

Business, Energy and Industrial Strategy Committee

Oral evidence: Automation and the future of work, HC 1093

Wednesday 15 May 2019

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Watch the meeting

Members present: Rachel Reeves (Chair); Vernon Coaker; Drew Hendry; Stephen Kerr; Peter Kyle; Mr Ian Liddell-Grainger; Mark Pawsey.

Questions 275 - 339

Witness

[I](#): Andrew Stephenson MP, Parliamentary Under-Secretary of State, Minister for Business and Industry, Department for Business, Energy and Industrial Strategy.

Written evidence from witnesses:

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Examination of witness

Witness: Andrew Stephenson MP.

Chair: Thank you very much, Andrew Stephenson, for coming to give evidence to our Select Committee today on automation and the future of work. Congratulations as well on your appointment as a Minister in the Department for Business, Energy and Industrial Strategy. Welcome to our Select Committee. I am sure we will be seeing much more of you in the months to come, and we look forward to that.

We recognise that you have not been in role for a huge amount of time. If there are questions where you prefer to get back to us after the session today, we will understand that and will welcome further thoughts in due course. We will start the questions this morning with Stephen Kerr.

Q275 Stephen Kerr: Minister, congratulations on your appointment. It is good to have you in front of our Committee. The Office for National Statistics has said that automation may replace 1.5 million jobs, and the TUC suggested in evidence to us that automation could lead to people having to work only four days a week. Are the Government concerned or optimistic about the impact of automation on jobs and working hours?

Andrew Stephenson: The Government are optimistic and keen to dispel some of the myths around automation. There is a myth it is about replacing jobs; it is normally about replacing tasks, not jobs. There will be displacement of workers, but look at some of the most forward-thinking countries that adopt automation. If you look at countries such as Germany and Japan, and their employment levels, you see that automation and advanced automation has created more jobs than it has replaced. I think that automation is a power for good. The Government think so, too. We are recognising it through the industrial strategy, and I am keen as a Minister to support that in every way we can.

Q276 Stephen Kerr: Have the Government initiated or undertaken any research on the medium to long-term future of work? Your reply suggests they might have.

Andrew Stephenson: We have. I am aware of the research that you just cited from the Office for National Statistics. I am also aware of various academic studies. There is lots of research looking backwards on this issue, particularly on machine automation in car plants and other things. Going forward, we would need a crystal ball to predict the future of work, because things change very rapidly. Certain things that we think will change the world may not necessarily. Every day, we still drive past people washing cars by hand and the machine car wash was invented in the 1930s. Some 90 years on, it has not replaced hand car washes. Certain things that we think will change dramatically may not, and there are other things we have not even thought of that will dramatically change the workplace.

Q277 Stephen Kerr: Beyond the research and evidence presented by outside



bodies, does BEIS intend to do any research of its own, even if it is crystal-ball gazing? Is there a plan to initiate a study into the future of work?

Andrew Stephenson: I am not aware of a specific study. If there is something that I am not aware of I will write to the Committee. Through the industrial strategy, we are working with specific sectors. We have the 10 sector deals and are working with individual sectors to try to identify how they think things will change going forward. To give you an example, with the construction sector deal we are directly incentivising modern methods of construction in a move towards modular housing. Something like that is specifically looking at the changing skills that will be required by construction workers of the future, if we go down a modular route. Those kinds of skills, particularly digital skills for construction workers, are things that are not on the agenda at the moment. We are working with different sectors to see what they require, through skills councils and other bodies, but is there an overarching piece of research? I am not sure there is. We look to be informed by the work of this Committee, and the Education Select Committee has a good inquiry going on at the moment into the future of work. All of that information will inform the decisions taken by the Department.

Q278 Stephen Kerr: That kind of research could look more closely at some of the statements that have been made about the future of work in relation to automation. You mentioned a couple of industries there. Which industries and roles are you most worried about? Do you share the concerns that Andy Haldane mentioned in a recent speech about the potential “hollowing out” of well-paid jobs in favour of insecure and low-paid work? He alluded to that. What industries are you most concerned about and what are your feelings about those comments?

Andrew Stephenson: I do not necessarily agree with them. A lot of the evidence that has been presented to this Committee and that I have seen says this is primarily about the three Ds—the dirty, dangerous and dull jobs that are being replaced. There is a myth here that machines and automation replace workers. If you look at what is going on in some of our car factories at the moment, machines are being used to help workers work longer by reducing the more stressful tasks that could only be done by somebody who is particularly young, fit and healthy. You are seeing a transformation into how automation can help our workforce, make them have more varied jobs, allow them to work more flexible hours, allow people to work longer in the workplace and enable more disabled people to come into the labour market.

Again, look at some international comparisons of countries that have gone further and faster than the UK, and look at what has gone on in their labour markets. You have seen improvements in workers’ rights and working conditions. Over the past 100 years, as we have seen automation across the world, the average number of hours worked has decreased and job satisfaction tends to have also increased over that period. These are long trends.



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You mentioned the four-day working week before. I am not sure when we will get to that point, but the trend is in the right direction in terms of different and more engaging tasks for workers and removing some of the dull, dangerous and dirty jobs that people have done in the past. We will be using robots and automation to make the workplace friendlier for workers, rather than a more hostile environment for workers.

Q279 Stephen Kerr: You do not discount the fact that jobs will be lost to automation, though.

Andrew Stephenson: Jobs will change. There will be job losses; there will be job displacement. Think of some of the evidence this Committee has heard. I think I am correct in saying that you had Ocado in, which has almost fully automated warehousing and various other things. Someone could see that as robots replacing workers' jobs, but they are not, because Ocado has become a very successful and fast-growing business because of its productivity. Because it has been successful, it has been able to create far more jobs than it would have done if it had not automated. I see automation leading to better productivity and profitability of companies, allowing UK companies to be more competitive globally, which should allow them to secure more workers, pay higher wages and ensure they are offering fulfilling careers to their workers.

Q280 Drew Hendry: Good morning, Minister, and welcome to your new role. Some 70% of the jobs that are likely to be affected by automation are held by women. What consideration are the Government giving to the impacts that automation will have on different groups.

