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Jim Norton

Interviewed by

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Welcome to the Archives of Information Technology. It's Friday 7th of July 2017, and we're in the BCS headquarters in London. I'm Jonathan Sinfield, and I'm an interviewer for Archives of IT, and today I'll be talking to Professor Jim Norton. Jim is an independent director, policy adviser, and public speaker. He is a Fellow of the UK Royal Academy of Engineering, an external member of the board of the UK's Parliament[sic] Office of Science and Technology, otherwise known as POST, a governor of Coventry University, a Visiting Professor of electronic engineering at Sheffield University, a board member and trustee of the Foundation for Information Policy Research, FIPR, a past special adviser to the UK House of Commons Culture, Media and Sport Select Committee. And, looking at Jim's commercial career, has held senior positions at BT, Cable & Wireless, Deutsche Telekom, and the Institute of Directors. In the public sector, he was Chief Executive of the DTI Radiocommunications Agency, and a founder member of the Cabinet Office Performance and Innovation Unit, latterly known as the Prime Minister's Strategy Unit. Jim was President of the BCS between 2011 and 2012.

Jim, firstly, thank you for agreeing to talk to us today. Looking through your very impressive CV, I can see, you are an information technologist, much in demand.

[laughs]

Good morning.

Good morning everyone.

[01:52]
Mm. Jim, if we can take you back. Perhaps you could explain when and where you were born.

[laughs] Well I was born in south-east London, in Lewisham Hospital. And, I grew up, went to school, initially in Lee Green, the station area, and then on Blackheath. [pause] My interest in engineering was from a, a very early age, where I got into building little radios in the late 1950s, early 1960s.

Right, OK. So, so what year, if you don't mind me asking you Jim, what year were you born in?

1952.

[02:33]
1952. And, I'm interested, as we are, with individuals we're interviewing for this project, about your family background.

Mhm.

So perhaps you could, perhaps, talk about your, a little bit about your home life and your, your parents and their occupations.

Right. My father was also an engineer, a chartered mechanical engineer, and he spent his life in the pulp and paper industries, but in particular, designing and manufacturing the machines to *make* paper, for paper mills. And so, I remember from an early age explaining to him that, with the coming of, of computing systems and so on, we, we'll be paperless fairly soon, and why was he still bothering with all this paper stuff? 50 years on, I'm still completely wrong.

Mm.

My mother was a temporary civil servant during the Second World War, worked for the Ministry of Agriculture, Fishery and Foods, in Blackpool, which is… and my father had grown up in Manchester, and that's where the two of them met. And, married, and eventually moved back down to London in the, late 1940s.

Mm. And, you, you mentioned briefly about your, your schooling. So perhaps you can tell us about your, your secondary school and…

Yup. I went to a, indirect grant grammar school, Roan School for Boys, which is still there, on Blackheath, but isn't an indirect grant grammar school any more. I had a

good time there. I particularly was interested in mathematics, and, physical sciences.
So, I did my compulsory ten, ten O Levels, and then, three A, three and a half A
Levels, because at that stage they were trialling a thing called Nuffield Physical
Science, which counted one and a half A Levels. And so in the end I, I got an A in
pure maths, an A in applied maths, and an A in physical science. I became an
exhibitioner from the school on going to university.

[04:28]
Oh right. So, so moving on to university. Which university did you join?

[laughs] I joined Sheffield University, which again has a very strong engineering
background. And had a, a thoroughly good time there., I have to say. Interestingly,
during that time, whilst I was reading engineering, I was able, during one of the
vacations, to go on a course, that was actually for staff, on the basics of computing,
and in those days programming in FORTRAN. And so that gave me a bit of a head
start. I was also a bit of a nuisance to the university's computing service, because I
ran various things which chewed up very large amounts of time on their, on their
mainframe.

[05:06]
*Mm. And, and thinking back to your education, would you say there are any
particular events that shaped you during your education?*

OK. I think, as with many people who go into science or engineering, an
exceptionally good physics teacher at secondary school, called Mr Axon[sp?], who
had a, the great knack of making science interesting, and challenging. And I think
that's a real help. And a reasonably good grounding in mathematics. And that is
something I do worry about today, where I don't think we're doing anywhere near
enough in primary and secondary schools to give children a genuine understanding of
mathematics and its basis, as opposed to just being able to use some of the tools.

*Mm. And at Sheffield, correct me if I'm wrong, I believe you came out with a First
Class Honours degree in Electronic and Electrical Engineering.*

Yup. The, the best First Class Honours degree of the year, and a Mappin Medal.
So… Mappin, as in Mappin & Webb the jewellers, was a, a great sponsor of
Sheffield; the building in which I did my degree was called the Mappin Building.
And he gave an award every year, a medal, for the top First Class Honours in each of
the areas of engineering, civil, mechanical, electrical. So…

[06:30]
*Thinking about that prestigious award, and your degree, how important would you
say were, were these early educational achievements to your career?*

They probably should have been more important than they were. Because hereby
hangs a tale, and that is, I was sponsored to university by what was then the Post
Office Telecoms, and, I had been rather mercenary. I wanted someone to pay me
through university. There were two organisations that were happy to do that, they
were both public sector, one was the Post Office and the other was the Central
Electricity Generating Board. The Post Office paid better. So I went into telecoms.
But, the way that it worked in those days was, in the, in your, second year at
university, as you're coming up to Christmas… No, sorry, third year at university, as
you were coming up to Christmas, they would have a sort of, milk round internally in
the Post Office, and various people would look at the students and decide who they
might want in their departments. And, I in my infinite wisdom decided that what I
really wanted to do was to go and design the next generation telephone systems,
called System X. That would have been a complete disaster. But the previous
summer I had worked in the computer systems division of the Post Office, a very new
division, and apparently they wanted me. So they put in a bid, and displaced the, the
chap I had shaken hands with, in terms of the, of System X. And so, I found myself
actually working much more in the field of computing than in the field of, of basic
electronic and communications engineering, which is where I initially had been
trained.

