and do a lot of things like Passenger Assist for train operating companies. That is based in Arbroath.

We run a company in Hull called Systex, which issues concessionary passes and has a whole range of other technologies and back offices. We issue all the national railcards. I run Viaqqio, the third company, which is a research and development company. We have a number of Mobility as a Service implementations.

Johan Herrlin: My name is Johan Herrlin. I am the CEO of Ito World. We deliver data about public transportation and other mobility-related data services to some really big players, such as Apple and Google, and to a number of Mobility as a Service providers. That is an emerging market. We also deliver a platform for cities, authorities and operators to help them work with their data and deliver data to support those downstream applications.

Q78 **Chair:** Thank you very much, and welcome to all of you. My first question is nice and easy, and it is for each of you in turn. Can you briefly state what you think the growth potential of Mobility as a Service is in the UK, and how it is likely to evolve over time?

Dr Owen-Vandersluis: We always have definitional issues with MaaS. I do not want to belabour them, but before looking at the potential it is important at least to say where I am starting from. The important dimensions of MaaS, from my point of view, are the public/private

dimension and the integration—the seamless part—with information and payments being part of it.

We see significant potential for Mobility as a Service in its direct form, which we will talk about, and because it is adjacent to the business models of so many other companies and organisations that are going through flux. For example, the auto makers are looking to get into a MaaS-type platform. Similarly, rail operators are looking to engage on first and last mile.

We see enormous potential in it. Where we are a little challenged is the extent to which it will result in either significant underlying growth of the mobility pieces below—the modes—or modal switch. We may well come on to that when we talk further about policy, but we see some demanding commercial challenges to those lower-level growth aspirations.

Sampo Hietanen: As a rule of thumb, from the end user perspective, I would say that people use roughly about 10 times the same amount for their mobility needs as they use for their mobiles and telecoms. That would give a rough estimate of the potential market.

Q79 **Chair:** How is it likely to evolve? What is your take on that, or is it too early to say?

Sampo Hietanen: The analogy for the evolution is quite similar to what happened in telecoms. In the 1980s, none of us had personal mobile operators. It would have been strange to even think about that. To say in 1985 that that was an innovative growth market with lots of potential would have been strange. We are experiencing something quite similar in transportation. If you look at the whole mobility market, it is somewhere between 10 trillion and 22 trillion. They are enormous figures. Those cards are being reshuffled.

Q80 **Chair:** Steve, do you agree? Is the potential enormous, and we cannot even get our heads round it yet?

Dr Cassidy: I know lots of people who do not use shared mobility, or buses or public transport. Last year at Journeycall we got 17 years' worth of calls in one year sorting out transport issues and problems. There are trips that people take by car. I talk to people who say that the car is the most convenient mode: "I would never use a bus," or, "I'd only use a bus for certain things." There is a lot of scope for making mobility transport—integrated transport—easy.

Unless everybody in this room has been travelling around only on public transport and shared modes for the last year, we can probably say that there is a bit of room for growth. That is everything we do. We make transport easy in the existing system that is out there. We are building on top of that. People ring us up with problems. People use our technology to travel, and there is always scope for improvement in that, through some of the things you will hear about today, such as data and different types of service. There is lots of scope for improvement.

In terms of how it will grow, the jury is not completely sorted on that one. There is lots of innovation out there. The policy is catching up; the technology is there. It depends on some of the findings of this Committee how we progress and implement. We will then be able to know how that really progresses. There are a lot of opportunities, particularly when you look at the existing system.

Q81 **Chair:** Johan, the same question for you: you have all this data that you are scraping together. What does it tell you about the potential for growth?

Johan Herrlin: From our perspective, the interesting thing we noticed is that as we started putting out at scale data on public transportation for cities around the world, and making it available through other third-party applications, we saw pretty quickly that behaviour on the ground started to change. Not only were people using more public transportation and other shared services, but they were distributing themselves a little bit more efficiently across the network as a whole because more information was available.

If you were a tourist who came to London in the 1970s or 1980s, you were probably a little intimidated about using a bus: "It's all scary; I don't know the timetables and it's confusing, so I'm going to stick to the tube because that is what everyone uses." But now that you have applications that can help to guide you through these complex things we call public transportation systems, you have a lot more confidence, and you are more willing to try other options that you otherwise would not have tried. There is more information and you begin to trust the applications.

As we see the explosion of new modes and forms of transportation, whether it be bike sharing, electric bikes or the new stand-up electric scooters that are appearing in Santa Monica and elsewhere, we see some really interesting opportunities. We see a couple of pitfalls there, but the idea of vertically integrating those solutions and being able to deliver them through a single experience is very interesting for the same reasons. You make it more accessible and easier to consume; therefore, people will distribute themselves a little more efficiently across the system. There is huge potential, and, as you well know, we are just at the very early stages.

Q82 **Chair:** That answer prompts so many questions that my head is going around. To come back on the particular example you gave about London, obviously there is more service but there is more data. One of the ways people get data about, for example, bus services is not just from using a mobile application; now, when you go to most bus stops, there are real-time information displays. Do those two things work together—physical things like real-time information displays at bus stops? Do they work alongside the apps? Are they used by different people? Are they doing different things, or, essentially, are they just different manifestations of the same information?

Johan Herrlin: That's a lot of questions. Yes, in some cases they are used by the same people, and in some cases they are used by different people. If you do not have a mobile phone, the obvious answer is that you can go to a bus stop or train station and see the running board, the countdown clocks and so on, but oftentimes they are used in conjunction and they complement each other.

The main point I was trying to make is that information informs decision making, so the more information you can get out there, the more accurate it is and the more relevant it is to the end user, the more likely they are to take action on the information they are being given. Clearly, smartphones have radicalised the way we deliver information to people and how relevant we can make it to you as an individual in that particular location.

For me, the promise of Mobility as a Service, from an individual perspective, not from a societal perspective, is about increasing convenience and accessibility to various options for public transport. From my perspective, in London now, if I want to use bike sharing, I have at least four different apps in order even to discover where those bikes are, let alone book and pay for them. If I am using new bus services, I have five of those. There are the traditional buses. VIA has just entered the market. There is the Ford Chariot. There is the Citymapper smart bus and ArrivaClick and so on. I have five of those, so that is nine apps just for those two modes of transportation. You can see that it is getting quite large and it is not very useful for the customer. It needs to be integrated because it is getting more fragmented. That is part of the discussion we are talking about here.

Q83 **Chair:** Is that one of the key functions of the Mobility as a Service app? It is a way of managing all the information that is already available in a multiplicity of other apps.

Johan Herrlin: In some ways, yes. Mobility as a Service is a fairly broad concept. It can be defined in a number of ways, as you have heard in previous testimony. One aspect is making the data and the availability of services accessible. Another portion of it has to do with how you book and pay for those things, unifying that app experience. Making available services visible through a variety of different applications, whether you consider them as MaaS, journey planning applications or TfL's home page, is a useful exercise.

Q84 **Chair:** I want to come back to how they can potentially help us with our public policy goals, but, first, for each of you, unless there is any disagreement around this, who are the main consumers of MaaS? At the moment, in terms of the people who are using it, what are their characteristics? Are they just individuals? Is it really aimed at individuals rather than family units or business fleets? Sampo, do you want to start off because you are one of the main providers of these apps?

Sampo Hietanen: A couple of weeks ago, I had breakfast with some of the users. We had predicted that most of them would start giving up their cars; we need to follow the money in all of this, and it lies with the car. We thought that they would be young professionals, somewhere between 25 to 35, either single or double households, who could live their lives without cars. But we were wrong. It seems that there are quite a lot of different potentials; 50-plus, 60-plus and 20-plus people were seeking an answer on something that they do not desire so much any more. It seems that the whole idea of car ownership has become a hassle for many city people, but they are quite under-served. Nobody else jumps in and says, "Okay, I can take care of you and we will service you for all your trips."

Of course, the most probable target would be young, urban city—what we call—car hesitants just jumping into the system, and we can still say, "Hey, we can serve you nicely." But there are quite a number of different types of people. We have allocated about 10 different categories that might need this system.

Q85 **Chair:** Do you have business users as well as individuals who are interested, for whatever reason, in deciding not to have a car?

Sampo Hietanen: We just launched a marketing campaign in Helsinki, in November. One of the things that surprised us was the number of people who wanted to sign up straightaway. We did not have a business subscription, but the biggest surprise was the number of companies, big and small, who started to call us, asking if, instead of a company car, they could give a MaaS subscription. Sadly, the tax regulation in Finland is still uncertain so we do not dare to sell that product at the moment, but we are about to start. It seems that there is quite a lot of demand for it. It is not just your company trips; that is the really important thing. If you get a company car, it will take care of your personal trips and your business trips, so we cannot just have a business subscription. It does not compete with the car otherwise.

Q86 **Chair:** Steve, what is your experience?

Dr Cassidy: It is not an app; it is a service that will have different features—we call them value features—for different bits of the segment. The people we work with are young, 16 to 25, and we are co-designing services with them. We have co-designed services for people with dementia. We have co-designed some services with a train operating company for people who are going through cancer treatment. We are now doing work with over-65s who are giving up their car.

Q87 **Chair:** Is that because they are groups you have identified as potentially being interested, or are they where you think there is a demand?

Dr Cassidy: Mobility as a Service only has a future, like any business or service, if it delivers value, as people go through particular life events. I remember when my dad took me into the front room and told me he was giving up the car. I thought he was going to tell me some terrible news,

and for him it was terrible news. It was a big event for him as an older man. He was losing his identity. We have always focused on co-designing services with people who are starting to reconsider their mobility. The service has to provide something extra or a value feature.