Andrew Stephenson: You are right to identify women as an issue in this area. Yes, a lot of women are particularly in part-time and low-skilled work, which is probably the most likely to be automated. Conversely, there is a very high proportion of women in the teaching and care sectors, for example, which have been identified as sectors that are least likely to automate in the near future, so it is a mixed picture.

As I was saying to your colleague, automation can complement labour. It can allow workers to be upskilled, achieve better quality work and become more productive. We need to look at this, but I do not think the impacts of automation will be particularly geographically targeted, as we may have seen in the past.

Q281 Drew Hendry: I will come to that in a second. To clarify, until now there has been no active consideration but you will be looking at this in the future. Is that correct?

Andrew Stephenson: We have £100 million going into the national retraining scheme.

Q282 Drew Hendry: I mean for women and other groups specifically.



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Andrew Stephenson: Specifically, we have looked into the issue of women and female employment. Female employment is at a record high in the UK.

Q283 **Drew Hendry:** I mean as affected by automation. I just want to be clear about the work that has been done on this.

Andrew Stephenson: I am not aware of research specifically on automation and women.

Q284 **Drew Hendry:** Would it be possible for you to come back to us on that at a later date?

Andrew Stephenson: Yes, certainly.

Q285 **Drew Hendry:** It would be interesting for us to know that. In your answer to Stephen Kerr, you talked about helping workers to work longer. During the Committee's visit to Japan last autumn, we saw a focus on what they call the 100-year life and encouraging older people to work. Do you want to see older people working longer and do you consider it will be a necessity?

Andrew Stephenson: People are working longer and want to work longer, from my experience. The concerns people have about working longer are that many of the jobs that we currently do are not jobs people would feel physically able to do once they got into their 60s. There are examples. The example I was using before was car plants. We are looking at ways, and companies are actively working with their workers, asking, "What are the stressful parts of this process? How can we ensure that it is easier to do?" Sometimes that is simply by rotating the vehicle, so nobody has to climb into the vehicle anymore, so there is no bending and lifting involved. There is a whole range of automation that can complement workers, rather than replace them.

People are working longer. Obviously we are living longer, so most people are working longer. In the evolution of robotics, we have seen a move from when they were caged away in a separate part of the factory, which workers could not go anywhere near, to robots now working alongside workers, supporting and complementing them.

Q286 **Drew Hendry:** You have rightly explained the enabling process for people to work longer, reducing the pressure on manual labour, et cetera, but the question was whether you think it will be necessary and if you would want that to be an option for the future.

Andrew Stephenson: I do not have the statistics to hand, but there is certainly talk of people of my generation and younger expecting to live to 100. If that is the case, people will want to work longer into their lives. You also have to look at how that is funded.

Q287 **Drew Hendry:** Will it be a necessity?



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Andrew Stephenson: We have seen a trend of reduced working hours over a past number of years. It could be that people do not reduce their working hours but have a shorter working life and can retire early. We will see a change in the labour market in how people work, whether remotely or still in factories. I am sure some people will want to work intensely. I know it seems odd for MPs to talk about a four-day working week, when we all work seven days a week, but some people will want to work intensely in their younger years, build up a good pension pot and a comfortable position, so they can retire early.

Q288 **Drew Hendry:** There is quite an important line, but I understand you might not have the background at your fingertips at the moment. It would be interesting to know if the Government have taken a view on the necessity for people to work longer. Perhaps we could ask you to come back on that again. It would be important for us to know if any work has been done on that. Finally, the Office for National Statistics has identified wide regional disparities in the potential impact of automation. What is your Department doing to ensure that its policies, on automation and more widely, take regional differences into account?

Andrew Stephenson: I am aware of that research. A lot of it is focused on a view of which sections of the economy will automate quickest. That research is suggesting that agritech will go quickly down that road, for example, because of skills shortages and various other things. That is going to accelerate. We are keen to look at this to see how we can support the transition of businesses. There are various pilots going on to look at different types of transformation. We have the Made Smarter pilot going on in the north-west of England, with £20 million funding for industrial automation. It will be different but, in my view, you will not see the big localised shifts that we have seen previously.

Q289 **Drew Hendry:** Where do you see the hot spots for automation?

Andrew Stephenson: I broadly agree with the ONS. We are in a fortunate position. We had the unemployment statistics out yesterday, which again show we are at a high level of employment in the UK. We have rising wages, which is good, but employers are therefore looking at rising wages and the availability of labour and thinking how they can automate. That will speed up the automation process. Therefore, I agree with the ONS. Things like farming have traditionally had lots of seasonal workers coming in. It was always seen as infinitely cheaper to hire short-term farm workers than to invest in machinery but, actually, that dynamic is going to change.

Q290 **Drew Hendry:** With the reasonable answer on agriculture excepted, has there been any other work done looking at how to distribute and prioritise the benefits for other regions, where automation might not immediately give a manufacturing advantage?

Andrew Stephenson: I am sorry; can you repeat the question?

Drew Hendry: I just want to know if the Government have undertaken



any work—again, feel free to come back on this if you do not have the information to hand—in terms of identifying the regional disparities that may come up and how to tackle that issue, to ensure more fairness in distribution of opportunities from automation?

Andrew Stephenson: My reading of the ONS information is that automation is going to affect every part of the country; it is going to affect some more than others. We are not going to see significant job losses in any sector or area that would have a destabilising effect on the economy, such as the closure of coal mines, steel mills or traditional large-scale employers, which would go from employing a lot of people one day to not employing anyone the next day. You are going to see a gradual and accelerating process of more and more tasks being replaced by robots and workers, which will change the economy at a rapid pace. As I said before with the Ocado example, you see a company actually creating more jobs and wealth through automation. The Government have decided to pilot Made Smarter in the north-west, with £20 million of funding, because we think we can get good productivity gains in that area, particularly by working with SMEs in the manufacturing sector. I hope and believe that that will be a successful pilot, which then can be rolled out to support other regions in their transition.

Q291 **Mark Pawsey:** Minister, you acknowledge that jobs will be lost as a consequence of automation, but you have suggested there will be other roles for those workers. To take an article from today's newspaper, Amazon has just put out a press release about being able to use automation to pack goods in their warehouses. There is an Amazon warehouse in my constituency and that is great news because those jobs have high turnover and people do not enjoy doing them, but it means some workers will not be performing those tasks. To take the Amazon example, is it Amazon's job to retrain those people, or are and should Government be doing that?