[08:07]
*So, I mean, it, it does appear that your, your studies were very, closely related to your
subsequent early work, working career. Would that be correct?*

Well, they were and they weren't. I came back to communications much much later, in terms of spectrum, as we'll probably see later on. But, what was really helpful was the work I had done for myself in terms of computing training during the vacations at the university. Because I came to the Computer Systems Division of the Post Office as it was in those days, and they wanted someone to go for a, quote, 'hardship post' end quote, unquote, which was Manchester [laughs], to be a clerk of works on a project that nobody believed would have any importance whatsoever, which was the development of the, of the first packet switches in the UK. Packet switches, these days, form the underpinning of the global Internet. But in those days, the Post Office, and all the telecoms operators, believed in a thing called circuit switching, not packet switching. They would experiment with this, they'd better see what it did, but clearly had no future, because the future was circuit switching. I went off to supervise the developments at Ferranti's at Wythenshawe on packet switching, and, my background from university was helpful in that in terms of the computing training. But, it is something that followed for the next 40 years, and seemed, that little technology that nobody through had the slightest chance of success, completely displaced the existing technology in global telecommunications.

Mm.

So it's been quite fun.

Yes, well… [both laugh] So you backed the right horse.

Yes, quite by accident, but that happens in many cases.

[09:48]
Thinking… concentrating on your education…

Yup.

Would you say there are any key lessons that you learnt from your time at Sheffield or before that you attribute to your later success?

I think an understanding that, the interesting things happen, happen at the boundaries of disciplines, not in the core of disciplines.

Mhm.

So, what I was doing in packet switching was, was very much at a boundary, and, and novel, and interesting. And certainly, I had some very good, if you like, lecturers and teachers at Sheffield. And, in particular, they were able to indulge me in, in developing things that were probably a bit beyond what would normally have been done at undergraduate level. So for example, we had a, a computer-aided design lab, and they had an early Varian minicomputer there. But really, no quick way of inputting and outputting from it other than an old teletype. So they wanted a fast visual display unit to link. And I built that as my final year project. And, again, it was right at the edge of what was possible, with semiconductor memories. This was 1974, so this is early semiconductor memories. And, it was great fun to actually build something and see it working, and it worked for many years in that lab thereafter, at very high speed, linking their computer. It could also then be used to teach, because, I had built it to television standards, it drove televisions, and so you could feed it into the university's closed-circuit television system, and teach from the computer. Which again was very early days.

[11:35]
Mm. So, it seems to me that, at probably a, a very early age you had decided in, to pursue a career in information, what would now be called information technology. Would that be correct, and if so, at what point do you think you made that conscious decision?

Because I enjoyed creating things. Now, many people tend to think of creating things perhaps in terms of other areas of engineering, civil engineering, bridge building and all the rest of it. But what I enjoyed doing was, was creating software, and creating capabilities that didn't exist before. And so that is in many ways what, what, what drove me and gave me my interest. And, I happened to be in the right places at the right times to do that. So, partly on my own initiative, I developed the world's first test systems for big, big data networks. Because we needed it, it didn't exist, so we

built it. And that was my first claim to fame in the, in the annals of professional engineering. And, there's a whole other story there.

[12:28]
Mm. So, you, you left Sheffield in, what, 1974.

1974, yup.

And… But perhaps we can now look at your, your, say, your professional career.

Mm.

It sounds as though you had already started your professional career in many ways...

Yup.

...whilst still, whist at university.

Well, actually, in a sense I should also bring in the professional institutions, because whilst I was at university I was the Honorary Secretary of the, of the IET as it was in those… IEE as it was in those days, Institution of Electrical Engineers, graduate student section, there. And so on. So I had already kind of started to enter into professional life. And I won their contest for, public speaking and presentation projects, I think two years running whilst I was at Sheffield.

[13:23]
Mm. And, so you, your first employer, you say that, that, it was the Post Office who sponsored you through university.

Yes, absolutely.

And, and you went on to join them

I did, because in those days we were locked in, and, this is, I think, before the Industrial Relations Acts actually kind of killed that off. But, I do remember being taken down the pub by one of my professors, saying, 'You really, really don't want to go to these people, do you? You would be far better staying here and doing a PhD.' To which I said, 'Well I've got the contract.' [laughs]

Mhm.

And so I did go off to the Post Office. And, that was the right thing to do as it happens.

And, and your first full-time job in the Post Office?

Was, as the, what in those days was rather quaintly called the clerk of works. Resident at Ferranti computer systems in Wythenshawe, looking after a project called the Experimental Packet Switch Service, which Ferranti's were building, using standard industry minicomputers, industrial, industrial control computers, for the Post Office, which we, we did put into service. And, my interest, I wasn't married at the time, I was living up in Manchester out of hotels, and so, whilst I did my main job during the day, I went back to the Ferranti plant at night, and wrote a series of programs to turn their packet switches into generators and suits of packets so I could test them. And that was the start of, of things, again we, we will come to later.

Mhm.

But, no one had done that before. When, in fact, anyone built a packet switch in those early days, they just ran it back-to-back with itself, which didn't actually prove very much.

Mhm.

So if you run it with something that's programmed completely differently, and then, interesting things happen.

[15:07]

So you're very, very much on the front line.

Mm.

And, and the cutting edge I should say.

Mm.

Was that recognised at that juncture?

[laughs] Probably not. I don't know. I… It's… To be honest, I was having a great deal of fun.

Right.