It will have core functions. We have already talked about trip planning. Payment and all those things will be in there, but it will look and feel different. Who am I, as a middle-aged white man, to say exactly what it would be like for someone who is going through dementia? We get them to design the layer on top. As soon as we know what will attract those people, we keep them engaged and solve their problems, which is where it started; we have to make life easier for people and solve the problems. The problems that they face are not for me to define; that is for them to define. We should put mobility into that. We should inject that into mobility, so we have designed a number of features, which maybe we can talk about later, for people with dementia, people going through cancer treatment, and younger and older people.

They basically want the same system, but they need other things that will keep them engaged in the system and really meet their needs. We can explore those. It has to be about value. Quite often, that value is not about transport. It is about something else to do with transport. It is about connectivity, getting to hospital, and so on.

Dr Owen-Vandersluis: I would like to clarify, with respect, that the discussion that Sampo and Steve are having is about the most ambitious and value-added version of MaaS. When we hear about MaaS models generally, they take a lot of different forms, so we have to be a little bit careful. An integrated payment mechanism for two or three types of transport, without necessarily having some of these value-adding features, will be called MaaS. If you look at models in cities around the world—for example, Vienna is talked about a lot—it is the simplest form of aggregator model. It is basically a click-through model to underlying service providers.

Barcelona goes a bit further than that, but, as I understand it, they are not talking about the kind of sophistication of subscription models or user-driven models that are being discussed here. Those simpler models are extensions of existing businesses for the most part. The easiest customers to integrate into those models will be the most straightforward ones in terms of their journey types and payment.

Q88 **Chair:** People who currently use public transport.

Dr Owen-Vandersluis: Probably younger, more urban people. As I said, the basic expectations will be the easiest ones to service in those simpler models. We would question whether those simpler models are much more than the aggregation of underlying transport modes, and therefore whether value is being created or just shifted around between different entities. That is an important question. It is an important standard to judge ourselves by when we ask whether MaaS will grow. Let us be sure

where we are generating value. When we come to how we might rethink some of this to meet policy goals better, looking at the total value pools is quite important as well.

Q89 **Chair:** Johan, is there anything you want to add on the question of who the main consumers of MaaS are? Is it all about the individual with their smartphone?

Johan Herrlin: I do not think so. One of the earliest implementations of this—it was not called MaaS at the time—was in relation to commuters. In the US, they started developing commuter-based apps 10 years ago. Part of the reason was that the economics made sense. Large corporations with campuses had to maintain expensive parking and so on. If they could get a small fraction of them to use shared rides or some other form of transportation to get to work—public transportation and other means—it would make sense for them to sponsor that. They started putting together programmes, and companies such as RideAmigos built apps, experiences and services that would specifically cater for those markets.

They morphed into serving cities themselves, with local governments trying to provide similar kinds of services because they too have big campuses with lots of people, like here for instance, who come to work every day and need different ways to get in. MaaS is in some ways a catch-all term for many different kinds of services, not just apps, that deliver value by making it easier to consume transportation options of various kinds.

Q90 **Chair:** In terms of both your answer and a couple of the other answers, we have started to touch on one of the issues we want to explore next, which is whether MaaS solutions can contribute to the achievement of wider public policy goals—for example, getting people out of their individual cars and into car sharing or using public transport. Obviously that can help with air quality and tackling congestion. It can lead potentially to healthier living and improve access to services for disadvantaged groups. Steve started to touch on some of that. Have you seen any specific evidence of MaaS helping to deliver on any of the sorts of wider public policy goals that I have just mentioned?

Johan Herrlin: The only specific evidence I can offer is the experience we had when we started making the data available to large providers for cities around the world. There were more people using public transportation and they used it a little bit more efficiently. That was the feedback we received from the cities in which we operated.

I can only imagine that, as you make data available, people will make slightly different choices. There is a panacea version of that, and then there is the opposite where it all falls apart. In the panacea version, of course people stop using their private cars and they only use taxis as an emergency when they need them. They bike and walk everywhere and are doing healthy things. That world will probably not be exactly the way

things work out. The opposite could also be true, in that people choose to use different forms of public transportation that do not really take cars off the road. Maybe it is on-demand ride hailing; maybe it is the new smaller buses that are coming in, which may add to the total number of vehicles on the roads unless you manage it well.

Where we are going to fall in that continuum is really hard to tell. It is the responsibility of folks such as yourselves to put the appropriate legislation in place to guide the behaviour of private and public actors to drive those larger societal goals. On an individual level, from my own perspective, on a daily basis, I will choose to do what works for me and my broader life. I know that there are bigger societal things that I need to think about, but they do not really factor into how I am going to commute. It has to be convenient, accessible and affordable, otherwise I will make a different choice.

Q91 **Chair:** That is a really interesting answer, which puts the onus back on us to shape where it lands, so to speak. Is there anywhere that is looking at MaaS-type solutions with a public policy goal in mind, and trying to do what you have just described, which is to shape where on the continuum we end up?

Dr Cassidy: It is happening day in, day out in the transport system, but it depends if we are going to call some of the things I will mention MaaS, which we are probably not, such as concessionary passes, national railcards and passenger assistance. All of those things exist and make a difference to people's lives. They promote policy in terms of inclusion and by helping people not to feel that they have to own a car.

There is lots of work on the benefits of some of the specific services that are out there. The issue for us, which we found when working with people and designing services with them, is that they are not aware of those services. They do not use them properly and there is misinformation around mobility for people who are going through a whole customer journey, particularly when their lives change. They say, "Oh my goodness, public transport looks scary. What the heck is a car club?" There is a real disconnect in the existing tools.

We see MaaS as bringing some of those existing services together under an umbrella and making them available in a much simpler way for those particular segments. The answer is, yes, there are real public policy objectives that have been achieved by mobility. We fully and completely buy into the idea that, if you can get good mobility, it will sort out health, integration and social services and make cities work financially. It is how you can bring that together so that awareness, use and loyalty continue.

In terms of the impact, very anecdotally, we have a service in Dundee called NaviGoGo. It is designed by young people, 16 to 25-year-olds. We are doing some work with some of the users who designed and have been using that service. We are getting stories such as, "At last I can travel without anxiety, because anxiety is a big problem for me, and

therefore I can now go for a job interview." We are talking to people who were car users who used the train occasionally. Now because of NaviGoGo they have suddenly realised that the train service works for them; it is easy, it is on a web app and they can ring up an adviser if they need to. Suddenly, it has opened up.

There are other stories around dementia. We have taken people with dementia on to the system on shared journeys and got them to use Passenger Assist: "I never knew I could use passenger assistance; I never knew it was available for me. Gosh, aren't these people brilliant?" Opening it up through a platform can really change people's lived experience of mobility. Maybe we will talk about the business model, and that is where some of the model can work. We have various figures on that. That is a very long answer to your question.

Q92 **Chair:** It is an interesting answer. You said there is anecdotal information about it, and I can imagine all the things you have described. Is there anywhere that pulls together evidence that might support those sorts of interventions or solutions?

Dr Cassidy: The real hard evidence comes from some existing tools that we have, and some of the things we are doing and implementing. There is evidence that people like the services and start to use the services. Then you can extrapolate from that and make some assumptions based on a future model, which is probably why we are still working, and gives us a lot of hope that that will happen. That is a long way of saying that we are not really sure.

Q93 **Chair:** Sampo, your service has been working in Helsinki most effectively for some time. What does that show us in terms of evidence, if there are wider policy goals?

Sampo Hietanen: It is a big phenomenon if you are up against the car; it has been here for 100 years. We did a study of those who used mobility subscription instead of a car. They roughly used about €100 more for their mobility and transportation services than they did before, which is quite a lot in the market square, when it used to be about €20.

Their modal split for public transport went from 48 to 72, which is quite good. For now, we do not track all our users for all their walking and biking; Helsinki is quite large. The city bike has just arrived, but the public transport share of all of our trips has been about 91%. It is quite nice, with 35,000 people using it out of a city of half a million, which is quite good.

It is still early days. As an example of how to get this in motion, whether it is automated vehicles driving you door to door or whether it is a plugged-in city, a Canadian colleague of mine says that MaaS needs to happen before the AVs hit the roads so that we make sure that it works for the benefit of the cities as well, which I would say is quite true.

A good example on the country legislation side is the Finnish transport code. It shows how the market will be shaped. On the city side, I love the example of Hamburg. If you want to have a plugged-in city, you also need to start reshaping the area so that it really plugs into public transport. It is not that you try to force people on to public transport, but you make areas where all kinds of innovation can plug in.

For creating markets I like Belgium. They are advancing with a mobility budget. They started opening up the market with a bit of a shift, with company cars being shifted into mobility. That is a really smart move.

Q94 **Chair:** They are doing something to encourage a company to offer some sort of Mobility as a Service package rather than a company car.

Sampo Hietanen: Exactly. Everywhere in Europe, the most lucrative part of selling a MaaS package is business subscriptions. There is not really a clear definition of how they would be taxed, which is really a disadvantage for the likes of us selling it.

Q95 **Chair:** Sarah, do you have anything to add?

Dr Owen-Vandersluis: I would reiterate that it is early days, but these are quite fast-moving markets with a number of commercial players that are trying to reposition themselves, and that creates particular challenges for policy. It is difficult to know, and the answer we collectively come up with will not be a 20-year answer. It will probably be shorter term. I guess what I am trying to say is that you want more flexible regulation.