Andrew Stephenson: I enjoyed reading the same article; I think it was in *The Times*. I was fascinated by the bit at the end that said that robots still have a degree of inflexibility. I think the example used was that some popcorn butter smashed and the robots became fixated on it and did not know what to do. They kept on circling around the popcorn butter. It will be a long time before robots completely replace human workers. You have seen with Amazon and with Ocado that growing businesses, by investing in automation, have become more productive and profitable, and been able to take on more workers.

Business is best placed here to decide how workers should be retrained and redeployed. There is a role for the trade unions on site. There is a role for the Government. We are consulting on the national retraining scheme and we want to work with businesses. The reason for the sector deals through the industrial strategy is to get under the skin of different sectors and say what challenges are coming up in the future and how we can help them to retrain and upskill their workforce.



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Q292 **Mark Pawsey:** You mentioned the national retraining scheme in an earlier answer. Is that available in the Amazon example?

Andrew Stephenson: We are still testing and developing the scheme, so at the moment the answer is no, but we are hoping that we will work with companies on that in the future. You have the apprenticeship levy and apprenticeship schemes to help upskill workers. We are working with workers and employers on digital skills. There is a range of things being done by both the Department for Education and my Department. Personally, I think it is for business to take the lead here, because businesses know better than anyone what their workers need.

Q293 **Mark Pawsey:** Does the consultation on that scheme acknowledge that Government could do more to retrain in work? We are good at training up people in school and university, but we do not do an awful lot for people once they have left the formal education system to help them enhance their skills while they are in work. Is there a bigger role for Government there, in your view?

Andrew Stephenson: Some people will argue that, and that is what the national retraining scheme is looking at. In the 2018 autumn Budget, £100 million was announced for continued testing and development of the scheme. We are looking at extensive research from employers and others as to how that should work. When you are looking at something like automation—and we are looking at people in the future doing jobs that do not even exist now—there is clearly an argument that Government and employers could do more. We all could do more in order to help with that and help to develop this scheme.

Q294 **Mark Pawsey:** Minister, I do not know whether you have had the opportunity to see the report that this Committee did last year on small business productivity. One of the issues we spoke about was the lack of digital skills within small businesses, but you could argue that across the workforce as a whole. We felt there should be some support for small businesses in getting those skills, which could include automation. Is that something that BEIS has looked at, in particular digital skills?

Andrew Stephenson: Yes, it is. Since the Committee's report, in 2018, three digital skills partnerships were set up, one in my home area of Lancashire, the Heart of the South West and the West Midlands. Over the course of 2019, local DSPs will be established in Cornwall, the Isles of Scilly, Cheshire, Warrington and the south-east. We recognise there is a shortage of digital skills. It was highlighted by the Committee's report and we are keen to ensure we are delivering face-to-face and online digital skills training opportunities to workers across the UK.

Q295 **Mark Pawsey:** Last year, we also looked at sector deals and spoke about sector-based skills programmes. Is BEIS working with the Department for Education on that? You have already spoken about the lack of in-work training.



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Andrew Stephenson: Yes, one of my roles is as Construction Minister, and I have already met one of the construction teams to talk about this issue. I have my first meeting with DfE Ministers coming up in about two weeks. I am keen to look at this because, if you look at the 10 sector deals, there was a sizable chunk in each about skills, high-level apprenticeships and also retraining opportunities. I am keen to work with those sectors and to challenge the Department and others about how those sector deals are going and if they are really delivering transformation in each of those sectors.

Q296 **Mark Pawsey:** One of the reasons that businesses invest in automation is to attempt to improve productivity, but we continue to lag behind other countries in terms of productivity. We are investing rather less in automation than some others, so what can we do to catch up? How can we implement more and make it more effective?

Andrew Stephenson: There is a range of things we can do. I said before that I am keen to tackle some of the myths about automation. One of the biggest myths is that it leads to job losses. My firm view is that it replaces tasks rather than jobs, but the other myths are that it is expensive with long payback times. Most businesses in my constituency that have invested in automation have found payback times of less than two years. In the Amazon example in the newspaper today, it talked about a payback period of two years or less. We need to encourage businesses to invest.

Q297 **Mark Pawsey:** Have business owners and managers got the wrong impression, in your view? Do they think this is always a very expensive solution? Is there a role for Government in persuading business owners and managers that it will not cost as much as they might think?

Andrew Stephenson: This gets to the heart of what the Made Smarter review is about. It is about saying that some big businesses in our economy have been great at automating; they have invested early in new technologies and been early adopters, comparable with many countries around the world. We have a long tail of unproductive SMEs, some of which lack access to finance, knowledge, or managerial and leadership skills. Some of them, frankly, do not have the time. I used to run a small business, and there were only ever nine of us in that business. Thinking about the idea of taking a day out to learn about a new technology, you would rather be satisfying the customers.

Mark Pawsey: We drew attention to that in our report.

Andrew Stephenson: Exactly, so we need to look at how we can make this user-friendly and easily accessible for businesses. The north-west pilot of Made Smarter is about exactly that: allowing thousands of businesses to engage with the process and learn about ways that could improve their business, improve their productivity and support them.

Q298 **Mark Pawsey:** Would you say that simply introducing automation is a



way to increase productivity, or is there more to it than that?

Andrew Stephenson: There is much more to the productivity challenge in the UK than simply introducing automation. We see there is a belief among businesses, particularly the SMEs I visit, that automation or robots are incredibly expensive and that it is not something they have the money to invest in at this time. When you speak to businesses that have invested in automation, they find short payback periods, typically of 12 to 18 months. They find that this allows them to grow their business, expand, take on more workers and win more contracts. We need some good case studies to ensure that all businesses are hearing from some of the success stories in their neighbourhood and can adopt similar technologies and strategies to become more competitive.

Q299 **Chair:** All the reasons you have given, Minister, are good reasons why small businesses in the UK might not have adopted some of these new technologies, but they do not really explain why we are so far behind some other countries, which is what we are particularly interested in. You would have thought that an economy of our size and history would be at the cutting edge of the new industrial revolution, as we were in previous industrial revolutions, yet that is not the case. The Select Committee went to Japan last September, which has the highest proportion of robots per head of the population. Why do you think Britain is lagging behind some of our neighbours in terms of the take-up of these new technologies?