And the sort of thing that I did, which, looking back, should have, far more should have been made of, the Ferranti computer, Argus 700, was a very interesting architecture, and, very much in advance of its time in many ways. But a lot of its capabilities were not used by Ferranti's standard software and operating system. Being an engineer, I got the manuals for the computer, and looked at what it *could* do, and wrote the entire real-time operating system for the Ferranti Argus 700, which ran roughly ten times faster than the one that they used, which was one of the reasons my, my source and six packets could do so much damage to their switches, because they ran ten times quicker. But also, I could do what we're now very familiar with, which was separating the code from the data. The machine supported block protection, so I could hide all the code behind block protection where it could not be damaged or overwritten. Which again, the Ferranti didn't do. So, the system was essentially bomb-proof, it could never destroy itself. It could fail, but it would tell you that it had failed, it would stop. It had tried to write in an area it wasn't allowed to or something, you could debug it very easily, as opposed to going back to the machine and finding it had wiped itself, which is what standard Ferrantis tended to do. So, again, if Ferrranti's had picked up that operating system, which was vastly more reliable and

ten times quicker than theirs, it, it might have been interesting. But, you know, as, the way of these things, it wasn't invented here.

[16:50]

Mhm. So, I noticed that, you were with, what was the Post Office Telecommunications, subsequently BT, for a significant period of time, what, seventeen years.

Mm. Indeed.

No doubt numerous challenges and obstacles during that time. And, I'd be interested in what, any particular obstacles that you think we can learn from that you overcame during that period of time.

OK. Again, I was extremely lucky I think, because during that time, the Post Office Telecoms became British Telecom and was floated. And, it went through a very radical rethink of how it managed staff. So for example, as a young engineer, an executive engineer, when I came back from university, I could not be considered for promotion until my seniority rose high enough, that I had been there enough years.

Mm.

And, in my case that took about, seven years.

Mhm.

Once I was in range, I passed to become a head of group; within, oh, it must have been, within eighteen months I had become a head of section, and six months after that I had become a head of division. But none of that could have happened without the transition, or the pending transition, towards being a quoted company, and away from the Civil Service as it was in those days.

Mhm.

But what it did do was, take me away from, from my love, engineering, and I ended up running organisations and businesses, which was a new sort of skill. So, round about the mid-nine-, or early 1980s, I was responsible for the marketing of the advanced networks; I was also responsible for a series of software houses and consultancy and so on. But the big turning point came with a thing that many older people will remember, which was the putative joint venture between BT and IBM. It was called JOVE.

Mm.

It was never intended to be a Jovian massage, it's just, it was JV, and JOVE was the simplest contraction of JV. But, that, in my opinion, could have given us what we now recognise, the Internet, quite a few years earlier, as it happens. It was a massive potential undertaking. And I was asked to work with a board member of BT, now, sadly long dead, Ron Back[sp?], and two directors of IBM, Peter Morgan, who went on later to become the Director-General of the Institute of Directors, and Alex Henderson, Morgan as Business Development Director, and Henderson as Telecoms Director. And we had to tour the country, talking to companies, explaining why this was a good thing, and why they should tell the Government it was a good thing. That was challenging in some instances. I remember ICL was, quite challenged by the idea that an alliance between BT and IBM would be a good thing. But, anyhow. But, as it happened, that joint venture was not approved of by Government in the end, despite the fact that very large endorsements came in across the board from companies. But very famously, a member of the Cabinet Office told me afterwards that, Mrs Thatcher took one look at it in Cabinet, turned to Cabinet and said, 'This is elephants mating. It cannot be good for competition. Take it away.' There was no more discussion of the joint venture between BT and IBM.

Mm.

BT of course pressed on regardless. IBM, had an immense internal heart-searching over it, it was the first time anywhere in the world that they had had a major plan scuppered. So… But it took me out of general management into business development, which I had enjoyed. I then went on to run business development

internationally for, for British Telecom International, or a chunk of it at least, for about 20 projects around the world.

[20:39]

But by this time, I had become rather one-eyed. I had spent seventeen years in one employer. OK, the employer had transitioned from being a Civil Service organisation to a, a commercial one, but it was still in many ways a beast in transition. And, it took me to… I had to leave to actually understand what I couldn't see.

Mhm.

And so, in 1987 I left. I joined a company called Butler Cox. Sir George Cox now, who was one of the founders of Butler Cox. And I spent three years working, not on things that would conflict with BT, because I knew all of their business development plans. [laughs]

Mhm.

And I had had an agreement with a friendly board member that, what I would do and what I wouldn't do. But I worked for a lot of other European public operators. I set up a practice in Butler Cox, providing consulting to suppliers information technology: they had been focused on users. And that three years, rebalanced me, in understanding of the business world, what worked and what didn't.

Mhm.

Previously I, I think I had been really very one-eyed. Shall we stop for a moment

[brief pause in recording]

[21:53]

So, I spent three years at Butler Cox It was never my intention to make a life in consulting. But many people would know, it's jolly hard work. And, towards the end of… I had said at the beginning of the third year to George Cox that I probably wouldn't be there at the end of it, and he should put someone alongside me to pick up

the threads of the consulting practice that I had built. And partway through the year I did a job for Cable & Wireless. Cable & Wireless had been in and out of Europe more times than I've had hot dinners, but Cable & Wireless decided they wanted to go back into continental Europe, and, were looking at what businesses they could establish there. And I did some consulting for them. When I presented the report, the, the then head of that asked if I believed it enough that I'd come and implement it. [laughs] And, I did. And so, I left Butler Cox and went, went to Cable & Wireless, the second employee of Cable & Wireless Europe. A slightly chequered time, because it was a point at which we had a change of chairman at Cable & Wireless. Lord Sharp, who had done remarkable things for C&W, including the acquisition of Hong Kong Telecom, and was retiring, and Lord Young came in with a very different approach and so on. And, dear old Cable & Wireless Europe, which had, which was on a business plan, but, about two years in, the stock markets had a look at Cable & Wireless and decided that it wasn't showing the characteristics of a, of a, entrepreneurial growth stock for which it was valued, and that unless it sharply improved its performance, it was going to be valued as a utility. So, Lord Young, perhaps understandably, closed just about everything that wasn't earnings per share enhancing in a year, including Cable & Wireless Europe. So having spent two months helping to build – two years having spent helping to build it, I then spent a few months, with others, shutting it. Which is never a, a fun experience.

And this is in the early Nineties, yes.

