Paul Mason

Interviewed by

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Welcome to the Archives of Information Technology where we capture the past and inspire the future. It's Monday 17th January 2022 and we're talking on Zoom, as has become customary during the coronavirus pandemic. I'm Jane Bird and I've reported on technology and the IT industry for newspapers such as The Sunday Times *and the* Financial Times *since the early 1980s. Our contributor today is Paul Mason, director of innovation policy at Innovate UK, the UK's innovation agency. Paul is responsible for Innovate UK's corporate strategy and the programmes that support its development and implementation. These include economics, insights and evaluation, commercialisation, design, equality, diversity and inclusion, talent and skills and digital comms and media. An Oxford chemist graduate, Paul led the creation of the very first Innovate UK strategies and since then he has set up and launched programmes in areas such as agriculture and food, stratified medicine, disease diagnosis and creative industries. Before joining Innovate UK, Paul worked for twenty-five years in the chemical industry at Courtaulds, Akzo Nobel and CVC Acordis, including spells in Europe, the US and Japan.*

Paul, welcome. I'm very much looking forward to hearing more about your life, professional experiences and insights into the world of UK innovation and what's happening in IT. So…

Thank you Jenny, thank you for the invitation.

Pleasure. So, perhaps if we could start at the beginning. You were born in London, I think? That would have been in the late sixties, was it?

Early. It's very nice of you to say late sixties, but early sixties, absolutely right, yes, yes.

Okay. Ah, so you didn't, you weren't in Cornwall then, because I know you went to school in Cornwall later on.

I went to school in Plymouth, which is Devon, it's on the border.

Oh right.

So yes, I was at school in Plymouth and then we moved around a little bit, so my parents are both teachers and so we spent a little bit of time in different schools as they moved around, and then we settled in Plymouth and I lived in Plymouth for, I don't know, five or six, something like that, until I left school to go to university. And I was at Plymstock Comprehensive School, which is, you know, one of the comprehensive state schools. Huge school, 2,400 kids in it when I was there, and it was a magnificent school actually and I, yeah, I mean I couldn't have wished for a better education. Any deficiencies are entirely my own fault, not those of my teachers!

That's wonderful, because comprehensive schools come in various different flavours, don't they, and often people with high academic potential perhaps feel that maybe they would have been better in the grammar school system, but sounds like you don't have that feeling.

Well, yeah, I mean I don't know, would I have done better if I'd been in a grammar school, I don't know. I feel it was a great school and I mean a number of ways in which it was a great school and it got me through my A levels and into university so, you know, that's nice. It had such a mix of different types of people, so that was fantastic, you know, and it wasn't some kind of intellectual hothouse. It had guys who were brilliant at sport, guys who were great in drama, people who were kind of keen on arts and, you know, we had, we were a good sporting school. I wasn't a good sporting pupil, but there were people who were. We had a fantastic music department, I spent quite a lot of time doing that. Very talented head of department who inspired many people, across the county, not just in my school. And so it felt like a very well-rounded place and, you know, I think if you were motivated to learn, so people were absolutely up for helping you, but it wasn't a hothouse. But I mean it depends what you think education's for. I mean there's an important thing about socialising people as well as filling their heads with facts, you know. I benefited from my school, I'm proud to have been there, I think it's a great school. It still exists, you know, my brother's kids were there and I think it's a fine place, really.

So you were entirely state educated then were you, before…

Yeah, completely. Yeah, yeah, absolutely. Yeah, yeah. Yeah. So primary schools and things in the state system and then through the comprehensive school and then into Oxford, so yeah, absolutely.

[00:04:54]

So what about your family life? Did you feel, were you happy? You said you had one brother.

Yeah, that's right, I have one brother.

So did you, must have been a wonderful place to grow up, Cornwall, I imagine, with lots of opportunities to go out exploring the countryside or swim and…

We spent, yeah, we spent a lot of time, you know, canoeing, we spent a lot of time walking on Dartmoor, we spent a lot of time travelling, my parents were quite keen travellers, and so, yeah, and there was a good languages department in the school so, you know, I learned a bit of French. They attempted to teach me German, my poor German teacher struggled with that, but I've caught up since a bit, I think. But yeah, I mean I think the West Country's a fantastic part of the country, really. Although having worked in Lancaster I would also say the north is a great place too, so I mean I think the wonderful thing, one of the wonderful things about Britain is wherever you go there's something good to find.

I suppose so, although Swindon would be stretching it a bit, I think.

Well, I think, I mean there are parts of Swindon that I think are, you know, are perfectly lovely and of course it's in a great part of the world, Wiltshire is lovely, the Ridgeway's just on your doorstep. So I know Swindon gets a bit of bad press, but actually I think, I think it's an okay place. And I started my working life after university in Coventry and, you know, Coventry's a city that's had its fair share of criticism, but I found people in Coventry to be lovely. My neighbours were great, I made very good friends who I'm still in contact with now. So yeah, I mean okay, perhaps it's not architecturally the most beautiful city. But it's got some amazing

things, like the rebuilding, you know, Basil Spence, I think was the architect, rebuilding of the cathedral in Coventry from the ashes of the old cathedral after the Blitz. I mean it's a really inspiring idea, you know. And if you go to Berlin, there's one of the nails from the roof of Coventry Cathedral in the sort of remembrance church in Berlin, you know. So I think those ideas, you know, I'm not saying that architecture's not important, it's really important, but it's not the only thing in what a city's for and how it functions, you know.

Yeah, sure. So going back to your education and your early family life, so were your parents graduates? I mean did you have quite a strong academic background?

Yes. My father was, my mother wasn't, my stepmother was, so yeah. I mean, slightly mixed, if you like.

And was your…

None of them are science graduates, by the way. [laughs]

Your father was a science graduate?

None of them, none of them.

Oh, none of them. Okay, you were the first. And what about your brother, is he older or did he go to university?

He's younger and he's, basically he works, he sort of did the… he went to university, decided it wasn't for him and then went into the broadcasting industry. So he's had a very successful career in that, but yeah, he decided that book work – well, it's not book work – it was I think he just didn't, he couldn't see himself as an engineer, he didn't want to build bridges or design circuits, but he's been great in television.