I think it is fair to say, having travelled around and spoken to a number of authorities overseas, that many of them are just coming alive to some of the challenges. There are potential downside risks, from a public policy point of view, of a totally unconstrained market. If you are asking whether any other country or city has the answer, or a guidebook that we could follow, the answer is no, not yet. We are seeing different moves and initiatives. Some things have been mentioned that we could look to.

We have to recall that different cities and authorities have different objectives. If you look at transport issues and the view of the car, particularly in a place like Singapore, they will be trying to maximise a different balance of policy objectives from what we would be doing in any one of our UK cities, not to mention across the country as a whole. There is more thinking to be done. We also have to think about the risks of not doing anything at all, which is a difficult position to be in.

Q96 **Chair:** Before we move on, is there any evidence to suggest that MaaS could have a negative impact—for example, more use of taxis and private hire rather than public transport or active travel? If so, how could you mitigate it?

Dr Cassidy: There is concern that taxi use will increase, particularly single-occupancy taxi use. In our young persons' trial in Dundee, we saw an increase in taxi use, but there was disappointment among our users

that the local bus operator had not fully integrated. We can come back to that.

Q97 **Chair:** They were not part of the scheme.

Dr Cassidy: They were not part of it. They had a very small part, but a lot of bus companies in the UK market like to keep their own customers. That is quite a common thing. It depends what we try to achieve, particularly given the segments we go to. We think there is a lot of potential in those segments to increase their use of shared miles and public transport, and we want to grow the pie. We will have failed if we cannot generate extra trips for shared modes. So far, our trials have been about demonstrating that, and we are getting data through on that.

If we grow the pie and some extra trips have gone to taxis, but overall the pie has still increased, that is not a bad thing, but we need to look at those figures. On the policy side, it is important that it is designed in early on. We have integrated the national entitlement card, which is the Scottish concessionary pass that does a whole range of other things as well. As a company we issue 2.4 million cards. You can link that card to the NaviGoGo account and get reward points for undertaking different types of journeys, which are facilitated by a large, young persons' charity. That policy is almost designed into the service. They still have the same basic rudimentary functions, such as payment, booking and journey planning, but how they are put together and what you are trying to achieve should be designed in early on. That can be put on top of the service quite quickly.

Sampo Hietanen: In any disruption, there is a threat that things do not go well. In some particular cases, we see a large rise in taxi usage, but all of those individuals used zero public transport before, so even one bus ride is extra for them. There is a bit of a threat if public transport does not open up fast enough so that you can plug all those things into public transport. Everything else then starts to become a package together, and public transport is left outside. As a European, this is a bit of a worry of mine in market creation. As Sarah said, these markets are moving extremely fast and lots of investment is going in. If the winning model comes from places where public transport is not really at the core of the system, there is a bit of a fear that public transport will be left alone; everything else will integrate, and it will be left alone to fight.

Dr Owen-Vandersluis: I will be direct. I do not think there is anything in MaaS by definition that drives better modal choice among individuals. Increased information might encourage people in one direction or another; maybe because it is cheaper or quicker. MaaS gives us the tools to be able to start nudging individuals, whether that be through selective information, through price or through simply saying, "Hey, you could take a healthy option," but that has to be designed into it. Those nudges could equally be, "Why wouldn't you take a car of this particular brand?" or, "Why wouldn't you take a point-to-point journey?" In those cases, I fear particularly for modes that are not revenue generating; for example,

walking is one element where we need to think about how to nudge people through MaaS and not just assume that it will necessarily happen in every MaaS scheme. That is the flipside of what Sampo was saying about its depending on which type of MaaS wins out commercially soonest. There could be some challenges.

Johan Herrlin: I totally agree. There is nothing inherently altruistic about MaaS as a concept. It is a mechanism to deliver a set of services. That is all it is. Increasing options will change people's behaviour. We have seen that in many cities around the world with things like bike sharing. That started to fill in gaps in public transportation services, and people are using them, especially with free-floating services, to fill those gaps. We see some small-level evidence of benefits.

That said, I can definitely see a scenario whereby the public transportation options get marginalised to servicing the non-profitable routes and the difficult areas to serve, or are only in disadvantaged areas, and private operators take the good routes and the profitable areas. There is a very real danger that that could happen. That is the dystopian version of MaaS in some ways. That is why it requires the solution to be designed. It cannot just happen, because I do not think we will necessarily get the outcomes we might want as a society.

Q98 **Chair:** Designed by whom?

Johan Herrlin: That is a really good question, too. The actors who might enter the market in the next few years to deliver some sort of MaaS platform will have a variety of different motivations. Some will do it because they have a grand vision for reducing car ownership. Others will do it to earn money, and that's it. Others will be public operators, authorities and public transportation organisations that partner with private organisations that may have slightly different agendas and will be driving those policy agendas.

It is really hard to answer. How do you influence the outcome? I do not know that I have the right answer for that.

Chair: I have dominated rather, so I am going to move on a bit. I will hand over to Daniel, who has questions about data.

Q99 **Daniel Zeichner:** This follows on quite seamlessly from where we were just now. A lot of this is about data, and the new opportunities that are emerging. Could you say a little bit about the key elements of data that are making MaaS possible at the moment? What sort of data can you currently access that make it possible for you to do what you are doing?

Johan Herrlin: The company that I run is all about data and data quality. We see a huge gap. Fundamentally, our role is to take data that is designed for operational purposes, by and large—managing fleets of vehicles, be they buses, trains, trams or ferries—and transform that into human, navigable datasets. There is a big gap, and that is what our company fills.

The thing to remember about data is that, when you are talking about digital data you send to phones or MaaS applications and so on, there are two implications. One is that journey planners do not understand the underlying meaning of the data in any meaningful way. What I mean by that is that we have seen many situations where there are simple coding errors in the data that we receive from operators.

There is a really great example. A bus appeared to be travelling at 70 mph across central London. We can laugh at that, it sounds funny, but what happened? The journey planners received the data and when their algorithm said, "I want to get from A to B," they all recommended that journey for everybody; it was always the fastest way to get from A to B, because you were travelling at 70 mph. Of course, that was not the reality, and the bus driver looked out of the window, saw a long line of people, and wondered what the heck was going on. It is a little bit funny, but it is not funny if I miss a meeting because of that or if I do not get to my job interview. A simple coding error can have very large implications because now we are handing this out to algorithms that are making decisions, and they do not understand when it is obviously incorrect. That is one implication.

The other implication is that in order to plan and execute a journey you need a lot of information, especially if you are not particularly familiar with the system. That is everything from the actual schedules to the physical location of stops and the stop sequencing, which is often incorrect in the data. We have to manually add the head signs to the data about buses, because it does not exist in the dataset. We add service branding and line colours and so on, all in an effort to try to create data that is as close as possible to the real-life customer experience that people have while travelling on those networks.

A lot is required to make a good user experience. It has to be trustworthy. It cannot be incorrect—it just can't be. I often use the analogy of cars. If you get into a car today and you are using a satnav system, and it tells you to take the next right on Main Street but when you get there it is not called Main Street, that is the last time you will use that app. You will never use that satnav system again. Our idea of good is so high now, and our standards are so high, that we just go on to the next app.

The same thing is happening in the public transport sector. People are coming to expect to be guided through stations. They expect to be guided to exactly which platform to go to, and if the information is wrong they will go to someone who can provide it. Again, there are many examples that I can give of things going wrong in the data. It has rather dramatic effects.

Just last year, there was a coding error around Christmas time. It made it so that, basically, all services in the UK looked like they were running a normal schedule on Christmas day. That is a real problem for people if

they are planning a journey and in fact that is not the case. It is very disruptive to people's lives. That happened to be on a day when there were not as many people travelling, obviously, but if you are travelling on Christmas day it probably really matters. It has to be right.

Q100 **Daniel Zeichner:** Are there any other experiences?

Sampo Hietanen: We need to define data a bit: the value of data, what the data is and who it is valuable to. Thinking about value created, we all like journey planners, we like traffic information and all of that, but there are zero pounds for that. It does not bring much value for end users. The one that has value is really getting you there.

It becomes valuable if you look at the analogy from telecoms again. I do not really care how they connect me if I call home to Finland. I just care that they fix it. A similar thing will apply to mobility in transport more and more. What is valuable in the data? Of course, you need the underlying data about how you get there, and all of that data needs to be in place. But if you do not have payment in the background, it is hard to justify any consumer money for it.

How you make business out of data will change once we get into transportation. If I am a mobility operator, and I am asking for £300 as a subscription price for mobility needs, I am not going to be selling that data in the background. The value of selling that data is way less than £1. I would rather make sure that you have your data, and that is a bit of a difference now that we are disrupting bigger fields of business such as transportation. There are quite big differences ahead in the logic and structure of data.

Q101 **Daniel Zeichner:** Whose data is it, and why should they share it? Is that already an obstacle which you are struggling with?

Sampo Hietanen: In our opinion, it is your data. That's it. If you want to open your API to any other providers, we are willing to do that. This does not just come back to altruistic means; if we are getting subscription money out of the consumer, it changes the logic. The product that we are selling is not the data in the background for some kind of advertisement. It is really getting the money out of the end user. It does not make much sense for us to sell that for little money.

Q102 **Daniel Zeichner:** You would see it as being the passenger's data and not, for instance, the bus operator's data.

Sampo Hietanen: Mostly it helps to think of it as always the end user's data.

Q103 **Daniel Zeichner:** But at the moment that is not quite how the bus operators necessarily see it, is it?