This is from 1990 through to nine- Yes, 1990 through 1993.

Mm.

[23:58]
It's a very sobering thing, when you have to tell the people you've hired that you don't want them any more. Anyhow. Needless to say, that didn't really endear me to Cable & Wireless either. So, towards the end of that time, in 1993, the Government headhunter gave me a call, and said, 'There's this strange agency of Government. Government agencies are supposed to do mechanical things, like benefit claim processing and so on, but this one doesn't fit the bill at all. This one does

international policy, it does law enforcement, it does just about everything. And the Secretary of State, Michael Heseltine, has made it clear he wants an outsider to come in and run it, and not a, a civil servant, a career civil servant.' So, I competed for it, and I, I won the role. Which was absolutely fascinating. The Radiocommunications Agency, certainly during my time there, it's now part of Ofcom, when Ofcom was formed it was the largest part of Ofcom, the Radiocommunications Agency at one extreme could, its chief executive could sign into law international treaties at the UN. Because that's how radio spectrum is allocated globally, through the national treaty. You go with ambassadorial credentials, signed by the Foreign Secretary. And at the other extreme, in my time we were carrying out 800 raids a year, with powers under the Police and Criminal Evidence Act, against illegal broadcasters, including forcible entry. And in between we issued a quarter of a million licences a year, of all sorts and shapes and sizes, from mobile operators like O2 and Vodafone, through to, citizens band licences, amateur licences, yacht licences. Everything. Balloon licences.

Mhm.

So you name it, we did it. And it was immense fun.

[25:47]
And, that, that was really what, between the period 1993 to…

1998.

…1998. Yes. So you were there, about five years.

Mhm.

And, involvement with Parliament at that stage.

Absolutely. Because when I took over the agency it was clear it had got problems. One of them was that it was working under an Act of Parliament from 1949, loosely backed, based on one from, I think the, very early 1900s, which meant that it, it really didn't have the tools to do the job of managing spectrum in the UK. When the, when

that Act, 1949 Wireless Telegraphy Act, was, was drafted in Parliament, there was no shortage of radio spectrum.

Mhm.

We didn't have commercial broadcasters, we had very little use of, of radio, things like taxi services were just starting.

Mm.

And there was no concept that this might be in short supply at some stage. So by the mid-1990s we're talking about now, we had a very different world, and it was very difficult to find spectrum of the right sort of quality and type for new, interesting services. A logical thing would be to say, right, we will, we will charge. So, the best economic use of spectrum is made. Unfortunately, we weren't allowed to charge. We could only charge, under Treasury Fees and Charges guidance, our exact administrative costs in issuing the licence. We could not send a message about new technology, we could not send a message about congestion. We had to charge what it cost to issue the licence. It took five years to change that. From the time I arrived in 1993 the agency was already working on what became a green paper. We had a green paper, a white paper, a Conservative election manifesto commitment in 1997, and of course they lost the Election. So, we had taken the, precaution, of having the legislation largely drafted before the Election. And when I went in to see my new Secretary of State on the first day that Labour was in office I said, 'I've got something you really ought to put into your Queen's Speech. Oh, by the way. I know you might be a bit short on things to put into Parliament immediately, so it's already drafted, it can go into the House of Lords tomorrow.' And, the Secretary of State very kindly agreed. And so, what had become a Conservative manifesto commitment was implemented by Labour. And when it got the House of Commons, the Conservative Party with a new leader disowned their own manifesto commitment and opposed it. And that's a very good introduction to practical politics.

Mm, yes. Yes, and we're talking about the time when Tony Blair came into power in...

This is… That's the Blair administration. Absolutely.

...in 1997. Yes.

[28:31]

So that was my introduction to Parliament. And, it was fascinating to watch it at work. So, for example, when this… This was unopposed at, at second reading in the House of Lords, because it had been a Conservative manifesto commitment. It came to the Commons. There had been a leadership election, and the Tories decided to oppose their own manifesto commitment. However, what they didn't know was that, the Government Chief Whip, Labour Chief Whip, was very worried there'd be an adjournment debate that particular day on energy, and, we were in the process of closing coal mines. This was not something they really wanted on the nine o'clock and ten o'clock news.

Mhm.

So the Government Whip sidled up to me and said, 'We're going to filibuster our own bill. So your second reading debate, which is starting at half-past four, we think might take about ninety minutes, is not going to finish until after the ten o'clock news.'

Hm.

And so, we had the, the Government filibustering its own bill, and the Opposition, the Opposition, going against its own manifesto commitment. And it was a, a fascinating piece of parliamentary theatre, including lots of maiden speeches by Labour MPs, which by parliamentary tradition, you're not allowed to interrupt. Funnily enough, they were all the same speech, but never mind. And about, I think I'm right, by about ten o'clock the Chief Whip was running out of, of members who hadn't spoken yet, and so he got the last one to read his parliamentary telephone directory – read his constituency telephone directory. Uninterruptible. But it was achieved, and at the end of it, I think it was the Deputy Chief Whip took me for a drink in the bar. Mission accomplished.

And what time was that then?

About half-past ten.

[30:15]
Half-past ten. Yes. [both laughing] Yes. Fascin- fascinating insight. I mean, when you're working for different government, you know…

Yup.

Do you… Is, is there a different style, or…?

I was very lucky. I had started working for the Conservatives; I ended up working for Labour. I always worked for ministers for whom I could have a great deal of respect. I think I was lucky in that respect. So, I had worked for, Michael Heseltine as Secretary of State under the Conservatives, and, his junior minister at the time was a delightful man called Ian Taylor, who I'm still sort of, in contact with, and was great. Under Labour, it was Margaret Beckett, but in particular a delightful man called John Battle, a Leeds constituency MP, a brilliant constituency MP. Probably not the best person, I think he would admit, in front of the despatch box, which was probably why that energy debate, the Chief Whip wanted put back until, much later.

Mm.

But no, I, I was… It was very good.