So you did the sciences for A levels. Had you thought of chemistry from quite an early age or did it come…

Maths, physics and chemistry I did at A level. And it was a dilemma. I mean I think science is great, but I also think music is great and, you know, I played, you know, I played the lead desks in the city jazz orchestra and in the county jazz orchestra and in fact I was the only person, I think, in the county jazz orchestra who was one of the lead, section leads who didn't become a professional musician, I might have been the only one. So becoming a professional musician was on my radar and it was a pragmatic choice, so a bit of balance of heart and head in that life as a musician is quite unpredictable, really, and I slightly more [laughs]… was less adventurous, perhaps. So I kind of thought, well, income is more reliable if you do science and I mean, you know, you don't generally get really rich as a scientist, but that's okay. But normally, you know, you don't normally have to worry about where the next meal is coming from, and that isn't always the case if you're a freelancing musician. So yeah, so it was a kind of choice between music and sciences and – or even languages, I mean I'm quite good in French, but – at least so my teachers told me – but, anyway.

[00:10:02]
So you chose chemistry and you were always expected to get into Oxford were you, or was that sort of a…

No, I mean I wasn't always expected to, but I think, you know, I mean it had a great chemistry course. I applied to a number of universities and I, well, I applied to five, the normal process then through the UCCA system, I think it was called, and I got offers from, well, all of them actually. I can't remember, I don't think I got any rejections, I might have got one. But I got accepted into Oxford at Balliol and I was very happy to go there. And I think that really is a privilege, I think, in a way. I mean it's not a privilege in the way you might think, oh well, you know, they've got kind of nice buildings and they serve you good food and stuff, I don't mean that. What I mean is that the quality of the staff who teach you and the amount of time they invest in your intellectual development is superb. So at Balliol there were eight chemists in my year, one of them got sent down, so that left seven, right? And there were three tutors or professors of chemistry, so organic, inorganic and physical. Well, actually only two of them were professors, but at that stage Oxford had three professors of chemistry, so it was before they unified under one professorship. So there was a, you know, a professor of inorganic, one of organic and one of physical, and two of the

professors were at Balliol. So, and it was my tute partner who got sent down, so in my second year I had one-to-one tutorials once a week critiquing an essay I'd written, by two of the three professors in the whole university at Oxford, which is a world class university and has a world class chemistry department, you know. And of course you get put through your paces. And I don't think I was the best student by a long way, but I mean that is a privilege, I mean to have the time of people like that invested in you as some chap who turns up, you know, I mean heck, that really is a privilege. And of course it wasn't, I mean intellectually, I don't think you realise quite what it's doing for you until ten or fifteen years later when you find things, you find that you can do things that you didn't know that you could do, or that other people don't seem to be able to do quite so well and somehow you had four years – because it was a four-year course – you had four years of that, you know, of learning by observing, learning by interrogation, you know, the Socratic method, writing an essay, somebody going, well, if that's true, what about this then, and, you know, why doesn't that work. And you've got to think, oh yeah, good point, never thought of that. You know, that sort of thing. So I mean an Oxford chemistry degree is a fantastic, it's a fantastic place to get a degree and I think the tutorial system is a brilliant way of training brains. Of course it's very labour intensive and therefore it's quite expensive, but it is… and I do think that was a privilege, absolutely a privilege. I also think my secondary school was a privilege because it was a really good school and the staff were first rate, you know. And I, you know, I think that people like that, I mean there were 125 staff, I think, something like that, and they were hard working and they knew their subjects, and if they didn't they'd find someone who did, you know, they'd help you. I mean I sometimes would get sent from one staff member to another, if I had a question that my own teacher couldn't answer he'd say, why don't you go and ask this other person because they might know, you know. And so… and then they ran school clubs, you know, and they ran school visits. I mean people putting a lot of their own private time into helping young people like me to develop. So I'm very grateful, both to my university and to my school, really.

[00:14:05]

Yeah. And had you come, when did you first come across computers? Was that at school?

Ah. No, no, it wasn't. There were a few people at school who sort of, I think had a little BBC Micro and so there were some guys who fiddled with that. A couple of my buddies went off and did electrical engineering and stuff and they were kind of playing with computers, and also with synthesisers, so one of my buddies built a little synthesiser in his bedroom and it made kind of interesting noises, it was prog rock days, you know, it was Emerson, Lake & Palmer and Yes and all of those guys were sort of doing their thing and creating, you know, Moog was the big computer, you know, the electronic keyboard synthesiser brand. But I never did anything with it, I really wasn't very interested in it. In fact it would be true to say I'm not really very interested in computers now. I love what they can do for you, but I'm not really, you know, once I've found a way of doing something on a computer I never find if there's, if I can do it a different way or if there are five different ways of doing the same, I'm just not inherently inquisitive in that sort of thing. Although I'm a huge user and I think what they do for you is fantastic. The world is a better place because of them. So the first time I really came across computers I suppose I had to type my dissertation up at university, so I did that on a word processor, on a big, you know, whatever it was, 5½ inch disk, that was probably the first time I used a word processor. And…

Not an Amstrad, was it?

No, no. I can't even remember what it was, but it wasn't an Amstrad, I never had an Amstrad. And it was a departmental computer. But most of the other stuff, I mean like, you know, the control of the instrumentation we were using, we didn't use computers to control them, they were basically little electronic batteries with, you know, rheostats and little pots on them and things. And then I suppose I was in my first working life when I first came across a computer, and we installed an area network, hard-wired in the research lab I was working in, and that was in about 1984 or 19… Because I went into industrial R&D, I went and worked in the corporate labs for Courtaulds. And so my boss installed a network of computers and a shared storage system for files and reports and things for the, there were about fifty of us in his team, and we all had, you know, a user name and could send each other emails and he wanted our monthly reports in a standard form, and that was like in '85. And I don't, that must have been one of the very early, we were the first group within – so

far as I know – within the centre of Courtaulds corporate R&D that used a computer network and that used a standard system. So in principle, all of us could see anybody else's work on the network and then, you know, our reports and things were… Although, interestingly, we were still handwriting telexes on telex pads, we were, I mean I can remember using a Dictaphone to hand into the typing pool for my reports if I went on business trips overseas. And so a lot of things were still handwritten. And we had an air conveying system for messages, so if you wanted to get a message, like a telex, from one building to another building on the site, you'd write it on a bit of paper and then take it to the typing pool and they'd pop it in a little tube and it would be blown with pressure up onto the third floor and then across the main road and then drop down and somebody would get it. And it was a typing pool of about, I don't know, twenty people who used to type reports. And you, I mean I can remember carrying round in my briefcase, if I went on business trips or up to do factory support for one of the manufacturing businesses, you know, a book of graph paper, because when you did results and then you produced the report you gave them the graph plotted out by hand with a little line through it and that would then be kind of, I don't know, photocopied and sellotaped on and then, you know, so all the reports had hand-drawn graphs. And I used to carry around acetates and highlighter pens and, you know, would sit in the hotel the night before I had to do a presentation to the management team in, say, a factory in Grimsby or Calais or whatever it was, and I'd write out my presentations by hand with the bullet points and then I would draw a sketch of the graph I wanted to show and, you know, mark on the little axes and talk about, you know, if we'd done some experiments to show how we could optimise the product, show if you varied parameter one, what happened to the outputs. And you'd do that on bits of… So probably for five or six years I just carried round, I always had a box of acetates in my- they weren't acetate of course, not by then, they were probably polyester, but you know, you called them acetates – and I carried them round in my briefcase and coloured pens. Those were the days. [laughs]

[00:19:19]
So what took you from Oxford to Courtauld – was that your first job, Courtauld?