Andrew Stephenson: There is a range of factors. In terms of the structure of the UK economy, there is a higher proportion of SMEs. Particularly in Lancashire—my part of the world—we made the machines that powered the first industrial revolution. We have lost those machine-making skills in the UK, over decades, and they have gone to places like Germany and Japan. When you visit pretty much any factory in this country, you see their machinery has normally come from abroad. Countries such as Germany and Japan, and other parts of the world, have machine-makers, probably working in the factory next door, which can encourage the businesses around them to adopt. There has been a greater willingness, therefore, to adopt new technologies and robotics, and to go further and faster.

There are opportunities in the UK going forward in AI and service robotics. We may have been behind in the past, particularly in automation in the manufacturing sector, but there is no reason for us to be behind in the future. We should look at all areas, but certainly where the UK could get ahead of the curve. Another example that was talked about previously was health and the involvement of technology in healthcare.

Chair: We went to Bristol University and the University of the West of England. In their robotics world they are doing some really good work on the health and social care sector, and the ability of technology to improve people's lives there. In your new role, a visit to see what they are doing



would definitely be worth it.

Q300 Peter Kyle: Following Rachel's question, the thing about Japan is that necessity is driving the use of automation and AI in the workplace, because their population will reduce by one third by 2050. It has one of the fastest-ageing populations in the world, so the switchover is not for convenience or simply because of the availability of robots; it is because their economy demands it, if it is to maintain its levels of productivity and output. Our economy perhaps does not have that same necessity. Do you accept the premise that, if we are going to adopt automation and use AI in a similar way to Japan, that necessity will have to come from Government? We have to create the necessity because the population and economy are not doing so.

Andrew Stephenson: There is wide recognition that we have similar challenges. There has been a lot of bilateral work between Japan and the UK, as one of the grand challenges identified in our industrial strategy is an ageing population. We want to be a world leader in coming up with solutions for that. Japan is doing a lot of work and we are now looking at projects between universities of the two countries, and research and development of innovative ways to help people live longer, healthier lives. All countries, particularly in the western world, are now facing this challenge of an ageing population.

Q301 Peter Kyle: My point is that the pressure to modernise the workplace in Japan comes from the fact that they have to for their economy to survive as it is. If employers are going to feel the necessity to modernise our workplaces in the same way, the pressure will have to come from somewhere. Because of immigration in this country, our population levels are broadly staying the same, but in Japan they are falling. Therefore, the pressure to modernise will have to come from somewhere. I would like to know where you think that pressure will come from, because employers are clearly not feeling it organically from within their own companies in the same way they are in other countries. Therefore, Government will have to be more assertive.

Andrew Stephenson: I think employers are starting to feel the pressure. We now have an employment rate of 76.1%, which is heading towards a position where the availability of labour is much scarcer than it has been at other times. I spoke to an SME in my constituency that has recently automated and, bluntly speaking, it was the national living wage. It was the fact that it employed a lot of people on minimum-wage jobs, doing fairly routine, dull, boring tasks. It had never automated because it was cheaper to employ lots of people. With the rises we are seeing in the national living and minimum wages, the pressure was put on them by Government to say, "You cannot just keep using people to pack these boxes", so they now have robots doing that. Some of those people have been redeployed in the same factory. Something like that was quite a significant change to a manufacturing business, so some people actually did lose their jobs in that process.



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The Government's ambition to raise the national living wage is something agreed across parties. Everybody wants to see higher wages in the UK, and that will start to put on pressure, particularly in agriculture, low-tech manufacturing and other sectors, where there has traditionally been a reluctance to invest in machinery, because a huge pool of labour can come in and do these jobs cheaply.

Q302 Peter Kyle: Do you see your job as a Minister to be assertive and an active participant in getting our economy to automate, use AI and modernise? I have never heard the argument made that we will raise the national minimum wage because we want companies to automate. However, these things are a consequence of the way our economy is evolving. Do you see your job as a Minister in the Business Department as being an active participant in modernising our economy?

Andrew Stephenson: Yes, I do. The point I was making is that it is a push factor from Government that has directly led to businesses saying, "Now is the time to automate".

Peter Kyle: I understand your point.

Andrew Stephenson: If you look at the industrial strategy and sector deals, productivity is key to them and how, in a range of different sectors, we lead to a step change in productivity in the UK. Some are delivering that quicker than others. We have the industrial strategy challenge fund and the grand challenges identified. There is a lot of work going on here, and I want to champion productivity in the UK.

Part of that is automation. I am pleased that, as I walk into the Department every morning, there is an Ocado robot in reception. When I first arrived, I thought it was a litter bin. Those of you who have seen them will perhaps know why I was mistaken, but we need to celebrate some of the British tech companies, some of our AI companies and some others that are doing great, innovative things and becoming some of the most productive in the world. We have huge productivity challenges, but we need to share best practice and enable companies to embrace new technologies and become world leaders.

Q303 Peter Kyle: Representing Hove, I suspect we are going to be early adopters of the Ocado robot. We will see how that unfolds. Normally, where things create value in our economy they attract taxation. Traditionally, humans create value and human endeavour has normally attracted taxation, in one form or another. We are now increasingly living in a world where robots and automation are creating value. Therefore, the argument could be made that robots and the use of AI should be taxed directly. On the other hand, you have an argument that we need to modernise our economy and, therefore, tax subsidies need to go towards investment in robots. On what side of the argument do you stand?

Andrew Stephenson: Without being shouted at too much by the Treasury, I see a robot tax as perverse. We do not have enough robots to



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tax anyway. We need more robots and automation. We need to incentivise businesses to invest and become more productive. I know that, through the AI Council, the robotics leadership group and others, we are actively looking at what further incentives can be provided. There are R&D tax credits, capital allowances and various things the Government are doing to incentivise businesses to invest in working in a more productive, smarter way. We should go further in those areas to enable British business to become more productive and the best in the world, rather than any regressive tax on robots, but I might be shouted down by the Treasury.

Q304 Peter Kyle: It is curious because on our trip to Japan we saw robots that were physically creating products. They were assembling products and, at the same time, ordering new items from the supply chain and participating in invoicing. All these things are happening simultaneously, and they are all the sorts of things that human endeavour has contributed towards, which has attracted taxation through the creation of value. It is interesting to see how these things are going, but you have been very clear, which is good to hear.