[31:12]
Good. And then you were involved with the, the set-up of the Cabinet Office…

Performance and Innovation Unit.

…Performance and Innovation Unit.

Hereby hangs another story. When I, when I was taken on to run the Radiocommunications Agency, it was made absolutely clear it was a five-year non-renewable contract by the Treasury. And, six months from the end of it, my then deputy secretary at the he department came to me and said, 'You will take an extension of the contract, won't you?' And I rather irritated by saying, 'No. I've done everything that I'm good at in the five years. I've got the legislation pretty much through. I've relocated the agency at Docklands, recovered it after the IRA bombed our headquarters, back to central London. Driven through fundamental change. There are more things need doing, but they're not my particular skill. And so I'm not going to take an extension.' There was a bit of a harrumph, which went something like, '[intake of breath] We usually have trouble getting *rid* of chief executives, not hanging on to them.' But, anyhow. So, one of the difficulties was, we were coming up on potentially the mobile, third generation mobile auctions.

Mhm.

[32:24]

And, obviously Government would be very worried if I turned up in one of the bidders. Understandably. I wouldn't have done it anyway. But, we agreed that I ought to spend some time, paid for by the department, but strictly speaking not gardening leave, I wanted to find something to do. And the something I did was, was to work with a former chap who had worked for me in the Radcoms Agency, in a thing called the Future Unit in the Department of Trade and Industry. And I wrote them a report about converging technologies. And, that was, interesting, good fun to do. It would have sunk entirely without trace, except that summer, Margaret Beckett was rotated out of the DTI and Peter Mandelson was rotated in. And Peter, again, another person for whom I have huge respect, and probably the most intelligent minister, and certainly the most capable manager I had ever worked for. Peter had a burning interest in what he called the knowledge-driven economy. It turned out, it was about the only thing in the knowledge-driven economy that the department had got. So my little report, which would otherwise have gathered dust on the shelves somewhere, suddenly became front page. And as I recall, Peter took it to the Labour Party conference. He then rewrote the Competitiveness White Paper that year, to be all about what electronic business was going to do for the UK. And indeed, he got the

Prime Minister to sign off a foreword saying, 'UK will the best place in the world for electronic business by 2002.' Signed, T Blair. At which point, Peter fell under his mortgage truck and was relegated to the back benches.

[34:01]

Now, I was by now off in Ireland, working, doing some work with the Irish communications regulation, and a phone call from Number Ten, saying, basically, 'This is all your fault. We've got this commitment that the Prime Minister's signed off. The architect is now on the back benches, there's no route map for it all. You had better get back here and, do something about it, hadn't you?' And so, that is how I came to be part of what became the Performance and Innovation Unit at the Cabinet Office, later the Prime Minister's Strategy Unit. A unit that was set up specifically to carry out tasks dedicated by the Prime Minister, but not reporting to him, reporting instead to the Cabinet Secretary, the jolly good Civil Service.

Mhm.

Governance reasons. And so, the very first report was a thing called e-commerce@its.best.uk, for which I led an excellent team, brought together from the Civil Service and outside. And partway through, we also had a little deviation in to the joys of encryption and key escrow. We produced a very quick report for the Prime Minister called 'Encryption and Law Enforcement'.

Mhm.

But, as I say, it would be difficult to say any of this as planned.

[35:09]

Mhm. So…

Yes.

We, we've covered in your career the period from 1970, when you started out with Post Office Telecoms…

Yup.

...through to, 1999...

Mm.

...when you were with the Cabinet Office Performance and Innovation Unit.

Mm.

So looking at, looking over that, that period, a sensitive period...

Mm.

Would you describe the, any key events that set you on the road to success during that period? I realise that, I'm sure you had many successes during that period, but, just thinking of any key events.

I, I… I'd quite like, I'd highlight three. And if you like, in time order. The first was having the opportunity, which was provided by Post Office Telecoms, to just go away and develop that world's first in the automated compliance, and load testing, and the packet switch networks. And as I say, today, that technology absolutely underpins the global Internet. The second would be initiating the field of spectrum economics in the UK, and driving through that first reform in legislation of radio spectrum management for some 48 years. And there's a message there. When I took over the agency, Radcoms Agency, in 1993, my predecessors had tried to persuade ministers about legislation. They had been career civil servants. They had tried to explain radio spectrum to ministers. This was not a good idea.

Mm.

I took a rather different approach, based on what I had learnt through the JOVE project with BT. And, I hired a set of economists, and said, 'Find out for me… If you think of radio spectrum a bit like crude oil, as being sort of, nothing very much on its

own, but crude oil refined into petroleum, chemicals and everything else, radio spectrum refined into broadcasting telecommunications, navigation. Find out for me what the gross value-added is in that, and how many jobs it's creating.' And the report was rather nice. It said, if I remember correctly, it's about 1994, the report said that, the industries that we, or the sections of the economy that were using spectrum, were growing at seven and a half per cent per annum real, and were generating 1,000 jobs a week. And so I was able to go to the ministers, in this case Michael Heseltine, and say, 'Look, great news, Secretary of State. For your next speech, you're presiding over this sector which is growing at seven and a half per cent per annum real, and generating 1,000 jobs a week, but by the way, it's going straight into a brick wall, and it's your fault.' And I got the legislation. The department had said, 'You're running an agency. You will never get legislation, agencies don't run legislation. And by the way, we need a new Companies Act.' 'You're a very low priority.' But the Secretary of State overrode them, because we had a conversation and language he understood, which was jobs and GDP.

Mhm.

Not, 'Let me tell you the intricacies of radio spectrum.'

Ah [laughs]

Yes.

You disappoint me there.' [both laugh] Yes.

And it's an important lesson, which is, finding the right language.

Yes.

That's particularly important in the political space.

I suppose knowing your own audience. I mean…

Absolutely.

We're talking about. Yes.

But that created the field of spectrum economics. It's gone on from strength to strength ever since. And there's a lot of people these days who now say, when they go to ministers, 'Look at the economic value I'm creating, Minister.'