Yeah, Courtauld sponsored me through university. So I, when I was seventeen, and I've got to thank my dad. He suggested I might want to get sponsored, because, you

know, it would help get me into the workplace. So I applied to a number of people, I applied to BP in Sunbury and one or two others. And Courtauld's gave me a scholarship and BP said they'd sponsor me but I'd have to do chemical engineering, because they didn't sponsor chemists. And so I kind of thought should I switch to chemical engineering. And then it was interesting because then Balliol didn't want to defer me, because I was supposed to do a year before I went up, between school and then Balliol said no, we don't really want you, we want you to come now. So I then said to Courtauld's, well look, I've got a bit of a problem here because I'm supposed to come and work for you for a year before I go to university, but the college is saying they'd quite like me now. I mean I don't know if they didn't want to go through the recruitment process again. I doubt it was because they particularly wanted me, but it might have been, I've no idea. But they didn't want me to defer anyway. And Courtauld's were very good, they said, no, that's absolutely fine, you can have the scholarship, don't do the year before, do a slightly longer summer. I think I worked for eight or ten weeks between school and starting at university. And so they allowed me not to do my year beforehand. And then they paid for all my books and they gave me quite a generous weekly, well, termly pay but weekly living allowance. And they gave me a guaranteed job every summer. So I left university with money in the bank and actually National Insurance contributions. I mean, you know, I'm getting to an age where you start thinking about how many years you've got of National Insurance contributions, but mine started in 1980, you know, I mean, just extraordinary really.

That was because you were working, that was the holiday job, or you didn't…

Yeah, it was a holiday job, but it was a proper job in a lab. I mean I can remember in 1980 I was working on trying to create liquid crystalline polymers, so I mean it was in the early days of liquid crystalline polymers and there were two types – I can remember now, I mean it's a long time ago, forty years ago – but, you know, smectic and nematic liquid crystals and you can turn some polymers which aren't naturally liquid crystalline if you put them in the right solvation environment so you can make them behave like liquid crystals. And then if you can get them out of that solvation environment and keep the geometry that you got in the liquid, then you can get the physical properties as if you actually, you know, you kind of create the molecular alignment that makes the thing tougher. And so I spent the summer trying to find

solvation environments for a few different polymers that were of interest to the company to see if I could make liquid crystalline fibres or films or something out of them. So basically, doing lots of experiments to try and find different solvent, cosolvent combinations that created the smectic or nematic liquid crystals in solution and then tried to get them out of that to give you the advanced properties. So I mean, and yeah, I mean then I worked on carbon fibres in the very early eighties while they were still, you know, being, well, they weren't being developed, I mean they were known for a little while by then, but the industrialisation of them, so you could afford to put them in things like golf clubs and stuff like that. So I spent time trying to optimise carbon fibre production methodologies and then… So I had a whole bunch of different, really interesting experiences in between being at university and studying, which was, I mean… and then of course my obligation was to do a year after university. Because the idea was a year before and a year after was part of the sponsorship deal and so, although at the time people were saying go into the City, and a very good friend of mine, I mean, you know, the father of my girlfriend's friend, best friend, was the chairman of a merchant bank, what was then called a merchant bank, and he was saying, well, aren't you going to come and work for us in the City, Paul, you know. And I was kind of going well, that's a nice offer, but I'm going to do my year, because I didn't do my year beforehand and if I take all this money and don't do my year afterwards, that looks like very poor form. And so I joined the chemical industry, thinking I'd do my obligation, but then thinking about the City, you know, so I was looking at investment banking and stuff. And I was just given a succession of such interesting jobs by Courtauld's that I never left really, so it's just like, you know, it kind of, it was like, this is really interesting work with really nice people, you know, why would you want to move on, you know. So I spent quite a long time at Courtauld's, really. It was a great, from a technical point of view it was just brilliant, because they made all sorts of things. I mean you can almost see nothing around you that that company wouldn't have been involved in in some capacity or other, you know.

[00:24:35]

Absolutely. So are there any other things that you worked on at Courtauld that you'd like to highlight before we go on to talking about moving to the Technology Strategy Board?

Well, well lots of interesting… I suppose one thing that's really interesting, a couple of things that are relevant to my current role. I worked in lots of different divisions, so I saw lots of different technologies, and one of the great things about being in the chemical industry is that you're in the supply chain for nearly all the other industries. So I remember going round Boeing, because we were making products, you know, for the inside of aeroplanes, and we used to make the product that kept the fuel in the wings, and glued the windows on, you know. So then you meet the aeroplane industry, right? And then, you know, we also made things for upholstery in cars, fibres for upholstery, so then you meet the automotive industry. And we used to make food additives that stopped sausages exploding, or make ice-cream, stop it going crystalline for, you know, in those days, for example, Unilever was one of our customers and that meant that when you freeze your ice-cream you don't get these sharp crystals that cut your mouth. So we used to make that, so then you meet the food industry. And then you make, we used to make bromine and sulfur containing intermediates, so kind of fancy chemicals, so then you meet the drugs companies. And we used to make fibres that used to go to the fashion industry, so Jean Paul Gaultier, you know, he's still doing his perfumes, he was a judge for one of our fashion industry, for our fibres, you know, so that was back selling. So, you know, the people would apply with their clothes and of course that would work back up the supply chain through the weavers and the knitters and the dyers and the colourers and all that, and eventually they'd buy our fibre. And so you meet the fashion industry, and we used to make, you know, we used to make bras for Gossard and jumpers for Lyle & Scott and Slazenger and, so all of those guys were our customers, or our customers' customers, and so then you get to know a little bit about that sector. And then we used to make energy control, energy management things, and so you get to know the buildings and architectural companies because you keep the heat out of buildings with your, you know, solar radiation control technologies. And so, you know, so when you kind of spend time kicking around- advanced materials, we used to make, we used to make the blue helmets for the United Nations and armour protection for Land Rovers, so you meet the composites industry and you get to know the military. So by the time you've done twenty years of that, you've got a pretty broad view of how you turn technology into money and how supply chains work. We used to make polymers for liquid crystal display, so that takes you into, you know, at

the end of the display line is Toshiba or… and also photography people, so Polaroid and Agfa and, you know, Konica and people like that. So- oh, and ship paint. We painted a third of the world's ships, so then you understand how boat paint works and the difference between coil coating and powder coating. So yeah, so when you end up in a job like Innovate UK, which is, or Technology Strategy Board, as it was, which is in principle all technologies in all sectors, you know, I'd actually seen quite a lot of that already.