We have also heard from manufacturers that capital investment incentives are too blunt an instrument and they do not take potential productivity boosts into account. Have the Government considered these sorts of incentives?

Andrew Stephenson: When I was first elected in 2010, one of the things that I was banging on George Osborne's door about was capital allowances to incentivise businesses to invest in machinery. There are a lot of SMEs on my patch and a desire from those businesses to invest more in machinery. Capital allowances were doubled and then, I think, quadrupled. We are now in a position where there are significant incentives for businesses to invest in machinery. There is an argument that we should not just incentivise investments in machinery; we should incentivise investment in software and other new tech. I am sure that is something that the Treasury needs to be looking at, because, if we think about automation, it is not just physical robotics and automation in the traditional sense, which we think of in the manufacturing sector. We start to look at service robotics and other areas, so perhaps a new incentive is needed. R&D tax credits and other things can be used there, but I am receptive to arguments that we could go further with capital allowances to help businesses adopt new tech.

Q305 Mr Liddell-Grainger: Minister, you have talked about Ocado at various occasions today, but one of the most interesting points today is: how are the Government going to regrow the manufacturing side of automation? There are various mechanisms you can use, but we need to do this quickly. If you take out aerospace and a couple of others, we have been really slow. How do you as a Minister look to improve this?

Andrew Stephenson: The Juergen Maier Made Smarter review now has its north-west pilot. This is something a lot of businesses would cite.



These are early days, but the Made Smarter review is a great way of getting out there and engaging with SMEs, bringing universities, research centres, catapult centres and everyone together to say how we can transform the productivity of different sectors. This goes right the way through the industrial strategy, but particularly Made Smarter, which is looking at manufacturing firms and SMEs. At the moment it is being piloted in the north-west of England but, in my view, should be rolled out much wider in the months and years to come.

Q306 Mr Liddell-Grainger: Can we follow on from that? You have touched on the Made Smarter review, but it is not going very quickly. I think that is probably an understatement. How are you going to make it go quickly? You have made the point you can roll it out, but surely it is about empowering companies, universities and others. You get the research of the product with the manufacturing, which all come in one. When we have companies such as Dyson leaving the country because they want to do automation in places like Singapore, surely we have a problem.

Andrew Stephenson: You can always go faster and invest more money. There is currently £121 million of investment into the Made Smarter digital manufacturing challenge to increase manufacturing productivity by up to 30%. There is then an additional £20 million going into the north-west pilot for the adoption of digital technology, which is supporting 3,000 businesses in the north-west alone. There is more we can do here. I think this is a very good foundation. I am keen to visit a number of businesses—I am visiting some on Friday in the north-west—and I am keen to see what businesses' experiences of Made Smarter are, how we can ensure that this pilot is a roaring success and then how I can go along with you and others to argue to the Treasury that it should be funded on a wider scale, across the UK. What is happening in the north-west of England at the moment is very exciting.

Q307 Mr Liddell-Grainger: I am not sure about the north-west; I can only speak for my bit of the world, as you know. Take aerospace, which is huge; Unilever and AB Sugar are, again, huge. These are large companies that can argue with the Treasury on their own. There are 200 SMEs in the field that are doing AI and machine-learning. To be fair, there are only 81 in Germany, and 50 in the Nordics and France, so we are ahead of the curve, but Rachel made a point about Japan; we are pedestrians. Your point about the Treasury is right, but we need to empower through LEPs. Should we be giving instructions to LEPs? I am not sure what the equivalents are in Scotland and Wales, but should there be tax rebates or grants for large manufacturers? We used to have all this, but it has now gone. Do we need to go back and reinvent the wheel slightly?

Andrew Stephenson: I would not say it has gone. Look at the aerospace sector. The UK has huge skills in the aerospace sector and still we have a very large chunk of an enormous global market. On Monday, I was at a business, MEP Ltd, to launch a £10 million fund to help about 90 different SMEs with leadership, management skills and the adoption of



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new technology. That is just one of many funds. This week, the Government have announced another £150 million to bring different products to market. We have the future flight challenge, which is working with Rolls-Royce and some sector leaders to look at the transformation from the current aero engines we have, through to new greener, more environmentally friendly engines. There is a lot going on.

There is more we could do. I want to see the aerospace sector in the UK grow and be enhanced, and to see global businesses such as Rolls-Royce, which is headquartered in the UK but has sites in Singapore and around the world, taking investment decisions that say, "Yes, it is right that we invest our money in increasing productivity and production in the UK, rather than investing in other sites around the world".

There are a lot of positives from the aerospace sector and a lot of money from Government going into this, but I am keen to look more at what we can do, particularly in research and development. There are challenges as we make a step change in engine technology. The current engines are predominantly made out of metal, but they will become new composite, much lighter and more environmentally efficient engines, which will power the planes of the future.

Q308 Mr Liddell-Grainger: I take your point on board; in fact, I wrote down "R&D". The problem for a lot of these companies, not aerospace, is huge. For smaller companies, the cost of R&D is proportionally higher than they are going to get back in the short term, which means a lot of smaller companies cannot do it. Would it not be advisable to ask the CBI, IOD and FSB—as three organisations hugely representing the United Kingdom—to start thinking about how we pool R&D through universities? They can do a lot of the work that smaller companies cannot. As I said, we have 100 SMEs in this country, but we want thousands.

I want to finish on one point. The Manufacturing Advisory Service was really there to help and it was shut down. If people now want impartial advice on what to do next in UK plc, where do they look? What advice would you give and who should they talk to now?

Andrew Stephenson: R&D is critical here. The top line is that we want to spend 2.4% of our GDP on R&D by 2027. I agree with you about speaking to some of the business representative organisations. You are probably aware that all Ministers in the Department meet the Institute of Directors, the FSB, the CBI, Make UK and others on a weekly basis, so we are keen to get their ideas on what we can do to support things like research and development investment.