Sampo Hietanen: That is how we see it. We really want to get our consumers to trust us and give us their money.

Q104 **Daniel Zeichner:** To make MaaS a reality, is that where we need to get to?

Sampo Hietanen: It is not a prerequisite for everything, but I would strongly argue that that is the way the markets are going. At the same time, in answer to some of the previous discussion, I think the world is looking for markets where Governments and cities show market vision—this is how we foresee a future market. The whole of MaaS somehow needs a coming together of public transport, taxis, car shares, bike shares, car OEMs and many others within the field. It is hard to come back with a joint vision. The world really needs political leadership to show how we envision the market.

Q105 **Daniel Zeichner:** Going back to Johan's point, if the data is not accurate and things go wrong, who bears responsibility within the system at that point?

Sampo Hietanen: When we are the mobility operator, we always have to bear the risk. This is a tough one, but it brings us to a point where we would need what we call an SLA—a service level agreement—with all of the providers' data. That is sometimes hard if the data is provided free for us from any public entity. If we do not get a service level agreement, and we are already chaining it up quite far, it is hard to pinpoint. We still somehow have to make it good for our end users, but if it does not go through the whole value chain it will be hard.

Q106 **Daniel Zeichner:** Is it going to need certain standards for the various transport operators to make it a technical reality? We have a commitment to open data in the bus service industry, but it seems that quite often the data is presented in forms that are not very usable.

Sampo Hietanen: There is a need for that, but there is also a need for extending what open data means. Open data without the payment on top is of little value. The end user value for that is zero. If the payment is not part of the open data scheme, we will end up with quality issues over and over again, because there is no actual market on top of that.

Dr Owen-Vandersluis: We have been talking a lot about transport operators and public transport, but, for me, one of the critical areas of competition around MaaS is the car. The discussion around data needs to extend, as Sampo mentioned, to the OEMs and to the car club providers. We have to understand that some of that data is probably being withheld at the moment for competitive reasons, as it is in all parts of the sector. Some of it is probably just not occurring in a form that is easy to share with other players in the ecosystem. There will probably be a cost and an inconvenience to some players in the system to get that data out.

There are two points from that. First of all, why would you do that proactively unless someone has indicated to you what is needed? Secondly, there may need to be a nudge to do that as well. Without the car piece, it is going to be very difficult for MaaS operators to generate some of the value we are talking about.

Q107 **Daniel Zeichner:** It seems to me that there are some commercial tensions in all of this. In recent years, the most disruptive industry is the taxi industry, with Uber and surge pricing, where obviously data is key. Given that that is the commercial model, how can it work with what sounds like a much more public-spirited kind of approach? Isn't there a fundamental problem at the heart of that?

Johan Herrlin: We really need to encourage that data sharing. In my opinion, there should be a "No data, no service" policy for public services, for sure. That can be extended to a number of other services. It does not mean that you necessarily have to know where every single Uber car is. They would not give that up because it would expose their entire business model, which allows them to compete. What is the service level agreement and in what area is perhaps an appropriate thing to provide. The nearest accessible bike to your current location is a good dataset to give, because you are not giving away competitive advantages.

On the public transport side, there are some impediments to people sharing, but I do not think we should accept that. If you want to deliver a public transport service, the trade-off is that you should make the data available for others to incorporate and integrate in an efficient way. The responsibility at central Government level is to define the standards for that data, not the mechanism by which the data gets shared, if that makes sense.

Dr Cassidy: There are three bits of data that we use. One is definitely the things we were talking about—the operational data. The things that we have struggled to get are fare stages and prices from the bus. That has been our biggest problem. I completely agree with the last statement from Johan. I agree that booking and payment is an important part of the operational data to make things work.

The other data we get from our users is their preferences—what they like, what they worry about and what their mobility problems are. There is some basic data that allows us to understand what type of ticket or mobility would work for them. Thinking about the segments I have talked about, they are very different. For example, we have an algorithm that matches people, based on a few questions, to some things that might work for them. In Scotland, with a Young Scot card you get money off local flights. People did not know about that and they have started consuming them. That is great; it is just opening up that system. Preferences are important to us.

The other bit of data is right at the beginning—the design data. We have already touched on it. What do they want? We have been working with old people living with dementia in a project funded by the Life Changes Trust. People were scared when they got a diagnosis, or maybe a one-year driving licence. The data they wanted was what happened at DVLA after they had talked to a doctor or made a decision—where they are in the pathway of finding out from DVLA what is happening. They also wanted a calculator to say, "Okay, this is how much my car is costing me

at the moment. The future is really scary but actually, when I work it out, I can get a whole range of different concessions and ways of doing things by joining the service." Suddenly, it does not look so bad: "Let's try it for a bit and see, while I've got this one-year pass."

It is about co-designed data to develop some of those features. We very much see it as that we just provide a platform and a marketplace for that. We can point people in the right direction and provide the service to allow people to make good decisions and open up the system. On the operational data, I very much agree with what has been said. We get preference data through talking to people who want to join the service. The other thing is that really early on we design the service around what people want and the tools they need.

Q108 **Daniel Zeichner:** Obviously data has been in the news recently. We also have a Data Protection Bill going through Parliament implementing the general data protection regulations. What effect is GDPR likely to have on MaaS? What are the opportunities and the risks, as you see them?

Sampo Hietanen: All in all, it is actually soothing for markets if there is regulation. Our idea is that it is your data, so we see that it is mostly possible if that is done. Of course, I am not technical enough to know whether it goes too much into detail or not. It remains to be seen what the interpretations are. But, all in all, I am in favour.

Dr Cassidy: It is business as usual for us. We have issued 56 million smartcards in the last 10 years. We have 40 million cards under management. We pick up the phone and handle data on behalf of our clients, be it TfL or the train operating companies. We live by data security. With GDPR, there are some new rules, but it is what we live with. It is important, because it engenders trust. If there is no trust in any of the things we do, we are all sunk. We do not see anything tighter on that as being a problem.

Q109 **Steve Double:** We have touched on this already, but I have a very specific question. How great is the risk that transport operators will refuse to open up their data? How much of a risk is there that that could potentially undermine the whole MaaS concept?

Sampo Hietanen: I have gone around about 100 areas where we have looked more thoroughly. At the moment, that is the biggest hurdle. To have any sustainable economic sense in the longer term, MaaS needs to be in the market of being comparable with car ownership. That is where the money is and where 85% of the market is, so we really need to go in that direction or it will be hard to be sustainable.

To provide that needs more than just public transport and taxis. It needs cars, bikes and quite a lot to have supply density. A car exists in individual minds, and this will be solved in individual minds. It is a freedom guarantee that you can go anywhere. Many Londoners do not have a car for London; it is to get out of London in most cases. That

means we need quite a lot of that supply. If the basic elements within a given area are not willing to open up for one reason or another, it is hard to go out there.

I predict that this will not be a long-term thing. Of course, those markets are the forerunners and will open up the market so that the layers of transportation and aggregation, or MaaS, are separated from one another. That is enabled by opening up as much as possible. They will be the winners in the market evolution. I am glad to be here, because I have a strong belief that there is a lot of potential, especially in the UK. Many of the players are market driven, so they are keen on getting a lot of new markets. There is also a lot of tradition in how to regulate markets so that they can actually bloom. At least we are happy in Birmingham.

Dr Owen-Vandersluis: The answer needs to be tuned just a little bit, in the sense that I personally think that, in the way we have defined it, MaaS is coming. Whether it is coming via OEMs and their mobility models or by existing on-demand providers creating alliances and then trying to integrate public data into their platforms, it is going to happen. If we then want it to be within a framework that has the best chance of meeting our overall policy goals, including fair and effective competition and equity—it is not just our transport policy goals that matter—some level of data sharing and protocols around data sharing will be essential.

We have a tendency philosophically to think that if it is public data, we should be sharing it to enable effective markets to be developed—if it is data funded by the taxpayer in its collection. We do not necessarily tend to think the other way around, and that there may be ecosystems of players that have data that will enable us to do better transport planning in circumstances of significant congestion, for example. We need to think through much more specifically what types of data and what those standards are to try to strike that balance.

Johan Herrlin: Clearly, I think that data standards and making data publicly available is really important. Open data is what underpins all of this from a public transport perspective, but we need to think much more broadly than that. It is not just about public transport. If we are going to create a level playing field, where we have both traditional public transport—for instance, buses in London—as well as new demand-responsive bus services and so on all entering the same space, we need a way for data to be shared about all of those that does not benefit one player or another disproportionately, or penalise one player or another disproportionately. That is when we get into trouble. Creating a level playing field is really critical, both for private and for public operators.

As I said, there is a continuum of value of data to the individual organisation. If I am TfL and I am collecting to and from where I swipe in and swipe out, it gives me some degree of information. If I am Uber and I know that you live here and work here, there is a different kind of value associated with that information, for better or for worse. Those cannot be

treated equally. We need to respect that. There is a continuum of the appropriate data to share for different types of organisations that will benefit the creation of the market. That is the real key discussion to have. I do not know that I have the answer, but some level of information should be published about anyone who is offering a transportation service.

The key will be to define what the data need to be and what the standards need to look like. How organisations make that available can vary. Decentralising the publishing of that information, but centralising the standards for that information, is a very good idea.

Dr Cassidy: There is a risk around that. What is happening with the Bus Services Act will be helpful. It is no coincidence that, in areas where authorities have more power, there is interest in MaaS and its implementation. We have struggled with some of those things. Hopefully, if operators, particularly bus operators, are getting public funding, there should be an onus to provide certain bits of data, at least the base data. What we have struggled with are fare stages and price. That is one thing.