Yeah.

And then I was a market analyst for a few years, living in the States and helping work out what the future markets might be. So we had a bunch of product and we didn't sell many of, you know, like maybe would do a million dollars or something, and the kind of question is, well, is that a hundred million dollar potential business or is it going to disappear, and it was my job to try and predict that. So I did that for a few years. And I looked after our technology transfer operation in Japan. So I'd spend a month of each year in Japan. That was only for about three years, so I probably spent maybe three or four months in Japan in total. And, but then you understand a little bit about how international trade works. I was a sales guy, so I had customers in Germany for a bit, so you understand about sales. So when you find yourself in this kind of position that, as head of development, which is how I joined Technology Strategy Board, making money out of technology's all about fitting what technology can do to what customers need. They're not necessarily the same thing. And I'd spent quite a few years in exactly that world, that iterative process of well, what can this technology do versus who really cares about it. So I've done a bit of that in, if you like, in a multinational environment, so one company, or, you know, successive bits of one company, you know, successive companies. Yeah, so that was quite a good training for Technology Strategy Board, really.

[00:29:36]
Was there, did they approach you or had you started to get itchy feet at Courtauld? What made you want to…

No. Well, yeah. No, it's a funny story. We got bought by- I was working at that point in Derby for, you know, a company that was called Acordis Acetate Products, and we'd been bought out of Courtauld's, Akzo Nobel had bought Courtauld's. Akzo Nobel are a great company, they bought ICI as well, that's very successful and, you know, have grown on the strength of those acquisitions. And then some of the things that they decided weren't core including, one of them was one of the bits I was in, then got sold to a venture capital organisation, so CVC, the Citibank venture capital spin out, I think that's its origins. So, well, private equity really, it's not really venture capital, it's private equity. And so then they sold us on, that's their model, you know, so they did some stuff with us and a bit of restructuring and sold us on, and they sold us on to our biggest competitor, an American company. And so I went from being in the, you know, in the management structure of a company that was – I was back in R&D then having done all these other kind of commercial and manufacturing roles and, or factory support roles – and they kind of said we'll tell you what to make and we'll tell you where to ship it. And they laid off all the sales guys and they laid off all the R&D guys and it was kind of quite clear that it was going to be a- I mean from their point of view it makes perfect sense, right, I mean why would you want R&D centres all round the world when you've got a big corporate headquarters in the States and why would you want different products being made in England from the ones you were making in America. So I don't feel resentful about it, but it did mean that life in the job I was in there got a whole lot less interesting. And they offered me to stay but it wasn't to do a job I had any interest in at all, so I resigned. And that was just at the point at which the Technology Strategy Board was being founded. So Technology Strategy Board started in 2007, I think it was 1st July, something like that, I can't remember the exact date, but it was in the summer. And so I was there on the first day, and then I went back to continue working my notice, and then I joined fulltime in the August. And yeah, it was a colleague of mine and friend of mine who knew that Technology Strategy Board was being set up and he, I'd worked with them, so when we got bought by the Americans I'd sent him an email going, oh, you might be interested to know we've just been bought, right? And he just came back and said, you know, if you are looking for a move, which I had been, definitely was thinking about at that point, then you might like to know that the government is setting up this innovation agency. So he put me in touch with them and I met with them and we

thought there was a fit, so I, you know, applied and went through assessment centre and all those good things and ended up joining.

And, so you've been there ever since, basically?

Yeah, yeah. I've been there for fourteen and a half years.

Yeah, yeah.

And when I joined there were thirty people, I think, thirty or forty of us. We're now about 600. And I was head of development. So in those days there were two heads of function, actually there were three heads of function in the entire organisation. Then there were a few, a couple of directors, two or three directors, and one was head of operations and they made sure we ran the competitions and people got paid. And then there was head of, there was me, I was head of development, and so we thought it up, what should be done, what the programmes ought to look like, what the strategies would be. And then we had a head of comms, and that, they kind of explained it to everybody else and helped us listen to everybody else so we could get, kind of make better programmes because we, you know, we were very keen not to sit in an ivory tower, but to actually engage with guys who were doing real things. And of course that's instinctive for me, I'd spent, nearly all the new products I ever developed were all in conjunction with our customers. You know, you'd make something, you'd ship a sample, you'd go out to Italy to see if it went through their factory, they would send it to their customer, they'd send it to their customer, it would come all the way back, you know. For example, you know, one of the products I developed for our company was the polymer that's used to make these spectacle frames. Not necessarily these ones, but the old ones, cellulose diacetate ones, the ones that the old Ray-Bans glasses used to be made out of. And those nice black pens, you know the fancy pens? Used to be made [incomp – brief sound distortion], that business. So I helped us develop one and we successfully developed one and, so of course I went to Italy to see it going through their process and it worked a dream. And so that was like 9 o'clock in the morning. Ten o'clock in the morning they went, brilliant, it's worked, fine, we're very happy. So our agent took us out, we went straight to a coffee shop and had an

espresso and he said, 'Stick some grappa in it, well done', you know. [laughs] So it was, yeah, good times, good times.

Yeah, that's the Italians for you.

Oh, I loved our Italian customers, they were fantastic.

[00:34:51]
So were you, now you must have been thinking - going back to the world of IT and computers at this stage – they were really, sort of had come on by leaps and bounds obviously by 2007, and after that, so you must have had quite a lot of work involving, work involving IT in one form or another, did you?

Yeah. Well, so I was responsible for the first dozen or so strategies that we created as an organisation. And as head of development, you know, I mean I didn't hire, I inherited a team of really, really smart people and was asked to manage it. And it was very daunting because they were, I mean they were much cleverer than I was and so, for example…

When you say you'd inherited them, where had you inherited them from?