There is a lot of work going on. Chris Skidmore is my fellow Minister working with universities to see how we can use Government R&D to lever in more private R&D across the economy. There is a lot of work going on here. We obviously have the catapults. I am trying to remember which one I am visiting tomorrow—I am going to one of the catapults. I am going to the National Automotive Innovation Centre in Coventry



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tomorrow, which will be my first visit to a catapult. I am keen to see how these things are working. Again, I am hearing positive things being said about bringing together universities and academia with businesses, both large and small. Some of the witnesses in front of this Committee may have touched on how there was previously a big separation, but now you have not just students but academics running companies. That is encouraged and incentivised by the universities, leading to lots of cross-fertilisation of ideas.

Q309 Peter Kyle: Should the country be specialising on certain sectors in our emphasis on developing automation and the use of robotics, or should we be trying to do everything, all at once?

Andrew Stephenson: We need to become more productive across the board. I want to see more automation in the manufacturing sector, but we all recognise that we have been behind the curve there. I look at areas where we could become world leaders, such as AI and healthcare, and a range of other service robotics. There are opportunities there that many of our universities are exploring. We should start to seize these new growing opportunities for the country.

Q310 Peter Kyle: Most catapults and universities have a high proportion of Government funding, so the Government will be choosing where to invest. Will you be looking for a global niche for us to focus on to become world leaders or should we actively compete with Japan, Silicon Valley and others on some of the things they are working on?

Andrew Stephenson: One of the first sector deals done—I am not sure if it was by my predecessor or my predecessor's predecessor, but I think it was my predecessor—was the AI sector deal. That shows that we are interested in these areas.

Q311 Peter Kyle: AI is general: it can be applied to any sector. Should the country be looking at how AI is applied within the automotive sector, health and social care or any other subsector to become the world leaders in that, or should we just be doing it in a blanket way?

Andrew Stephenson: We need to look at sectors where this can really make a difference. On one level, all businesses can benefit, but in things like health and social care we can become a world leader. Since the change in Health Secretary, the new Secretary of State Matt Hancock has made a focus of talking about the increasing use of technology in the NHS. There is an institution with lots of Government money going in and loads of innovative things are going on in our medical schools and teaching hospitals at the moment. How can we ensure that those new technologies and new ways, which improve patient experience in addition to reducing cost and having better outcomes, are replicated across the NHS quicker than at present? Most doctors' surgeries still have fax machines, so how can we embrace technology across the board in something like healthcare?

Q312 Peter Kyle: The British economy is unique and has opportunities that



others do not. Will you be looking to see where those unique features are in the British economy and where we can have a scale in use of robotics and automation that other economies do not, and will you be focusing in on those things? Is this something that you and your Department will actively be doing?

Andrew Stephenson: We definitely will. This is something we are always looking at through the industrial strategy. We have 10 sector deals up and running, and there are another two sector deals firmly in the pipeline, which I hope will emerge in the coming weeks. Then it will be looking at in which other sectors we can really make a difference, where a partnership between Government and industry could help to boost a growing industry or support it going forward. Once the next two sector deals, on which my predecessor has largely done all the work, are officially launched, I am keen not just to be keeping an eye on the sector deals we have launched, in ensuring they are delivering, but where we go next. What is the next sector where Government can work with universities, on R&D, investment and a range of other things? How can we come up with the next best sectors to focus on?

Q313 **Chair:** Following on from Peter's questions, I have already mentioned that we went to Bristol University, and we took evidence from academics from Sheffield, Edinburgh and Imperial College. One of the things they said to us consistently and we saw at Bristol was the importance of international collaboration to develop robotics. What are the Government doing to ensure that we continue to collaborate, particularly with European partners when we leave the European Union?

Andrew Stephenson: There is lots of ongoing discussion. Of course, it depends how we do actually leave the European Union, but our universities work very closely with European institutions. We have a lot of shared R&D projects in Europe, but also internationally. We are keen to ensure that all those partnerships remain, wherever possible. I know my fellow Minister, the Minister for Universities, has been out in Europe this week talking about some of the challenges that face the UK and our desire to continue working with our European partners, regardless of how Brexit eventually turns out.

Q314 **Chair:** What salary would an academic need to be earning to come to the UK and work under the new proposals the Government have put forward?

Andrew Stephenson: That will be part of the immigration Bill. The details are still being worked out and consulted on, and I am sure lots of people, particularly our universities, will feed into those ongoing discussions and ensuring that what comes out at the end is something that supports the UK science sector.

Q315 **Chair:** What representations will you be making, as the Business Minister and someone who has said that one of the reasons that we do not have enough technology in our workplaces is that we are not making the technologies so we do not have those synergies and that knowledge of



them? If that hypothesis is correct, we need to make more technologies in UK universities and by UK businesses. What representations will you be making to ensure that it is no harder for an academic or student from a European university to come and study, and add their knowledge and expertise, to ensure we are at the cutting edge of some of these new technologies?

Andrew Stephenson: I will be working with my ministerial colleagues to ensure that we get this right. We have some of the best universities in the world here. We should celebrate that, but they are the best universities in the world because they attract talent from across the world. We need to ensure that they are able to do that and are open for business. The message I send out is that we are open for business and wish to remain so. I will be ensuring, through the immigration Bill and other things that come forward, that we are supporting our research institutions and universities going forward. This directly impacts on things like the life sciences sector deal and various others where we have skills shortages in the UK and need researchers and others to come in to support industry.

Q316 **Chair:** We absolutely must be open for business when we leave the European Union. Business often pays higher wages than the public sector, including our university sector. The point I am trying to make is that, as a researcher or an academic at university, you might not always be well paid but you are incredibly highly skilled. On this Committee, we do not want to see people not being able to come and contribute to the research efforts at our great British universities just because they are not earning a salary that meets the threshold the Government are now proposing.

Andrew Stephenson: I agree.

Q317 **Chair:** On a related point, do you have any concerns about the proposals to raise tuition fees for EU students, which again might deter talented students from coming to this country and then staying and contributing their research efforts? If EU students have to pay international fees after we leave the European Union, I worry it will deter some of the best students from coming to this country, if their parents are not able to afford the higher fees.

Andrew Stephenson: It is not my field of expertise. Instinctively, I think that if we are leaving or have left the European Union, it should be a level playing field. Therefore, we should not be giving preferential treatment to European students against students from any other part of the world, once we have left the European Union. While we remain in it that is something we do but, going forward, we will be refocusing as a global country with a global outlook, and we want to attract the brightest and the best from across the world, regardless of which country they come from.