The other thing that is very important to keep the operators involved is a real onus on us. It goes back to something I said earlier. We have to prove that we can grow the market. Can I, with hands up, go to a bus operator and say, "Okay, do you want all of these people who are living with dementia to access your services? We can bring them to you. We can provide that for you. Can we grow the market for you from younger people?" What do we offer on top of their services?

I sit on the board of a massively successful, publicly owned bus company. They do a fantastic job and are great, but I often think, "What more can MaaS bring to them?" I have to be able to bring customers at a lower price than it currently costs them to get a new loyal customer, and I have to be able to prove that I can do it. There is an onus on us to do that. There is a risk, but it is not always about someone else having to do something. We have to prove that, which is one of the reasons why we are doing the work we are doing.

Q110 **Steve Double:** Do you think there is a role for Government in promoting data sharing? You are nodding.

Johan Herrlin: As I said, I think there should be a "No data, no service" policy, and that you have to share data. Exactly what data needs to be defined, but you have to share data about the service you are offering, if you are offering a transportation service. That would be huge. In Finland, they already have similar policies in place. It is about levelling the playing field and making that data available in a useful way.

We talked about the problem of quality. We take the data. In the UK, for instance, non-rail requires 97,000 changes to the data in order to make it useful for our downstream customers. That is huge. We have surveyed 500 cities around the world, and we see the same problem everywhere.

The UK is a particularly complex market, because of deregulation and so on, and the competition that forms. Some of the regulatory policies make some operators nervous about giving up their data. If you just look at statistics as important, that is holding operators accountable for a level of performance without the local context for why they might be underperforming. They want to hold on to that data for fear of being penalised by the Government in the first place. It is about finding a balance: holding operators accountable for delivering a quality service but not being so onerous that it makes them unwilling to give up their data for fear of being called out on it. That is important.

Sampo Hietanen: I like the Finnish regulation, where, as of 1 January, if you have any public transport you have to have an API, including booking and payment for third-party service providers. Period. There is now a new one that says "on behalf of purchasing," so even commercial services will have to have an API.

I am not too much in favour of pushing this, because it should be a voluntary thing. I would suggest to Governments that they have rights for users. It is pretty easy to say that the users deserve a few things. They should get to choose between MaaS operators, so that there is not just one. There should be fair competition and many to choose from. What is good about cars is that you get to choose from hundreds of beautiful different options that are individually made for you.

Secondly, you should have the right, with the operator who does it for you, to access everything in a city. It does not make sense that you have this car share or that bike share but not everything. How do you make that kind of market happen? The world really is looking for a clear market vision of how Governments will really enforce this, and make sure that the market goes that way. The opening up of data derives from that market vision.

Q111 **Steve Double:** I have a question for Johan. Can you explain why you believe the process and the technology for registering with the traffic commissioners does not fit the needs of a modern transport environment?

Johan Herrlin: Yes. This is a super-specific example, so I apologise to everyone who does not know it. Basically the process, if you are offering a new bus service in the UK, is that you have to submit a form that is mostly written. I believe there is an e-form option now but it is still a form that you fill in manually. It gets sent to the traffic commissioner 56 days ahead of the start of the service. The schedules and all the data are not required for that. It is simply several stops along the route, but not all of them, and some service timings.

Local authorities monitor those manual handwritten submissions. They try to transcribe them and turn them into schedule data with actual stops along the way, which they usually cannot match because it is incomplete information. If they do not pay close enough attention, it does not

appear, so it never makes its way into the national database that has all of that data.

There is also a fee associated with it. The fee is relatively modest; it is £60 per submission, but it is £60 per submission for every line and every change that is ever made. It puts a massive burden on small operators. When they make changes, they are sometimes reluctant to do an update in that manual process, not only because it is painful to do the manual update, but because they have to pay the fee again. Of course, as you can imagine, they are making changes all the time. In a deregulated market such as we have, they are always changing, because they are competing against each other.

Instead of doing that, we propose that the changes get made directly in the TNDS database immediately by the operators, so that they create a schedule and it can be listed as a draft until such time as it is actually made available. Then you would have real data in a format that cuts out the need for local authorities to monitor manual submissions from operators that are incomplete in the first place. It is a crazy system at the moment. Instead, it would get pushed into that centralised database. It is fantastic that the UK has this. It is one of the few markets that already has it. We should leverage that and make it available.

Large operators would be happy with that solution. The smaller operators would need some support, but the market has tools that can be made available to them. They might need support from central Government to have access to those tools. That would definitely be our strong recommendation. Does that make sense?

Steve Double: That is very good because you answered my final question, which was what would you do about it. Thank you.

Chair: We want to look a bit further at data standards.

Q112 **Huw Merriman:** The point has already been made about some of the data protection that exists. I want to ask Sampo specifically about the Finnish Transport Service Act and governing standards. What has the implication been for the Whim app in Helsinki? This is linked to legislation empowering the apps that we are talking about.

Sampo Hietanen: It started from the Ministry having a strong market vision: "We want to open up these markets for MaaS operators." Transport operators started developing it further and this is the end of it. All of the regulation was looked at, with the idea that it would be future-proof. There are a few key points for us.

First, if you want to make a new trend for consumer markets, it takes a lot of money. To ensure that the investment is not made in vain, it is good that we know the APIs exist. It may sound harsh, but sometimes you need to force markets open, especially for players who may hold on for monopolistic reasons or for whatever reason, to make sure that the ingredients for MaaS exist. That is number one.

Number two is enabling new types of services coming to the market to really compete against car ownership. Just having the existing modes of transportation probably will not do. There will have to be quite a lot of innovation in shared rides, shared segways or whatever drones may come in. The new legislation enables new types of innovation that can plug into the MaaS ecosystem.

The market vision is making sure that you can invest in the aggregation part of it, because you know that the bits and pieces will not disappear afterwards, and enabling new pieces for the whole ecosystem.

Q113 **Huw Merriman:** I have an ancillary question that relates in a way to the point you were leading me to, Chair. Sampo, in Finland, has there been a recent culture, as we have experienced here, where there are perhaps concerns about sharing data or indeed personal space from a safeguarding perspective? One can see some of those being constraints towards MaaS developing in this country. Have they been barriers in Finland, or is Finland a little more open to the concept of sharing?

Sampo Hietanen: Not so much in opening. Of course, privacy and data protection is a big issue, but by opening up with the Whim app we can purchase tickets on behalf of our users. That does not itself violate anything. We are not asking for any personal data from different providers. In that respect it has not been an issue, but privacy and data protection laws are about as strict as they would be in the UK. Yes, the concerns are as high.

Q114 **Huw Merriman:** Yet it has not proved a barrier to implementing what you have just described; okay.

Sampo Hietanen: Yes, yes.

Huw Merriman: No; thank you.

Chair: We want to look at business models now.

Q115 **Grahame Morris:** In earlier evidence, we heard that there is no kind of ready-made, off-the-shelf business model that we could apply here in the United Kingdom. You have touched on some of these things, but in order to aid our understanding as a Committee, are the best solutions for making a financially sustainable business model private and public sector models, incorporating both sectors?

Sampo Hietanen: It is a B2C market. If you cannot sell the system to the end users, so that it is as appealing as the car, and brings dreams like the car, you are not really adding value. To be able to produce it, you have to combine the private and public parts of transportation. In that sense, it is a coming together of both of them, but my strong opinion is that the end result—the actual operators like ourselves—will have to be private and go with the consumer money.

Q116 **Grahame Morris:** Is that the only model? Steve was talking earlier about designing systems for people suffering from dementia, or for

groups of young people in Scotland and so on. Are there a variety of business models that could be developed?

Dr Cassidy: Yes, I think there are. Going back to what I said right at the beginning about the work we do, I sometimes think that the UK transport system has been like a swan on a pond. There is lots of stuff going on in the background to make it happen. There are lots of margins being made and lots of business being done, like ourselves as an outsourcer, to make that happen and make it user focused.

We see our role as being involved in the B2C side, but we also see it as a marginal cost model. If, for example, we are delivering the Passenger Assist service to people who need extra assistance on rail, and we become part of a franchise bid to do something more about that and provide a much higher-touch kind of service, there is a different cost base to achieve a certain outcome that can be built into an existing franchise arrangement. I noted RDG's submission to this Committee, which I thought was very good. It was interesting. The cost base can be very different, and the existing system upon which we are placing Mobility as a Service can change the model.

We also think in terms of achieving certain objectives. As I said, a great transport system and a fantastic service that allows people who are undergoing cancer care to access hospitals can create a lot of savings for the NHS. It can create a lot of savings for individuals as well. I cannot remember all the figures, but I can submit them in writing; Macmillan said that someone going through cancer treatment spends £325 a year. If you can save them money, and save non-emergency ambulance services some money, there is a different case there.

From some of the projections we have made in our models, for example, moving forward with NaviGoGo—the younger persons' model—we think surpluses can be made that can be reinvested in the transport system. It is interesting that NaviGoGo was very successful in Dundee. It was in north-east Fife as well, but it was less successful there. It was a rural area and it was difficult. However, a future model could cross-subsidise services and pay for some of the rural services. The Community Transport Association's submission said that community-based facilities should be integrated into this. There are a number of different models.