Well, some of them, they were being recruited by DTI who were setting up the organisation and they'd got some guys in to recruit some people and, you know, one of the people they were recruiting was the head, me, and then they were recruiting a load of specialists in topics, from biosciences to IT, to, you know, electronics, sensors, photonics, advanced materials, you know, green economy, life sciences. And I was given the job of running that team and, you know, creating national strategies for those programmes. Some of them were markets and some of them were technologies. But, for example, the person who wrote our strategy for ICT – and I mean we had lots of freedom, you know, we had the debate about what we should call that strategy, should we call it a strategy for software as a service, you know, what were we going to call it, you know. You know, we did lots of work on what's the market trajectory, where's it going, what's the capability of the UK. But she had run the AI programme for DERA, the defence people in Malvern, so she was, she had a PhD in AI, she was

all over AI technology. So I'd used AI, you know, when I was in the chemical industry, to optimise, I'd used a neural network system to try and optimise the plant that we were running, you know, to see if we could run it with a better set of conditions than, you know, using traditional techniques like linear regression or something to optimise things. So I had used AI, I'd come across neural networks before, but I didn't have a PhD in the subject and I hadn't spent years trying to work out how best to deploy them, right? And then the guy who wrote our electronics strategy, one of them – there were two other guys I had in that area – one of them had worked for Nortel on light amplifiers and, you know, broadband infrastructure, and the other had been working at the Cavendish in Cambridge on cutting edge physics and electronics. And I was, I mean these guys said, oh, you're now reporting to Paul. And they were very nice to me and I was in awe of them, frankly, and with good reason because they were very, very smart and good people. But between us we managed to get along, they did a brilliant job for us, I tried not to get in the way, and we produced a set of strategies that I think are good, actually, I think, you know, they stood the test of time. And some of the things that we've invested in on the back of those strategies have turned out to be good technologies to have backed, you know. You know, so regenerative medicines moving into the cell therapies area, I mean that's an important growing industry and we started investing in it in 2009. The CubeSat industry in space and satellites we were investing in probably, I don't know, 2010, 2011, that sort of time, that's kind of moved forward, the stuff we were doing in big data and AI and metadata, you know, particularly in the creative industries, has gone forward really well, and the movie industry, the UK is the headquarters of, it's the leading, London's the leading centre of the video effects industry now, globally. And, you know, we invested in wind energy, offshore wind, and now offshore wind is the cheapest at scale source of energy generation. So, you know, at scale, right, so to power homes, not – and towns – not just small things. And it's the cheapest now source available, cheaper than coal, cheaper than gas, cheaper than nuclear, per kilowatt hour. And, that landed ten years ahead of schedule, based on what our estimates were when we looked at it working with DEC in 2010 or so. So, I mean we didn't do any of this on our own, of course, we work with partners, we work with government departments, we work with- well, actually, industry did it, we just helped them. I mean most of this stuff's being delivered by companies.   So I mean, and so all of our thinking in those areas, I think, you know, of course not everything we've

invested in has been successful or has transformed the industries that they're in, but, you know, we were talking, we were talking with the vehicle industry to look at electric vehicles in 2004. So, you know, as a pilot within DTI, so we picked up a low carbon vehicle programme in 2007, you know. In those days the luxury vehicle companies would say something like, well, it doesn't matter what the CO_2 is because none of our customers pay for their own fuel, right? And of course now, nobody thinks like that any more, in twenty years that world has completely changed and now all of those guys are offering electric vehicles. But that wasn't the case fifteen years ago, some of them, it wasn't clear to all of them that they needed to do it. And of course that's not us, I mean that's society widely but we were having those conversations nearly twenty years ago.

[00:40:50]
So how do you think you influenced the evolution of the IT industry in the UK generally?

Well, what would I say? I would say that… I think making the opportunities that come from the cloud and the idea that you don't necessarily need to build and install your own large data centres, you can benefit from the economies of scale that you get by sharing Compute Resource, that in the case of software you don't necessarily have to kind of own the software and pay your licence just for that, but the idea that you can use software as a service and that there's a whole infrastructure of people who provide that. And then connecting that into lots of different industries, not just the tech industry. So, you know, guys who may not have, guys who may have never heard of the cloud in, you know, I mean I think in 2008, 2009 there were a lot of guys and a lot of industries who probably hadn't heard of cloud computing, and we raised its profile. And we ran programmes to support people in doing that. And then we ran specific investments in areas like, you know, multi-core processing. And in those days, you know, people were just bringing in quad-core chips. I mean I know that, you know, that that seems very old-fashioned now, but it was absolutely cutting edge then. But in those days software that ran on multi-core processors took longer to execute its code than single-core processors because the software wasn't optimised for the chip capability. And so, you know, and we ran a series of investments to help people make the most of the capability, if you like, and we did some KTP, so we

helped transfer people from universities to work in companies and ran them as a cohort so that people would get used to coding for multi-core processors and deploying multiple codes. That's one thing we did. We did a load of things about, for the movie industry, around metadata. So in an advanced film, you know, you would, in those days you would tag all of your different scenes manually, right, then you'd have to stitch them together. But you might have a million different bits of film that your people are editing, and it's all tagged manually, right? So we kind of started, we ran lots of process competitions – not lots, but a number of them - where we tried to get the idea out that if you used the metadata associated with your edits then you could actually manage the metadata, it would help you with your workflow being more efficient. And then, the other thing in the movie industry that was interesting – I'm not quite sure if this would count as tech to your question – but if you take a movie like *Avatar*, the James Cameron film, I can't remember the numbers actually, but it's something like a couple of thousand hours of compute processing to produce a minute of movie that you watch. So like 200,000 hours to give you one minute of movie. Something like that, it's that order of magnitude. I mean I might be out by, you know, a bit, but I'm probably not out by a factor of a million.   So, and yet if you play a video game you get it in real time, right, so 50 Hz. And you've got to think, well, how about if you get the guys who've got the rendering engines that the games industry use and you put them together with the movie makers, then these guys don't have to spend 200,000 hours, they can do it really, really fast. So we ran a bunch of networking activities to bring the gaming industry and the movie industry together and we funded projects for them to work together. And now when you make an animation intensive movie, you can render, I mean it's not high resolution, it wouldn't look good in a movie theatre, in a cinema, but you can render what you had shot that day very quickly so you know whether you're going to have to reshoot scenes the next day instead of having to wait three months to know whether you've got to reshoot a scene, and then you've got to rebuild the set and call all the actors together again and it costs you millions. And now you can know that in real time and then you've got hopefully better metadata architecture for version control and things. And that has been, you know, so that, you know, that sort of capability is why the *Star Wars* movies were made here, why Lucas… so the Lucasfilms use Industrial Light & Magic for their special effects. So ILM set up a studio in the UK, Sony have set up a studio in the UK. If you look at the list of movie investments that have been made in the UK

there's about, you know, I don't know, maybe as many as two dozen inward investments or expansions planned on the back of that kind of technology, which we helped to seed the excitement for.