Q318 **Chair:** Does that mean you think we should reduce the fees for students around the world? If that was a proposal, people might be a little more



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sympathetic. The idea that we want to play a more global role so will put up university tuition fees for some people around the globe does not really match that rhetoric, Minister.

Andrew Stephenson: The broader picture of our university finance is something that I know my ministerial colleague Chris Skidmore is looking at very closely, to see how we can ensure that it is fair, going forward. I just feel that we need a level playing field. We also need to ensure that universities are not disproportionately hiking fees for foreign students and using a large number of foreign students to subsidise British students. We need a level playing field and stable funding of UK universities, but I will happily raise the concerns of the Committee on this area with my ministerial colleague. If we leave Europe, there should be a level playing field for anyone coming in from outside the United Kingdom, because we want to attract the best and brightest globally.

Chair: I am not sure how putting up university tuition fees for one group of people without reducing it for all global students will enable us to attract the best people and live up to your rhetoric about global Britain, but I feel that that is perhaps falling on deaf ears.

Q319 **Drew Hendry:** Minister, we talked earlier about the jobs that might be affected by automation, but can you describe what the industrial strategy is doing to ensure that the UK has the skills we need to succeed at research in developing automation?

Andrew Stephenson: I talked before about the ambition to increase R&D spending, working with our universities. The catapult centres have now been established to ensure that research and development spending is going directly into automation and new types of work. We have the industrial strategy challenge fund, which is a sizable amount of money available to businesses and others in order to change their working practices.

Q320 **Drew Hendry:** As part of that, have you identified for what number of people or specific skills the industrial strategy is going to deliver?

Andrew Stephenson: Digital skills are core to a lot of the transformation in many of the sector skills and issues we have been looking at. That is something this Committee has looked at.

Q321 **Drew Hendry:** I understand what you are saying, but “digital skills” is a wide term. “Industrial strategy” is the name of a document and a proposal; what is in it to ensure we have skills specifically in research and developing automation?

Andrew Stephenson: Specifically for the research and development of automation, there are the catapult centres. More broadly, through the industrial strategy you have the national retraining scheme and investment in STEM education. There is £406 million to improve STEM skills. We have work to address low digital skills.



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Q322 **Drew Hendry:** Throughout this inquiry, we have heard about the difficulties to encourage women into automation and engineering more widely. You mentioned the STEM issues there. What specifically are the Government doing to improve that?

Andrew Stephenson: A review, which may have just come out, looks at a range of barriers that women face in the workplace. In a number of sector deals—I cannot say if it is in every one, but I know it is in the majority—there is specific reference to women and diversifying the workforce. Whenever I visit a business, it is something we talk about, because many of the sectors I covered, if you think of construction, aerospace or engineering, are still male-dominated industries. They are also very non-diverse industries.

Q323 **Drew Hendry:** Would you be able to give us a progress update on that? I understand you might not have it at your fingertips just now, but it is clearly an important issue. It has been raised throughout the inquiry and you have just mentioned the focus on it, so one imagines there is ongoing monitoring of the situation. Would you be able to come back to us with what is happening in the field of encouraging women into engineering and research?

Andrew Stephenson: I can. I would say the evidence is mixed. We have seen some encouraging signs, particularly in the number of women on boards of FTSE 100 companies. We are seeing significant progress there. Whenever I speak to businesses, one of the challenges is the pipeline. Businesses will all say to me they want to take on 50/50 male/female apprentices. When they go to the colleges and speak to people who are going down an engineering route, they still lack young women wanting to take on those jobs. There is certainly more to do. We have seen significant increases in the number of women taking STEM subjects at schools and we have seen a significant increase in the number of women doing engineering degrees at university, so there has been some progress but we need to do more.

Q324 **Drew Hendry:** Will you come back to us with the details of what is happening in that specific area?

Andrew Stephenson: I will come back to you with specifics on that, but I agree we could do more.

Q325 **Chair:** You are going to the catapult centre in Coventry tomorrow. We have been to that catapult centre as a Committee, and also to the one in Sheffield, the Advanced Manufacturing Research Centre. They are doing some fantastic work there, but what proportion of apprentices at the Advanced Manufacturing Research Centre in Sheffield do you think are women?

Andrew Stephenson: I do not know.

Q326 **Chair:** Hazard a guess. It is a number between 0% and 100%.

Andrew Stephenson: I would guess 10%.



Q327 Chair: It is between 4% and 5%. There is a real problem of getting young women into these subjects, which can often lead to well-paid and rewarding careers. It is not good enough for businesses to say they go to colleges and cannot find the women, because that puts the blame on women for not taking the subjects. Much more needs to be done by colleges and businesses, not when they are 16 and have already made decisions about the subjects they are studying, but much earlier at school. We are talking about the fact that we are behind all of these countries in our take-up of new technologies. One of the reasons we are behind is that we pretty much write off 50% of the population from contributing to these innovations, because they are not encouraged to study these subjects at school.

I suggest you could usefully ask, when you are in Coventry tomorrow, what proportion of the apprentices at that catapult centre, funded in some part by Government money, are girls and what they are doing that is making a difference. There are always pilots and things going on but, as Vernon said when we visited the catapult centres, "What you have done obviously has not worked, so what are you going to do that is going to drive that change?" The truth is we will be lagging behind other countries if we do not utilise the skills and talents of 50% of the population.

Andrew Stephenson: I hope you will be reassured to know that, at every visit I have made so far as a Minister, I have raised this issue. I raise it frequently. Yesterday, I met trade union representatives from Rolls-Royce sites across the UK and we turned to this issue. I said there are lots of things we can do, particularly getting out into schools and showing that engineering is a worthwhile future career for everybody, really getting out and about. I also said that, at many Rolls-Royce sites I have visited, you see even grandfather to grandson. There are a lot of generations working in these firms. Why are they not encouraging their daughters to get involved and follow in their footsteps, doing high-value, high-wage engineering jobs? We all have a role here, but I agree much more needs to be done.

Q328 Vernon Coaker: Much of the theme of this Committee and your responses have been that automation is a good thing. The TUC and CIPD have both said in evidence that the benefits of automation will only be felt if there is full employee engagement. If I am going to lose my job, why would I support it?