Yep.

And that was the first one.

Makes a lot of sense.

Mm. Yup.

Mm.

And the, the final one I think would be, leading that team for the Prime Minister to produce his two reports. It was an absolutely fascinating insight into the time, into the ministers that were around, into the way Government worked at that level. And, though it may be unfashionable to say this these days, it gave me a great respect for Tony Blair, at that time. I think, he subsequently discovered, much as Mrs Thatcher discovered, never ever serve the third term. [laughs]

Mhm. Right.

Yep.

[39:13]
And thinking about key decisions, both positive and negative, during the, these years, that you made, and, and what difference did they make?

Oh. [pause] I think that… Let's give you some examples. When I was at Radiocommunications Agency with my team, we were concerned that the development of what you now recognise as Sky and satellite broadcasting, unless we could introduce terrestrial digital broadcasting much more quickly, open up many more channels, then, it would be, it would be very problematic. It would be difficult for the BBC and the terrestrial broadcasters to recover if Sky got too far ahead.

Yes.

And so what we were able to do was to pull forward the normal planning timescales in Europe for terrestrial digital broadcasting. You do have to agree the standards, you have to agree the spectrum allocations. And there was a committee of the CEPT, Confederation[sic] of European Posts and Telecoms, CEPT FM, which would do that. But it would work on rather a long timescale. What my team did was to summon them all to a meeting in Chester, for which we paid quite a lot of money, and essentially locked in a room for a week until they agreed the structure, and two years early. And there are some nice gems there, because, you might… It replaced a UHF television decision, which introduced UHF in '65 by television, which I think was 1961. This would now be, about 1996, maybe 1995. And all the countries sent their delegates. One country sent exactly the same person. who was signatory to the 1961 treaty, to this new treaty. It would be unfair to ask you to guess which country it was. It was the Vatican City.

Ah, right. Yes. [both laugh] Yes.

But, that… We were, we, we got that. Also, you have to clear your transmitters with your neighbouring countries, and, that was always going to be fairly problematic. We did… [pause] At this time you will recall that there were major developments going on with respect to Ireland. Certainly, I went to Ireland, to Dublin, to my opposite numbers, and said, 'Let's forget the last 30 years. Let's re-plan the transmitters along the border so that RTÉ gets more input into Northern Ireland.' And we did that. And the broadcasting corporation in Ireland cleared our terrestrial digital broadcasting transmitters. The French decided to buy a stake in one of our transmitter tower companies. And so they had an interest. [both laugh]

[inaud].

And they… Yes. And, the result was that we brought terrestrial digital along rather earlier. And this was a great achievement of, of my, my then minister, Ian Taylor.

Oh right. So, yes, as you say, a great influence on television that we see today.

Yes. Absolutely.

[42:24]

And, you mentioned an achievement. I mean, what would you say would be your proudest achievement during, during this period? Or, perhaps there's one or two that spring to mind.

Mmm. I think it… One of them, was a rather sad one in many ways, would be the way in which my agency reacted to having its headquarters destroyed. We had moved to Docklands in December of 1995, to South Quay. On a February evening I got a phone call about, just after seven o'clock in the evening, from my finance director, who was still in the building, saying, 'We've just been blown up.' The area, as you may recall, was fairly much devastated. We weren't targeted. The bomb was meant to take out Canary Wharf, but they couldn't get in, so they parked it in South Quay.

Mhm.

And, there was a lesson there too. First of all, we had done some things right. So, we had fitted blast film to all the windows in the building. We had open-plan floors. If we hadn't had blast film, the glass would have sliced through the floors, possibly killing people, certainly doing a lot of harm. The blast film worked a treat, and dropped the glass straight back down. And whilst a lot of people were shaken, there was about 40 people in the building at the time, seven o'clock on a Friday evening, none of them were seriously hurt. We did also have a plan for such an eventuality, which would have been absolutely fine except for the one thing that actually happened. The plan was that, if we had a bomb warning we would evacuate staff into

our stairwells, where steel shutters would come down over the windows. and it was the strongest, supposedly safest part of the building. Well it would have been, if the bomb hadn't been directly over an underground car park. And the explosion went down into the car park, and up through the stairwells of the building, and blew the roof off. So, I can never find it in my heart to criticise the police for not getting round to telling us there was an alert, because if they had, a lot of people would probably have been much more badly hurt.

Mm.

So, it is a funny old world. But the agency pulled together on that. We got new accommodation in London very quickly. We then spent some months, years actually, in New Kings Beam House, sharing some space with Her Majesty's Customs and Excise, which was an interesting experience. But a tremendous amount of work was done by a management team of people. And the agency pretty much hit its target in that year, even though we had been blown up and relocated. And so, you know, there, there are some… The Civil Service gets a lot of criticism. There are some really good people there too.

Yes.

Yup.

[45:06]
And, a lot of decisions made in that, in those times.

Yup.

Is there anything that you would have done differently during that period?

[laughs]

Or, some of the things you may have done differently, if you had your time again in those roles, and, and why?

Yes. Probably. Whether it would have been successful is another matter. But the test systems that, that I built and my colleagues built in the early 1980s, we could have taken that and built an entire company, and entire business round it.

Mhm.

But, that really wasn't who we were. You know, it… We now have a vast test equipment industry. This was in advance of what as around at the time. As it happened, the Post Office itself, or BT as it became, decided that, it exhibited some of this at a world telecoms exhibition, and people were bowling over to, to buy some. So the Post Office actually, after my time, British Telecom, manufactured a series of developments in its own factories, and sold of them around the world for a lot of money. But we never thought of, of departing and building it ourselves.

Mhm.

Weren't entrepreneurs. So, that, that's, that's a decision point. We might of course have made the most awful mess of it, but that's, that's another matter.

Mm.

Yup.

[46:36]
Several times during our talk this morning you've talked about various different colleagues.

Mm.

And, I'd be particularly interested in, perhaps your style, how did you work, and, and develop key colleagues in the respective organisations you've worked for?