[00:45:57]

Now of course we're not the only ones. And then with our digital catapult, the next generation of things are coming forward with things like, you know, so that was, you know, a lot of that stuff, like *Lord of the Rings* is based on performance capture and Andy Serkis, and that's now moving into volumetric capture and next generation movie making. Yeah, so performance capture and – sorry – volumetric capture, and so our digital catapult has got a studio that allows you to do that, which is the next thing on from the technology to make *Lord of the Rings*. All on the back of those things. And we've done a lot to help people promote, you know, AI and companies to explore the use of machine learning and things. So I think – and then we've made investments in the Internet of Things and we've made investments in, you know, comms technology, local area networks, LPWAN, 5G, different kind of comms devices and different business models. And of course quantum technology. So we made, we started, you know, we did quite a bit of work to help companies work out how that physics, which was just at the point of going from physics labs to engineering labs in universities, and how do you get that into companies, so the National Quantum Technologies Programme, which we built with EPSRC, with… in fact I sat next to George Osborne in Number 11 when he made the announcement on BBC TV about that investment in that programme. So that takes you into quantum computing, it takes you into quantum secure communications, you know, it takes you into quantum imaging. So, and you know, gravity, gravity imaging. So the ability to see the world on the basis not of its reflected light, but on the shape of the gravitational field. So, yeah. I think I might have rambled a bit there and gone off message slightly, but all of those things, IT is relevant to a lot of those things. And of course Industry 4.0, which is important.

[00:47:55]

So yes, I suppose one criticism often made with government bodies charged with the task of picking winners is that, you know, they're notoriously bad at it because people who've, you know, who are civil servants or, you know, who are not- I mean you obviously do have a lot of commercial background, that must have helped really kind

of sharpen up your antennae to know what was going to be more likely to be a commercial success, because otherwise if you try to pick winners purely theoretically it's virtually impossible to do, isn't it?

Yeah, it is, but I think, well, what would I say? I'd say a couple of things on that. I'd say first of all, when you attempt to pick winners, some of the things you pick aren't winners, and that's fine. And that happens in industry too. I mean, you know, I worked probably in R&D in industry for, you know, I don't know, maybe ten years, something like that, in different manifestations, and we invested in projects that went absolutely nowhere, you know. And so I don't see why it's, I don't see why we should feel that if government sometimes gets that wrong that that's in some way weird. I mean of course they get it wrong, everybody else does. But if they get some of it right, you know, and if they get more right than they get wrong, that's fine. And that's the same with VC, I mean if you look at VC, they will invest in ten companies, you know, they know they'll lose their shirt on six of them, they hope to break even on three and maybe one will make out, you know, and return a really healthy return. So even VC, you know, the stats are what they are. So that's the first thing I'd say is, I think government should worry a bit less about picking winners and we should be more tolerant of things that don't work out for every single, you know, if the net, if all the pounds invested result in a net return, the fact that some of them don't, I think we should be tolerant of that. The second point is that you don't necessarily pick winners. What we do is we pick fights, if you like. So we don't necessarily know if we invest in, well, let's say the movie industry, I mean we probably funded – or I'd say the creative industries overall – we've probably funded, you know, something like 300 companies in the creative industries during the time we ran the implementation of our first strategy, it will be something like that. And some of them will have gone nowhere, some of them are probably out of business now, but others will have done really well, and all the stuff I was talking about the creative industries in the UK is incredibly healthy. So we've definitely got a good story to tell for that and we've got a good return. But we didn't pick one company and put all our money into that company, we chose a field of technology and a market where we thought on average there was going to be something good that was going to happen in the UK, we didn't necessarily know who would win and who would come out on top.

Do you feel…

But that's why you…

[00:50:39]
Yeah. Do you feel you missed out on the gaming industry, which has largely gone overseas, compared with the early days?

Well, I don't know. I mean I think if you look at games production, the UK's still pretty strong. If you look at games publishing, the UK isn't strong. So that is really the Japanese and the Americans who own most of that market, you know, the kind of Sony PlayStation, Atari, all those sorts of guys. But if you look at the games, I mean Grand Theft Auto, it's a UK company, you know, and created in the UK, coded in the UK. And so I think that's one of the problems when you look at, you know, if you're in the B2B, I mean who would know that a UK company was providing the polymer that sits in your Toshiba laptop for the liquid crystal display. The man on the street would not know that, why the heck should they, it's buried deep in some supply chain. But that's the sort of thing we worry about, we try and understand the trajectory of global supply chains and we try to work out where the UK can find a home in those trajectories where the ship hasn't already sailed and then we try and find whether there are companies who care about it and if they don't care about, we'll know about it, then we say do you want to think about it, and then we help them think about it. And if they already care about it, we help them go a bit faster.

So how, looking at the changes that have taken place in society over the time that you've been working then, what do you see as some of the greatest changes that have happened sort of because of the work that you've been involved in?

[pause] Yeah, interesting. I think, I think the ubiquity of the cloud, of big data, of the cheapness of computing, the functionality of phones and of computing generally, we see it as movies that are streamable, but, you know, movies that had the animation effects in like *Avatar* used to come along once every five years and now, you know, you can see dozens a week, probably. I don't know the exact numbers, but… So I think that sort of thing is enormous. And we definitely, in the movie industry we can

definitely claim to have been a contributory factor. I mean of course, you know, we didn't do it on our own and other factors like tax breaks that the government put in place for that industry were also extremely important. I think, you know, the help in electric vehicles, we've been investing in that area, and batteries. We've now got, you know, commitments to create battery gigafactories in the UK. That's really good, we've been a part of that journey. In regenerative medicine, which isn't, I mean it's basically early stage patient trials for the most part, but we've got the largest, third largest cluster of regenerative medicines companies, cell therapies companies in the world is in the UK. I think 12% of all trials globally in that technology area are being done in the UK, and we're 1% of the population, so you know, that's a pretty, that's a pretty disproportionate level of impact. So I think there are, you know, there are quite a lot of, you know, the adoption of advanced technologies in farming, of precision agriculture. But I don't think it's fair to say that we alone did that, I mean I think, you know, what we helped, what we help UK companies to do is to pick up on, from the movements in global markets. Most people can see them, I mean customers see them. And then, and of course to use the great science base. You know, in quantum technologies, for example, the UK's superb science base in quantum technologies, or synthetic biology. You know, we started investing in synthetic biology in 2009 and that technology is the basis of the messenger RNA Covid vaccine, so that's, I know that BioNTech is a German company, that's the Pfizer product, but there are a number of other products coming forward in the UK based on that technology which are really good. We funded the first lateral flow test in the UK, that was funded within UKRI. And so, I mean I don't know, there are lots and lots of things.