Q117 **Grahame Morris:** I want to try to aid my understanding, as someone who has a limited understanding of this complex concept, and go back to the explanation that Sampo gave about following the money and taking cars off. I understand what Steve is saying about Passenger Assist and offering a bespoke service that adds value that someone would not otherwise receive. People with dementia and cancer sufferers are niche markets—

Dr Cassidy: Can I just pick you up on that? The nicheness is a difficult one, and my back goes up when I hear that. There are a lot of people who are affected by cancer, and their carers—

Grahame Morris: I went through it with someone last year.

Dr Cassidy: The numbers become very big. The numbers around young people become very big. The number of people living with dementia and their carers become very big. They are not niche. They are massive, and it is about making mobility accessible. I get your point, but I am sorry, my back always goes up when I hear niche.

Q118 **Grahame Morris:** I am not trying to get your back up, Steve.

Dr Cassidy: It does not go up very often.

Q119 **Grahame Morris:** I am an advocate of public policy interventions. I want to ask some questions about ticket pricing and how that business model stacks up, because these questions are about understanding the business model.

Sampo Hietanen: A lot of it has to do with critical mass. If you get enough critical mass, you start having all kinds of options. I can give you an example that we calculated in Lapland, which is a really rural area in Finland. It is 50 kilometres both ways and not many people live there. It has a bit of tourism. We calculated whether you could do MaaS there. With the little tourism they have in that area, we wondered what would happen if we gave all tourists an unlimited MaaS option, to gain some critical mass. It was mainly done with buses, but some taxis.

The fun part was that we calculated with the actual entrepreneurs there that a daily price for unlimited was between €5 and €10. It sounds extremely low, but that comes when you have enough guarantee of critical mass. We had that discussion with people from the town, who said, "Okay, if it is only that little, we will give it to everyone who does not have a critical appointment to hospital or to go to daycare." All the employers then said, "Okay, if it is only that little, I will give it to every one of our staff just to make sure." It is about bringing different things together.

Q120 **Grahame Morris:** I am sorry to be so stupid about this, but what is the incentive for the customer, the end user? Are they getting a cheaper ticket, or are you giving them a kind of comprehensive service that they otherwise would not have?

Sampo Hietanen: At least in the long run, the only way to make this a durable and sustainable business is if we can compare the price of the service, in your mind, to what you pay for your car. We have to say, "Hey, you are spending more than £500 for your car. If you give us the same money, we will do all the tricks that your car would have done for you." If you feel comfortable with that trade-off, we are on to something, because then we have so much to spend on purchasing different types of services, whereas car ownership takes away 85% of even the UK market. It is on the individual level. If we can bring it to the same level in the mind of the individual, we can make money.

Dr Owen-Vandersluis: In reality, we are going to be in a very mixed landscape for a very long time. While I agree that it requires public/private collaboration, not least because both public and private modes of transport need to be involved and integrated, we have to be cautious about assuming that that necessarily means public ownership of MaaS or direct corporate governance of MaaS schemes. I am sure there will be as many opinions on that as there are individuals in this room. We have been alluding to other mechanisms around data sharing in order to play, and around pricing mechanisms. There are numerous other things that we can start to look at within which all the operators have to participate and thereby enhance some of the public policy goals.

Q121 **Grahame Morris:** With due respect, that is your point of view. There is another point of view, isn't there, Steve?

Dr Cassidy: There are lots of points of view. I agree that we are going into a phase where a whole range of different models are being tested and applied. I very much agree about getting numbers to come into these services. You only get that by delivering value, and that will change the whole dynamic.

With NaviGoGo, we have Young Scot as a partner. Young Scot issues 625,000 smartcards. They are issued on behalf of National Entitlement Card for a range of different benefits—for example, volunteering. We can bring 625,000 young people to our platform and we do that by delivering the services and tools that they want. They might want a taxi-fare splitter, for example, so that, when they get into a taxi in the evening, the last one out or the first one does not pick up the tab. They can divide it quite easily. If we can attract them with a whole range of different things, functionalities and value features, we have market demand. When you have those people on the platform it will drive up standards, because they will articulate what they want from operators, and it will give you bargaining power to be able to do a range of things.

We are not buying tickets in advance. We are just creating a marketplace so that people can purchase, which is slightly different. There will be different models emerging, but the general theme that is emerging is correct. Lots of people have to deliver value, and it will be mixed for a while. The collaboration and the role of public and private is key.

Transport for West Midlands helped us with one of our earlier pieces of work—Car Freedom—which is now part of a TOC's franchise commitment. They have been very important for Sampo. There may be collaborating for funding as well. We got funding for NaviGoGo from Innovate UK, and they fostered collaboration with a range of different partners. That is a role for yourselves—to set a direction and foster that collaboration.

Q122 **Grahame Morris:** Sampo, I want to ask you a couple of questions because you have the most advanced system operating in Helsinki. You mentioned the importance of having a certain critical mass. Is that in terms of end users or transport operators? Did you encounter any

particular problems in negotiating agreements with transport operators to participate in your scheme?

Sampo Hietanen: First of all, luckily, we are live in the West Midlands. Thousands of users have already signed up quite nicely. The second part of the world we are live in is in the UK.

The answer is both. Even to get started, you have to convince the transport operators to come along. We need a minimum set of tools to sell it to the first one. The minimum is that we need access to public transport. It is a fall-back strategy for the end user. If public transport is not there, we will get you a taxi. If you need to get out of the city, we need to give you access to a car and, in many cases, also access to bikes. We need those four elements within a city before we can even start thinking about the critical mass.

To make it sustainable, and to have business, you need to start pricing differently from what you buy in. The car is the only one that is not priced according to production. It is based on dreams, hopes and freedom. It is a package. When you buy a BMW, you do not ask, "How much did this transmission cost?" We need to get to the same level, but, of course, it takes a bit of time and a bit of critical mass so that we can provide a service promise. That is the biggest value-add you can bring into the game.

Q123 **Grahame Morris:** Is it critical when you are establishing it that you are inclusive, so that you have all the transport operators, or do you begin just with a certain number until you get your critical mass?

Sampo Hietanen: We see it this way. If we find in Birmingham one person we can serve for all of their trips for at least a month or two, we are good. Any one mode or even two modes will not cut it. A ticket vending machine is a market, but it is not really what we are after in all of this. We have to get that critical mass.

On the question of whether it is hard to convince a transport operator, of course it is. It is a totally new thing, and there is understandable fear of being commoditised or white labelled. I understand that worry, but at the same time our argument is that only by joining forces do you have any chance of competing with car ownership, because no one has enough alone.

Q124 **Grahame Morris:** Have you had experience in Helsinki of transport operators leaving once it is established?

Sampo Hietanen: Not so far. As I said, it is not easy with everyone, and different players have different timetables, which you also have to take into account. To be honest, our expansion strategy is what we call an apple-tree strategy; we shake the tree and see where the apples fall. This is also where the transport code gives us some certainty. It is now obligatory, but it also gives assurance to the transport operators that

many others will come in as well. We are not exclusive either. There will be a balance between the transport operators and MaaS operators.

Q125 **Grahame Morris:** Someone answered this question a little earlier, so this is for the sake of the record and for completeness. Is the MaaS provider responsible for providing customer service to the end user when they are travelling across different modes? Who is responsible for protecting the end user's interest? Johan said you were, in terms of the responsible person.

Sampo Hietanen: If it is pay as you go and we promise something extra, we take care of it.

Q126 **Grahame Morris:** My final question in relation to business models is a public policy one. How do we protect the interests of people who are elderly or disabled, or cancer patients or poor people? Can they successfully be incorporated in one of these MaaS solutions?

Dr Cassidy: Yes. There are various things to say about that, but in a nutshell MaaS is not an app. It is a range of different services that people want. Spend time with the people we are trying to encourage to use mobility, and understand what they need. They may have a mobile phone or they may not. Sometimes when I travel, I am a businessman; sometimes, I am a carer; sometimes, I am something else. We need to understand what those needs are.

If you want to get to certain people, you have to think what services they need. It might be an app. It might be a card. It might be just a little bit of support at the end of a phone line. It can be a range of different things. Yes, you can incorporate them.

Q127 **Grahame Morris:** Johan, is there a basic conflict here? Am I detecting something? Initially, you told us about the potential growth and the potential markets. Potentially it is incredibly profitable, but is there a conflict with what we are, hopefully, seeking to do in terms of setting parameters and being inclusive for disadvantaged groups?

Johan Herrlin: I do not think there is necessarily a conflict. MaaS is a concept. It is not an implementation or a blueprint. There are many ways to organise it. In some ways, it is the wrong question to ask, if I may be so bold. It is a bit like saying, "Can a banker use public transportation?" because they are not the canonical person that you necessarily think of as using public transportation. You think of someone who might have less income and so on. But of course they can. Can a MaaS be inclusive in many ways, from accessibility to affordability? Absolutely. There is nothing in the MaaS concept that says it has to be for people who have a lot of money or who have no disabilities, or whatever. That is exogenous to the concept of Maas.

Why did public transportation become accessible, with step-free access on subways and so on? It became that way because you structured it that way and made it happen. Would it have happened organically?

Maybe, in certain transportation services. You can get an Uber today that is accessible. That is purely a privately delivered service. There is nothing inherent in the concept of Uber that says you cannot have an accessible service. Of course you can; it is just a question of what you can do to influence and encourage different markets to serve different needs.

Q128 **Grahame Morris:** You can nudge and you can regulate; that is the difference.

Johan Herrlin: Yes, but you can do that with MaaS as well. It is not necessarily different. The only difference is that you are mixing public and private players. How do you affect and influence the outcome? That is what you are really asking. Right?