Andrew Stephenson: That goes back to where I started. There are a lot of myths about automation. We are seeing where those myths are dispelled and where people think the employer is going to support them. It is not just about replacing their job; you are seeing workers actively suggesting ways to automate their processes, because they know it is going to make their site more competitive and will lead to more investment at the site and more jobs.

Q329 Vernon Coaker: How do you know that?



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Andrew Stephenson: There is still a widespread myth that people will lose their jobs, but you are starting to see a change. I am starting to see a change in some of the businesses I have visited, with people thinking, "How can we make this business better? How can we grow it? How, therefore, can we ensure the long-term viability of my role and employment within this business, by helping my employer create a more competitive and productive business?" Certainly the myths are still out there and there will be reluctance from some workers to engage. My own experience is that the Rolls-Royce trade union officials at the Barnoldswick site in my constituency have been proactive, suggesting to management ways to make the site more efficient and introduce robotics to it. The trade unions have played a positive role there.

Q330 **Vernon Coaker:** Are you going to meet the trade unions regularly to listen to what they have to say about how things should move forward?

Andrew Stephenson: Yes, as an MP with a Rolls-Royce site in my constituency, I already meet with the trade union representatives of Rolls-Royce about three times a year. In this new role, I look forward to working with the trade unions on this and a range of other issues.

Q331 **Vernon Coaker:** It would help if they felt there was proper engagement in that way. What about this idea of a commission to examine the future of work and the Government's response to the Taylor report, which was supposed to look at that? Where has that got to? Is there a new strategy? Is the Taylor report on the shelf? What is happening with all of that? When is the employment Bill due?

Andrew Stephenson: The Taylor review is not on a shelf. It is the biggest shift in employment rules since the Employment Rights Act 1996. There is a range of challenges in there. On 17 December, we laid secondary legislation to kick-start the package of reforms. There are more announcements to come in due course. On 6 March, the Secretary of State committed on the Floor of the House to bring forward an employment Bill to implement the good work plan.

Q332 **Vernon Coaker:** What is the timescale for that?

Andrew Stephenson: I hope it is as soon as possible.

Q333 **Vernon Coaker:** That can mean anything—autumn?

Andrew Stephenson: Soon.

Q334 **Vernon Coaker:** In other words, you do not know. The serious point is that the employment Bill is supposed to give effect to many things from the Taylor review. It is supposed to talk about the future of work and all of the different challenges you have laid out, including the definition of a worker, whether agency work, self-employment or an employee. All of those are huge things and depend on an employment Bill, but we do not really know when it will come forward. That is important. You are making strong representations—can I put it that way? Is that right?



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Andrew Stephenson: They are strong representations. Having been a Whip for two years and said, "Soon", a lot, I hope it will be soon.

Vernon Coaker: It is crucial. You are now Business Minister. It is a crucial demand.

Andrew Stephenson: It is fundamentally important, but it is also important that we take a considered approach and get this right.

Q335 **Vernon Coaker:** You have had the Taylor review to do that.

Andrew Stephenson: The Government accept that and are going to move forward, but we have to do this in a considered way. This is a significant change and the biggest reform since 1996. We need to get it right.

Q336 **Vernon Coaker:** What are we doing in schools to prepare children for the fact that the World Economic Forum has said that "two-thirds of children in primary school today will work in jobs which do not exist yet"? You are meeting the Department for Education. What are you going to say it needs to do?

Andrew Stephenson: Over the past few years, the Government have focused on STEM. That has been the big drive here.

Q337 **Vernon Coaker:** As the Chair said, the problem is that is not working. For 40 or 50 years, we have been trying to do exactly what the Chair has just talked about. It is not new that there are no girls taking up these jobs. This is criticism of Governments over decades. We all know about STEM and getting people into schools—doing this, doing that—but none of that works. What is the fresh approach you are going to adopt as a new Minister? That may be unfair, because you may not have got to it yet, but it needs a fresh approach.

Andrew Stephenson: I have not met the Department for Education yet and I do not want to tread on too many toes. The focus has been STEM, apprenticeships and that route. I watched a couple of evidence sessions of the Education Select Committee, where there were some interesting comparisons being made with how things are taught in, for example, Singapore, where they are teaching children how to do things and think critically, rather than just learn facts, which we still very much do in this country. I do not know if that is the right way forward. I look forward to hearing what that Select Committee has to say.

Q338 **Vernon Coaker:** Let me be provocative for a moment. To change that, you will have to change the SATs, the way schools are judged and what is regarded as a good school. Are you going to argue that? Otherwise, it is not going to change. Schools teach to get SAT results, because that is how parents choose which school they want their children to go to. You are saying we need STEM; that requires the SATs to change. Is that what you are going to ask for?



Andrew Stephenson: Primary and secondary education are not in my ministerial remit.

Q339 **Vernon Coaker:** It is something to think about. You are the Business Minister. Education is their responsibility but, if you want STEM to change or what the Chair was talking about, with more girls interested in engineering and then more young women to do this, it will need a fundamental change. At the moment, schools are assessed as to whether they are good or not on things that fundamentally conflict with that. That is all I suggest to you. Are you willing to think about that and ask the Department for Education to consider it?

Andrew Stephenson: I am willing to think about that. For a long time, I have been sympathetic to what you are arguing. However, how the curriculum is structured and the best way to ensure outcomes for young people is something for the Department for Education. What is in my remit is ensuring that businesses, for example, work more closely with schools and we get businesses going into schools, explaining to kids and running competitions in schools. You can start to show young people the careers and opportunities out there in engineering and robotics.

Vernon Coaker: That has been done for decades, showing young women and girls the opportunities out there and taking into schools role models of brilliant women who have somehow managed to succeed in spite of there being few women who do this. We met a brilliant young woman at the catapult centre and she was going into schools. All of that is good. I will leave it there, Chair, but will just say to you that your job is not to apologise for the Department for Education; it is to demand of the Department for Education what will give Britain the skills and talents it will need in the future, if automation is to become a success. At the moment, that will not work with the current way schools are assessed.

Chair: On that note and challenge to the Minister, thank you very much, Andrew Stephenson, for giving evidence to us today. Good luck in your new role. As I said at the beginning, we look forward to seeing you in front of us many more times.