Yeah, and what about…

One of the difficulties is that the world constantly changes, so at any point in time you either haven't quite arrived or it's happened and now that is yesterday and the next thing's coming along.

[00:55:30]
Yeah. Yes, that's one of the big challenges. I mean are there, so looking back then over those years, is there anything you'd think, well, we should have, you know, I would do that differently if I would have my time again.

Yeah. I don't spend a lot of time regretting, so it's not a question I dwell on. And of course, you know, nations have finite resources so there are quite a number of things that we could have done if we'd had a bigger budget, but you know, we have to bear in mind that we're not the size of America or China and so, you know, we've got to be realistic and deploy the resources that we have in a kind of sensible way.

Yeah.

I mean I, what do I think that we could have done more of? I think that what we do tend to, we evaluate a lot at a quite early stage in the development of technologies and companies. So, you know, has this given us a return yet, and we worry, I think, we worry too early about whether something has been a successful investment. And, I mean this is a national kind of behaviour, I don't think it's limited to us at Innovate UK. And I mean, for example, Google, right? The licence patent came out of Stanford in, was it '95 or '96, something like that, when the Google IP got filed. Now, if you'd asked whether they'd got a return on that patent investment in, I don't know, 2002 or 2008, I mean would it have looked like a brilliant return? I mean it might have started to look quite good, right, but compared to where it is now, it would have been nothing. And so I do slightly worry that we don't always accommodate the trajectory of, you know, multiple supply chains, multiple suppliers across global things, so I wonder if we don't take slightly a long enough term view, not only in our thinking but in our evaluation processes. You know, you can't evaluate whether a project has given you a return while the project is ongoing. I mean you can work out whether it's being well managed, you can work out whether the money's being well spent, you can work out whether the promise is still there, but, you know, you don't get any orders until something exists. Well, generally, I mean you do get people pre-order, but you know, if you take a paperback book, how many people paid for the paperback book or the hardback book before it's been published? Most people wait till it has been published. It's the fans who pre-order the book, most people don't.

[00:58:33]
So it doesn't sound like you regret not having become a merchant banker or even perhaps going into the world of VC, which you've mentioned, I mean you could have made a lot more money, I suppose…

Well yeah, definitely. Well, probably I would have made a lot more money. I might have been awful at it and have been out on my ear, you know, [laughs] I mean, who knows? I think the fact that, you know, the fact that you get the job doesn't mean that you can do it, I mean getting the job is the easy bit, it's doing it day in, day out is the hard bit, in my experience. Maybe I've uniquely struggled with that. But no, I mean I don't have regrets on having spent a career in technology, in its broader sense, I mean, you know, obviously we've talked a lot about digital technologies and, you know, electronics related technologies, but you know, I would argue that, you know, the advanced materials that you use to make your golf club light or that you use to, you know, stop your sausage skin splitting when you fry it, I mean that's all technology. So I don't regret having spent time in those, doing those different things, I mean I think it's been fantastic fun, it's been hugely mentally stimulating, I've met loads of lovely people. It's, you know, it's created, it's contributed to national wealth, I mean the chemical industry is a huge exporter. It exports much more than it imports and it creates high quality jobs for people. And I definitely am poorer than I would have been, but I've probably had a more interesting career than I might have had and maybe I would have loved a career in financial services, but I mean I do know some people who worked in that industry and they've had good lives, you know, and most of them are massively wealthier than I am. But, as I said, I mean for me, I think my number one thing, my number one requirement of any job I've ever had is not to be bored and I can honestly say, I mean I'm not saying that sometimes you think, oh really, have I got to write my monthly report, okay, I'll get on with it. So I'm not saying that every single moment is stimulating, but the number of days when I've felt bored or under occupied or where there hasn't been something interesting and worthwhile to do or to think about, or something new to learn, I mean, you know, in nearly forty years I can think of hardly any, you know. I mean what luck is that.

[01:01:06]
Well, and that sounds like you would recommend it to young people. One of the things we like to look at would be what would your advice be to somebody who was in your shoes when you were eighteen or twenty-one and thinking about which route to take.

Yes. So I think there's a general careers level advice I would give. I don't know if this is of any use to anybody, it's what I say to our kids. So, you've got a triangle, right, and at one corner of the triangle is what you love doing, right, and then another corner of the triangle is what you're good at, and then the third corner is what someone will pay you for. And so I think I'm reasonably good at playing the saxophone, or I kind of was relative to other people when I was sixteen, but it was quite clear to me that nobody was going to pay me any money for it, right, so that's not a good career option. I do like doing sport, right, and you can earn money doing sport, but I'm basically rubbish at it, even though I enjoy it. So I think you've got to find the bit in the triangle where you like it and it pays you enough for your needs and they're all different. I mean, you know, I've never wanted a yacht in Monaco, some people absolutely, you know, their heart would be set on big yacht, you know. And, you know, I've found there's usually jobs in technology, or for people who think like scientists. So I think first of all people have got to try to work through the balance of- what that means is that you can't expect a career that allows you to only do the things you like doing, right? You've got to be a bit pragmatic, right? And a compromise between what you love and what someone will pay you for is not a bad compromise to make. And, you know, you might love playing chess, but maybe you need to get a, you know, a job doing something else and then at the weekends you can play chess, or whatever it is. So that's my first bit of career advice, is have realistic expectations. My second bit of careers advice would be try to give more to your employer than you take. You know, I mean basically, if you're somebody who an employer can rely on, they aren't going to want to quit you and, you know, so try and help other people succeed and try and be a net contributor. Which doesn't mean occasionally you need to, you know, turn to your employer and go, look, we've got a family crisis, I need an afternoon off, or something, it doesn't mean that you never do that. But it means that, you know, you do more hours over than you take back in whatever other kind of help you might get from your employer. So give more than you take is not a bad idea. And then in terms of topic, I mean I've done all sorts of different things. I think find something that you like that you know there's a market for, you know, there are companies. I mean of course you can start your own company, but then it's a different market, then you need paying customers. If you get a job then the organisation you're in has to find the paying customers and you help that process. But ultimately, you know, if somebody in the supply chain isn't getting paid, then the