Grahame Morris: Yes.

Johan Herrlin: How do you deliver MaaS in such a way that it is accessible and affordable? How do you deliver MaaS in such a way that you encourage the largest societal benefits of reducing congestion and pollution? I think that is the question. Can it do that? Yes, but it is up to everyone in this room to structure it in such a way that you achieve those societal outcomes. To me, it starts by thinking about how you deliver a more convenient and accessible service to an individual, whether that person is fully able-bodied, has mobility challenges or has Alzheimer's. Does that make sense?

Dr Cassidy: On outcome-based, we are all operating under a range of models and it will change over time. We can go into areas and we can operate with those models, but in terms of public policy we would be very interested in being challenged, as I keep saying. If outcome-based procurement was happening and someone said, "Okay, you keep these people connected and we will potentially put some money into the pot if you achieve that"—great. Challenge us. If you say, "Change the modal split in this city by 4%," challenge us to do that, but there would have to be a different form of procurement. Social impact bonds are very promising. We would be interested in it.

Sampo Hietanen: In short, this brings new tools for inclusion. It does not necessarily mean that they are used, but at least it gives an opportunity.

Chair: That is really interesting. We want to look at it now from the other side, which is about competition.

Q129 **Luke Pollard:** Is it best to have a single MaaS provider for one given region?

Sampo Hietanen: No.

Dr Owen-Vandersluis: We have probably all hinted that we expect it to be a mixed model, for reasons of both practicality and reality on the ground. There is a lot of innovation in what is happening at the moment. Properly structured, that will drive greater benefit for all users than a

single model trying to anticipate everybody's requirements. There is a risk that a single model just becomes a thin layer, rather than trying to do some of the value-added that Sampo, Steve and Johan have been referring to.

Q130 **Luke Pollard:** I was struck by somebody's example of it being like the telecoms market. I remember that when I first got a mobile phone, if you were on Orange, I would not call you because it was hideously expensive to call anyone else. As a result, you had people clustering on one particular model. Can we learn from the experience of telecoms and jump that stage, and say that everything has to be open API so that we do not have people locked in on a certain type of platform?

Sampo Hietanen: We are extremely lucky in Finland that the Ministry is the Ministry of Transport and Communications, especially because the same people who were writing the laws for GSM, and went through those stages, are now also legislating this part. There is a lot that can be done.

I do not think there is any chance of survival with a single-provider model. I am a transport planner myself, and what we tend to forget is that this is not solved on a map; it will be solved in people's heads. If you only have one provider on the other side competing against hundreds of beautiful options, you stand no chance. There needs to be a competitive market if you really want to get people into it.

Secondly, it is often not remembered that there were parts of telecoms where people thought it should be a national provider or a local telecom provider. You could easily make the argument that most of the calls within London were made within London and that you did not need roaming, because who likes that at all? Nowadays, we would laugh at that. If you have a single provider within an area, it would be hard for there to be a roaming solution.

Thirdly, as I said, people in London—just as in Tokyo—have a car to get out of London and not for London. If your service area is only the city, I do not think you have a MaaS solution.

Dr Cassidy: I agree. You would expect me to say that, because as you can imagine, a city/rural area that has a service for people who are living with dementia, something for younger people such as NaviGoGo and something for older people such as Car Freedom—there is a lot of mix and match in there—would recognise that people would log into or join whichever service they worked with. Importantly, if Whim worked for them, and it was in the area, it would be wrong not to allow them access via that platform.

When we did our very early phase trial of Car Freedom, we integrated Uber so that people understood what Uber was. Once people understood it, they wanted to use it, so that was fine. There are different ways of monetising that, potentially and realistically, and there are existing mechanisms in terms of retail models. There are third-party retailers and

commissioners that we take advantage of for our existing business, so it most definitely has to be multiple.

Q131 **Luke Pollard:** I want to ask about the regulatory environment we have for doing this and ensuring that we have the type of open access market that you were talking about. We are at a very early stage of development, and that gives an opportunity for the Committee to give proposals to the Government about how they should regulate it. I am guessing that at the moment there is not a huge number of regulatory models that you would suggest cutting and pasting or adopting, but are there principles about how you would be able to manage fair access and market competition between the different MaaS providers that might emerge?

Sampo Hietanen: The first thing to overcome is how to build a service, because, if you cannot build it, there is no need to regulate it. That starts with opening up the APIs, including the data, payments and booking. If those pieces do not exist, it is really hard to do. If they exist in a simple and easy way, I expect there are quite a lot of universities here where youngsters, instead of creating games, would start making mobility apps and creating a lot of value that none of us has any idea about. That is the first thing.

Of course, we need to incentivise the markets one way or another. In my book, the best driver I have seen for that is how company subscriptions will be taxed instead of company cars. That is one of the biggest incentives. It is those kinds of elements. I am a strong believer in the Government and the cities pulling the strings, because we cannot know the total development of this system, and legislation tends to be quite slow. If you have different types of incentives, you can change the rules and regulation according to the market.

At the same time, I meet a lot of different transportation authorities, and there is a broader issue. Within transportation, the traditional competence is tendering and purchasing. That's it. There is not much competence built around controlling the market. Within the UK, there is probably the most in the world, but not enough.

Dr Owen-Vandersluis: A couple of other things spring to mind. First of all, at a very general level, there is lack of clarity and differential interpretation between jurisdictions and authorities as to what regulatory powers they actually do and do not have. Even in a single urban area, that leads to challenges, with different interpretations of even some of the basics. A clarification about some of the principles and the ecosystem would be helpful.

There could be something for authorities, or just generally centrally, which says that every MaaS app has to have public and private transport options in it. That is a fairly simple thing, but you could go one step further and start to look at powers to undertake dynamic space usage. For example, there could be dynamic use of different types of lanes as a

mechanism. Perhaps we will come on to that if we talk about autonomous vehicles, where it becomes particularly important. In authorities where there is road charging or congestion charging, the powers to do some form of dynamic congestion charging would be quite useful.

Q132 **Luke Pollard:** Sarah, I am a big fan of your autonomous vehicles readiness index, which you kindly presented to the Committee when we visited the West Midlands. You listed the UK as the fourth best among the countries you assessed for autonomous vehicles. One of the arguments that I really bought into when I was speaking to colleagues is that autonomous vehicles, MaaS and electric vehicles are going to hit us at pretty much the same time, and it will be one single revolution rather than being in three different phases.

Dr Owen-Vandersluis: There can be strong dependencies, yes.

Q133 **Luke Pollard:** What does the UK need to do to integrate what seems to be quite a good preparatory framework for autonomous vehicles and transfer it to MaaS?

Dr Owen-Vandersluis: MaaS is coming slightly before autonomous vehicles. If you look at what we think will be the major drivers of uptake of autonomous vehicles, in the first place it is MaaS schemes such as Waymo and Lyft in the United States. They say that at the end of this year or the beginning of next year they will have autonomous vehicles. We are calling them robo taxis, but they are ride-sourcing apps. That relates to some of the things we are talking about in terms of data protocols.

If you look at the three levers of control, one is price, use of space is another and licensing is the third. Have a look at all three and make sure that, in an environment where we might potentially see much cheaper journeys—for example as a result of autonomous vehicles—and therefore greater congestion, authorities have the appropriate tools to achieve our wider objectives in that context. A lot of it is very similar. You may then want additional powers to remotely direct vehicles, for example.

There is a whole set of other issues around autonomous vehicles, relating to communications, infrastructure and insurance regulation. There is a whole series of other things that we could talk about for quite a long time, but if you get it right for MaaS, with a thought for autonomous vehicles from a congestion point of view, at least we will be in a good place.

Johan Herrlin: The physical infrastructure that is chosen to be built is really important. The other revolution brewing is micro transport across the city, which is not necessarily the last mile but maybe the last quarter mile. That is changing really rapidly, too. Bike sharing has been around for about 10 years and it has just exploded. Right now, we have dockless bike-sharing schemes. Those vehicles are becoming electrified, so in some ways they are more accessible for older people as well. You can go

a little further than you otherwise would on a regular bicycle, if it is electrically assisted.

The number of form factors in that space is exploding. It is really quite remarkable. It is designed for families. It is designed for carrying parcels. It is designed for everything. The road network does not really accommodate that just yet. Bicycle superhighways are being built, which is really positive, but how do we accelerate that? Another way to direct the outcome is to create the space for the kind of vehicles that you want to travel across the city, and where you want them to travel. That is another level that we have not yet talked about.

Q134 **Luke Pollard:** I was going to ask you about why people would choose different MaaS providers, but actually it is just a competitive market. That got me thinking that quite a lot of the sell we have had around MaaS to date has been about the social goods that can come from MaaS. I am sold on the fact that there could be a lot of them, especially being able to target certain groups with benefits.

The flipside is also true. If you have oodles of cash, you will be able to game the system to get faster, quicker and more available travel than someone who is poorer and might not have access to the resources. Do you think there needs to be an element of socioeconomic regulation, because otherwise you could be building in inequality from a very early stage with the roll-out of this type of technology?

Dr Owen-Vandersluis: Going back to the conversation we were having before, there is no reason why you cannot have concessionary fares in a MaaS scheme. There is no reason why you could not use MaaS and some demand-responsive element to serve parts of the country or city that are not very well served. In an autonomous-vehicle world, we are expecting journey costs to reduce substantially, which, absent any other changes, should assist. The technology allows us to target and authenticate much more carefully who needs which types of benefits and travel, and which types of individuals we feel need to be supported and in what ways. I do not think that will happen if we just say, "Let's take the bus pass and roll it over into MaaS." It probably needs a more substantive rethink, because all those value pools are moving so substantially.