It's a good question. Because, sadly, one thing that's, that Post Office Telecoms, then BT, didn't really go in for was management training. [laughs]

Mm.

You had to learn it on the job. And I think I probably made some mistakes in that early on. But, the key thing was learning to present, and that's what I had to do. I was capable of doing it anyway, and it was refined in that process with BT and IBM, because, senior management at IBM don't get to be senior management without the ability to present very very compellingly. And, that was a very important learning experience there. [pause] Sorry, I've forgotten, I've lost my thread. What…

Yes. Yes. Oh, I… So, the importance, about soft skill in presenting…

Yah.

In this world, did you, did you move up…

Advocacy.

Yes. Yes.

The skill of advocacy. And that's really important. And also, the recognition that not everything lies in your discipline. The, the real achievements I've had have come just, through, essentially the discovery at a late age of economics, and the economic language. And so, for example, I, I gave a speech at the University of Bath, at a degree ceremony, some years ago, and my point I was making to those who were graduating was, they had just started, and that they shouldn't think the world existed just in their own discipline. The next thing they had to do was to reach out to the other disciplines, to recognise where it could help them.

Mhm.

And I think that's quite an important message.

[48:30]

Mm. And, looking at the financial outcomes of, of the work that you've been involved…

Well, one, one of the obvious things was the third generation mobile auctions. And, at the time that we were… My new legislation, from the agency, in 1998, was, essentially, as I mentioned earlier, to try and allow signals to be sent in terms of pricing.

Mhm.

Now, for the vast majority of that we could use administrative pricing by just setting a price, which we could then discount for things like new technologies. Didn't even have to be a market clearing price; just enough to be able to send a message. But there were always going to be some things which were of much greater value, and there were more bidders, than you can, or more people wanted it, than you could issue licences. And mobile, cellular mobile communications was, was the lead one. So, our first use of auctions would be for cellular mobile. The advice I had at the time was that the licences were worth £200 million a licence. Five licences, a billion pounds for the Treasury on a good day. And that would have been fine, because, what actually convinced the Treasury was that we didn't want to stoke the price up, because, we wanted to get services up quickly; they would then make their return on the taxation on the operators. But the last thing to do was have the service entry delayed. And the reason we wanted auctions was, if we had used traditional methods of civil servants deciding, then the first thing that happened would be any failing operator would take us to court, and we'd be there for years afterwards, and the service wouldn't get up. So, the service, driving it in was key. Now, one of the operators did actually challenge us anyway, so the auctions were delayed, and that took them into the period, when my successor ran the agency. At the point at which we were finally going to auction, he advised Gordon Brown for the red book that it was now worth £800 million a licence, so £4 billion for the Treasury on a good day, for which Gordon was very happy. However, as you may be aware, what actually happened [laughs], was that people bid up to, four and a half, five billion pounds a

licence, and the Treasury actually pocketed twenty-two and a half billion pounds. Now, the one bit of good news for the Treasury in that was that, when my team had set up the original project, we had hired Rothschild's, the merchant bank, to promote it around the world. And being cautious people, in particular, I, my then head mobile coms, said to me, 'We ought to, we ought to cap their fee.' So, they reckoned it's worth a billion pounds, it's what they've advised us. That's fine. Let's cap them if it goes above two billion. Which we did. And they happily accepted. So when the auction finally ran, Rothschild's lost their fee on 20.5 billion pounds.

Right. Yes.

This did not make us very popular, I have to say. However, they, they happily signed the contract. And, and the Treasury saved that money. I have never had a word of thanks, I have to say, from the Treasury.

Right.

But… And of course, Gordon Brown used it to pay national debt, which as it happens turned out to be a jolly good thing to have done.

Yes. Mm.

So, you know, it's a, it's a funny old world.

[51:56]
And were there any what you would describe as negative financial outcomes that you experienced during your, your time?

The same one. And that is… Academic economists are still arguing about that auction They will tell you that the twenty-two and a half billion, or one, one set of economists will tell you that twenty-two and a half billion was a sunk cost, and doesn't affect future value. And the other set of economists say, 'Don't be so daft. [laughs] Of course it affects future value.' And my personal view is, by over-paying in the auction, and they weren't forced to over-pay, they did it themselves and to

themselves, even the licence, the new licence, the fifth licence, went for those sort of values.

Yes.

You could argue, if you had an existing licence, you had to get a replacement, though that's not necessarily the argument, but nonetheless, the fifth went for the same. They did it to themselves. But, clearly, in my mind, it detracted from the roll-out of the networks. And our objective had been to roll out the network quickly.

Mm.

So, in that sense it was a failure.

Yup.

I'm sure the Treasury still think it was a roaring success.

Yes. Well, I appreciate your honesty regarding all this. [both laughing] Thank you.

Yes.

Right, OK, so, well, thank you very much for that.

Mm

[53:12]
So, picking up again from, say, 1998, 1999. Since that time, you've taken on a number of directorships.

Mm.

And you've been involved with a lot of not-for-profit organisations and think tanks.

Mm.

Perhaps you can talk us through that transition, and, some, some of the work that you've been undertaking in the last, what is now nineteen years.