supply chain will fold, it's just a matter of time. So you've got to think about what is saleable. The last thing is, I think, I mean this is not true, this is the way I did it, which is I never really thought about my career. So I've never really had a career goal or wanted to be at a particular destination, but I've thought a lot about my job, right? So I've thought a lot about am I doing a good job now, am I going to, are we going to get somewhere in three or six months or a year where we need to be on this programme, is it working. And I've thought a lot about is the organisation I'm serving worth serving. So is it, are these guys I'm prepared to give my day to and am I doing a good job for them. And for me the rest has taken care of itself. But if somebody had said, oh I want, I mean I've not been a chief executive, okay, I'm a director, it's a privilege to be a director of Innovate UK, but if my ambition had been to be a chief executive then I'd have to consider myself a failure. But since I didn't have any ambition, I can't consider it to be a failure because you can't not arrive at somewhere where you don't intend to go, right? So I think people maybe don't, maybe they should think about their jobs and worry a little bit less about the long-term trajectory, particularly now, because I mean the kind of comm thing about the percentage of jobs that you'll be doing in twenty years' time that don't yet exist, I mean that's going to speed up. Being flexible, being prepared to, you know, if you do a good job today, tomorrow will take care of itself, within sensible limits of self-preservation. If you're in a twilight industry, if you're in an industry that is chuffing CO_2 up the stack and screwing up the planet and nobody's making any attempt to tidy things up, at some point that's got to stop, right? So I wouldn't recommend that someone sits happily churning around in that kind of environment, you know, I think you need to think about… But, I mean, you know, you can offset and stuff, so I'm not saying that energy intensive industries all need to go, because we can't live without some of that stuff, but we do need to balance what we put out with what we, you know. So I think people should think about being in a sensible place. But ten-year careers plan is not something I've any experience of.

[1:06:59]

No, no. And talking about ten years then, might you look into your crystal ball and just make a few visionary thoughts or forecasts as to how you see your part of the world changing over that decade?

I do think that, so we've just supported the creation of a standard called PAS 440 for responsible innovation and the idea is to try and balance the good that technology does with its potential for harm. So there's no such thing as a good or a bad technology, it just depends on what you do with it. Now I wouldn't want to live in a house without electricity, but I definitely don't want it in my bath, and I wouldn't want to cook with blunt knives but they're just a disaster in a street fight. So, you know, so I think we've got to get more mature about how we make those balances for the forces in favour of using a particular technology with the forces against using that technology. And the PAS 440 is intended to give companies a framework for thinking about that and doing it. So I do think that in ten years' time we're going to be in a different place, well, we actually need to be in a different place in respect of the relationships between what technology can create, I mean technology creates supply, right, it gives you the ability to do something, it doesn't really create demand, people create demand, and society and markets. Society and markets and people, if you put them all on one pool site, demand site thing, and the balance between the broader impacts of what we do with our technology and what the technology's capable of, I think we need to get much better at that. And, you know, AI, for example, targeted advertising, very helpful not to get a load of adverts you don't want. Disaster to start advertising whiskey to recovering alcoholics, right? So we have to get much, much better at balancing the pluses and minuses of the use of technology, and that applies in lots of things, in robotics, it applies in AI, it applies in things like synthetic biology, it'll apply in some things about, you know, quantum technology and kind of issues of, you know, if people start being able to see through walls or round corners then you've got kind of privacy issues. It applies to security cameras, almost anything you do online, I mean everything you do online. And so things like, I don't know, the right to be forgotten, you know, the propagation of fake news, all of those things which undermine democracy and harm society, you know, we have to kind of get on top of that somehow. But I do think that, you know, there's a lot of really good stuff will come out of technology, so the capacity to actually cure diseases that at the moment we can only treat, you know. I mean in my lifetime my life expectancy has grown by two and a half years for every decade I've been alive. I mean, the probability is I will live for fifteen years more than it was anticipated when I was born. I mean isn't that astonishing? It's just astonishing. So I think all of those things can come forward, but we have to balance wider societal impacts and I think

society will be much more conscious, and the relationship between companies and society, particularly big business, which is a dirty word in many people's books, right? But, you know, some of these big businesses give 200,000 families their livelihoods, I mean what's not to love about that? So that balance has got to be struck. I think the digital thing and the privacy thing is going to be really, I think, quite important.

[01:11:01]

And then the other really big thing, you slightly - I haven't really thought about these, so just off the top of my head - I think the other really big thing is about planetary stewardship. And so we do have to, so CO_2 equivalents – nitrous oxides, methane – we've got to get on top of that, but it's much more than that, it's habitat loss, it's biodiversity, it's the, you know, we do not know, I mean even – take Covid – we do not know what the impact of huge amounts of anti-viral and anti-bacterial substances going into the environment's going to be. What's it going to do to fungi, what's it going to do to watercourses, what's it's going to do to flora and soil bacteria. So we have to learn to live on this planet in a way that doesn't mess it up for, you know, for future generations, I mean people we've never met and they won't know we were even here unless we mess it up. So those sorts of things: environmental impact; wider societal applications; but bring through all the really good stuff that technology can bring. So don't, let's not end up with a, you know, like with the kind of GM in Europe thing where, you know, a whole industry gets shut down in a particular geography or, you know, or Cambridge Analytica or something, you know, which is just clearly, you know, we've got to… And the onus is on companies, you know, and that's why the PAS is so important and it's why things like sector groups are so important, it's why trade associations are so important, you know, because they can help show the big picture and make it visible and help people to organise around it without the risk that companies kind of, you know, they find themselves in a position where they kind of think, well, I don't really want to talk to my competitors because people might question my motives, but actually if we don't organise ourselves one is going to drop the ball so we have to get smart on how we work.

What does PAS stand for?

Oh, it stands for Publicly Available Standard [Specification] and it is a process that BSI, that's the UK standards body, before they go to a full BS standard or full ISO standard they can create a PAS and it allows you to experiment with processes and standards and get them out quickly and start using them in a way that's a bit less formal than having to go through the formal BS or ISO standard.

And that's currently happening now in the area of planetary stewardship?

Yeah. So in responsible innovation we've got PAS 440, it's out there now, you can download it from the BSI website for free. We funded it from Technology Strategy Board or Innovate UK, so yeah, it was funded from my group and we'll be reviewing that with BSI in the coming year and thinking about what to do with it next, whether to leave it as a PAS, whether to keep it as a PAS but reissue it and update it based on what we've learned, or whether to take it into the ISO committee structure and say this could become an ISO number in the way- or to turn it into a full BS number, you know. I mean ISO 9000, which nearly all companies are ISO 9000 compliant, and, you know, it started life as BS 5750, you know, I can remember us getting BS 5750 back in the 1980s, you know.

Okay. Well, thank you very much Paul, it's been a pleasure to talk to you and absolutely fascinating to hear about your wide ranging and hopefully long continuing exciting career.

I'm looking forward to that too. [laughs]

Perhaps I should just call it your succession of jobs, rather than your career.

[laughs] That would be more, from a planning point of view that would be a better description. [laughs] It was nice meeting you. Thank you for the time to talk.

[1:14:46 end of recording]