Dr Cassidy: I agree with that. There are a lot of policy areas under DFT's and Transport for Scotland's remit that MaaS can support. Inclusion is one of them. Congestion is killing our cities at the moment. Bus market structures is another area. We would hate to look back in 30 years and think that our services killed the bus industry. That would be awful. There are how franchises are put out and what weightings are put on the full customer experience. Again, I refer you to the RDG submission. There is a lot of bullishness in the initial franchise bid, but when it comes to the transition, it can change.

It is about setting an expectation in some of those policy areas. All of those policy areas can be enabled by Mobility as a Service; we have

touched on that a few times. If you see Mobility as a Service as very personalised, it is about getting to the customer and engineering customer needs. Going back a number of years to when I was working in traffic control, we used to put out information on roadside variable message signs to try to change behaviour, but we had one arm behind our backs. We could not change behaviour, whereas now we can start to do that. For policymakers, it is looking through a Mobility as a Service pair of glasses at the raft of policies you have and asking what you are trying to achieve.

Reading over Sampo's shoulder, I see he has written "market vision"—which he just whispered to me; I wasn't cheating. It is spot on. Where do we want to go in a certain number of areas?

Sampo Hietanen: By saying that there are new tools for inclusion there is a chance, provided that the markets are working, to point any Government subsidy directly to the end user instead of to production, where it goes most of the time. If it goes really well, instead of subsidising a trip that you have to justify for this or that purpose, you could even subsidise a service level that empowers more people. At least there is the opportunity for that. Of course, a lot remains to be seen.

Getting back to the enabling part, now that we have brought in automated vehicles, one of the biggest questions of the next decade will be whether those AVs plug into public transport. I had a long walk in London today and I tried to imagine plugging into tube stations AVs and all the new modes of transportation that will come in. You all know the answer. This really needs a bit of a rethink, and quite bold acts.

There was a point in history when only 5% of people owned their own car. For some reason, all of us transport planners believed that we should build cities as if everyone did. There has to be some point where we trust enough that new kinds of services are coming in, and we should start building cities as if they were.

Luke Pollard: Before we get on to car ownership, I will hand back to Lilian as she has questions on that.

Q135 **Chair:** I have a couple of questions. I want to follow up on Steve's comment, which was, wouldn't it be terrible if MaaS killed the bus? Do we need to do something to make sure that does not happen? If so, what is it?

Dr Cassidy: We all have a role to play. For us, it is to prove that we can increase demand for a range of different services, including the bus, and maybe get passengers to the bus more cheaply. That is one thing. In terms of what is happening with bus services and what you are looking at in terms of open data and regulation, different powers are important, and, hopefully, that will enable the bus industry to engage better.

For the bus companies I am engaged with, the difficult bit of the business is congestion. Concessionary pass use is going down around the UK.

What are we doing about that? That is a wider conversation around some of the other policies and the Bus Services Act, and so on. That is a really positive way forward.

The idea about concessionary fares that was mentioned is really important. When people talk about the ticking time bomb of an ageing population and free concessions, they tend to forget that we have a smart concessionary service that can target people and provide a different range of concessions, perhaps based on different behaviours; for example, if you give up a car, or if you change your behaviours to A, B and C, you will get a certain bonus.

There are things happening. We are responsible for proving that we can create demand. The Bus Services Act is fantastic because it will bring people to the table. Some other things about congestion—being bold and showing some form of leadership and saying that congestion will kill our cities—would be very good.

Q136 **Chair:** You talked about concessionary bus pass use going down. Obviously a concessionary bus pass is only useful if you have a bus to use it on.

Dr Cassidy: Yes.

Q137 **Chair:** Although hugely valuable, instead of giving you a concessionary bus pass, is there a way of giving you a right to Mobility as a Service that would support wider things?

Dr Cassidy: One hundred per cent, and being able to put money into an account, which I know is something that has been put forward by various people who have submitted. There is also being able to use your entitlement card, concessionary pass or identification to log into and access a service that might just be right for your needs, so that it will open up public transport.

I remember working with a group of older people in very rural Fife. They looked back with real happiness to a time when there was no oil or petrol and they started helping each other and giving each other lifts. If there was a way of being able to aggregate people, so that they are going on to the same platform and getting a bit of support and saying, "If you are going there, we can organise some lift sharing," that would work as well. Maybe there could be a concessionary arrangement around that, or enabling concessionary arrangements to be applied to community transport facilities so that we have that complete mix in certain areas.

Q138 **Chair:** Sarah, you wanted to come in.

Dr Owen-Vandersluis: The question of the bus and how it fits into overall policy is one of the more challenging aspects to be looked at. We know that bus patronage levels are falling across the country, including in London. That is driven by a number of factors: changing work patterns and people getting more online deliveries. We also know that we put a lot

of money into buses because they are an important aspect of moving people around in a shared way.

The bus operating model is probably going to change substantially in the next 10 years. Some operators are already embracing that mindset and seeking to understand how they fit into a new shared transport, demand-responsive environment. There is potentially something to be done to help them in that direction, so that we achieve the overall outcome, which has to be ecologically friendly, cost-efficient, shared transport.

As an aside, one of the things that is being played with a little bit from a regulatory point of view is the distinction between private hire vehicles and buses—fewer than eight seats and more than eight seats. People are using that as a bright line in the market. It allows them to do certain things if they stay below eight seats, and other things if they stay above eight seats. From an end user point of view, that distinction is breaking down, and we need to be aware of that as we think about the future of shared transport and demand-responsive transport options.

Johan Herrlin: I definitely think that is the case. Those lines are being blurred in really interesting ways. What is a bus in the first place? Is a four-person Uber pool a bus? If not, is a VIA a bus? What is the real difference?

The thing that will ultimately drive that will be utilisation rates. If you can get enough density of usage to support the business, it will survive. Unless you subsidise it, it will fall apart if you do not get density of usage. Creating a level playing field for all of those different actors will be the really important part. Those bright red lines are a little bit dangerous, because that is when people start gaming the system: "I am just going to go a little bit below and then I will take all the good routes." That is the real danger. It is the taking of the good routes that are profitable and then leaving the other things to someone else.

Q139 **Chair:** My final question is directed to Sarah, but others may choose to jump in. What impact will MaaS have on the future of traditional car ownership, and how quickly?

Dr Owen-Vandersluis: You have saved one of the hardest questions for last. We have done some thinking on it. Again, it is very preliminary thinking because all the models that people are looking at rely on some algorithms around switching that are extremely difficult to predict.

Our current assumption is that replacement of private ownership will occur earliest and most easily with second and/or third vehicles in households where there is a third vehicle. That will affect probably a small proportion of the overall vehicle park to begin with. We are looking at about 1.5 million vehicles by 2030. We also had a fairly high substitution rate of private hire vehicles of some type for vehicles taken out of private ownership. I do not think we forecast a massive decline in actual cars in the near term, but, with some luck and a fair wind from

MaaS providers, there will be a substitution, initially at the margins, from private ownership to shared use.

Q140 **Chair:** Does anyone else want to add anything?

Sampo Hietanen: In any disruption, it is really hard to forecast when the big hit will be, because so many things have to be in place. MaaS has a good potential to start to substitute for some of the cars. When will that happen? It will be when one provider or plenty of providers get the value proposal right. When that happens, I think the take-up will be fast.

Dr Cassidy: On the value proposition, I would just reference that there are a lot of households in the UK that do not have cars. Every day, a lot of people are giving up their driving licence. I can provide some figures from an FOI that we made to DVLA, just looking at people over the age of 65 who were giving up their driving licence. There are a lot of people doing that all the time. It is good to bear that in mind, although obviously the big prize is moving away from car ownership.

Johan Herrlin: I do not have any specific answer, but in other industries radical changes happen when there is a 10X difference in price or savings. If you look at when electric cars will take over from gasoline-powered cars or at any hugely disruptive change, it is usually around that order of magnitude. When there is that big a price difference, and it is in your favour, it happens very rapidly. Until then, it will be incremental with small changes, and then it will happen very quickly.

Dr Owen-Vandersluis: That is potentially why autonomous vehicles play into the equation so significantly.

Johan Herrlin: That is a huge market.

Q141 **Chair:** How quickly are we really going to see autonomous vehicles? What is your best estimate, Sarah?

Dr Owen-Vandersluis: We think it will be a relatively slow uptake through the 2020s, driven predominantly by the MaaS providers. We think that about 25% of car sales in 2030 will be for autonomous vehicles, but that will still only represent quite a small proportion of the vehicles on the roads. Then we are expecting quite a steep uptake through the 2030s, driven by a reduction in the cost of the technology itself, so it will become more accessible. There will be greater consumer acceptance because, hopefully, by then—it can be quite binary—there will be a lot more comfort, with safety elements; the technology will be more proven; and people will have seen it, touched it and used it a lot more.

We also think that fleets are going to play a big part in adoption. Obviously, fleet is a large proportion of the UK car park. They are going to be much more sensitive to things like safety benefits, insurance cost reduction and the ability to get more miles out of a vehicle for multipurpose uses. We think that all those efficiency factors will drive take-up.

We are looking at a technology S curve, with the steep part of the S probably somewhere in the 2030s. That is our best guess, but there are a number of binary features that could make that go considerably quicker or considerably slower.

Chair: Thank you so much for giving evidence today. Once again, it was really fascinating stuff. That concludes our session.