OK. Well some of it is cause and effect. When we did e-commerce@its.best.uk for the Prime Minister, what we were advocating was, was a recognition of economic reality, and that is that companies would have to take out stock, they'd have to run lean, they'd have to move to just-in-time systems and so on. And the e-commerce technology was immensely powerful in helping them. But there's a sort of hidden corollary to that, and that is, the more you run lean, the more you take out stock, the more you are vulnerable to disruption. And, at the same time as we were doing all those things, which were necessary for competitiveness, what we weren't doing was strengthening the national infrastructure. So at the time we were reducing companies' ability to cope with disruption, we were actually potentially creating more disruptions, because of ageing infrastructure. And so, that has ever since that point in the 1990s been a particular interest. And so I retain a, a key interest in resilience, in better infrastructure, in some degree of regulation, because I'm a free marketeer at heart, but some degree of regulation, to boost the resilience of key systems, on which everything else depends. So, one theme through that time has been, in, for example, the Institute for Public Policy Research work on a national security strategy for the twenty-first century. Looking at the vulnerabilities created by new technology has been a particular interest. In other areas. At the end of the time that I had been working for the Prime Minister, the sort of, two-year clock, which had always been there saying, you shouldn't really go back into areas you used to regulate for two years, which by the way has no legal force whatsoever, however, doesn't really do to thoroughly irritate the, the Government, was still running, and had been reset. So I still couldn't really go. And so, I was going round London to the big trade bodies, promoting the report on e-commerce@its.best.uk. And I went to the Institute of Directors, to my old friend Sir George Cox, who I had worked for at Butler Cox, who had just taken over the IoD, and he wanted someone to evangelise throughout the IoD's regions and branches on the importance of moving to electronic business. So it was a marriage made in heaven. I didn't want to do it full-time, so we opted for three days a week, in which case I could develop a non-executive portfolio at the same time. The Prime

Minister was very happy and wrote to George in those terms, because it removed any particular risk I could have turned up anywhere embarrassing, and I was actually promoting the agenda which he had just launched.

Yes.

So, everyone was happy. And I spent a very happy couple of years in the IoD. I think I probably did more than 300 presentations around the country on, on the joys of electronic business. I had hoped that they have had an effect. You can't tell the counterfactual, but of course the UK *is* the biggest user of retail e-commerce per capita, by some way.

Mm.

[56:46]
So, I think some of the things we did, did have some effect. In terms of non-executive roles, the visibility I got from the IoD led to other things.

Yes.

So, I went into the investment trust business, largely because I had given a presentation at which the investment trust chairman was there. I gave the Christmas Lecture for the Royal Academy of Engineering, on – which is of course in January of course, not at Christmas, which is meant to be a lighter lecture, and for partners as well as, as fellows. And I gave that on e-commerce, and sitting in the audience was the CEO and, also the chairman, of a company called Telemetrics, who were out with a headhunter for a new non-executive director, and they went to the headhunter and said, 'That's the one we want.' And so on. So visibility was helpful. And that led to a series of other things. All of them have been interesting. And, as you probably guessed from my career, I have, I have very broad interests

Mhm.

[57:50]

And perhaps a low threshold of boredom. So, it's taken me into areas such as, advanced semiconductor manufacturing, which was one of the areas of Telemetrics. It took me into investment trusts, which was new. It took me onto the board of what was then Securicor, before it became G4S. And, I discovered I had moved professions. So, really, I wasn't any longer a competent engineer, nor even a competent information technologist. [bell sound] And so, I went to, back to the IoD, who are now promoting their Chartered Director status, and said, if I'm going to sit on these boards, I'd better know what I'm doing.

Mhm.

And so I took the Chartered Director examinations, various[?], [inaud] direction[?], and so on. And, was eventually elected a Chartered Director. And that's probably the only area in which I've retained current competence. I think I am a competent Chartered Director. I'm pretty sure I'm not a currently competent information technologist or engineer. But that's life. But it did mean, I think, I could contribute better to those boards.

Mm.

And in particular to help mentor people, and so on, which was one of the points that, that you raised earlier.

Yes.

So, yup.

[59:03]
And you mentioned the Royal Academy of Engineering.

Yup.

I mean, am I correct in saying, you're still involved today with?

Absolutely.

And… Yup.

I was elected a Fellow, which is a great honour. There are some absolutely tremendous people in the Academy. [pause] I have, if you like, been a working Fellow. [laughs] So, I have served… I'm just coming to the end of my time on the Finance Committee. I'm just completing four years, which is one more than you are supposed to do, on its Engineering Policy Committee. I'm newly started on the Audit and Risk Committee. But in particular, I chair its Community of Practice in Digital Systems Engineering, which is the area, essentially, we've been looking at today.

Mhm.

[59:48]
And I have a particular interest in what is colloquially called big data. I would much prefer to call data analytics.

Mhm.

And, so the Academy's been very active in that field. We published a report eighteen months ago. We have published various follow-ups since. There is a major programme going forward looking at how data analytics is being adopted, for good or ill, and the good lessons and things to avoid, in various sectors across the economy. And concomitant with that, the issues around cyber security that arise with it as well. So, I still remain very active in that, and I will continue to do so. I do firmly believe that, I have just contributed to a Royal Society report on data governance, which was published, this week. And in that I made the point that, actually, data is the lubricant of the twenty-first century. So the way in which industry and commerce will operate will be lubricated by data, in the way, if you step back, 100 years, it was lubricated by oil, and similar things.

Yes.

So, what we have to do is to recognise that things have changed, and we have to change the, the whole approach we have to value in companies, the way in which companies report, the way in which we trade, and trade data sets for example, to recognise it's, it's a whole new world. And the UK *could*, *could* get a world lead there, which might be rather important to us at the moment.

Right.

Yup.

[1:01:22]
And, if I could come on to the BCS. When did you become a member of the BCS?

Well, I have, of course, been a lifelong member of their rivals, the IET.

Yes, I was going to say, you have, mm.

And I had a bit of a falling-out with the IET, because, one of the things that I am very concerned about is current competence. And the engineering profession was relatively slow to recognise that you do have to, you ought to show current competence if you're a practising engineer. It's always been there in certain fields, for example, if you're a civil engineer, you couldn't design a dam without a certificate of current competence in dam engineering, which seems like a pretty good idea. But I could design a nuclear power station control system based on what I learnt 40 years ago. You know, this is, this is not clever. So, I tried to persuade the IET to move to current competence. And, I got a very dusty reply. [laughs]

Mhm.

So, I went to BCS. And said, 'Well, you ought to do this.' And, through a series of discussions I became a, a member of BCS at that stage; latterly I became a trustee of BCS, and ultimately, that led to the presidency of BCS. But, BCS were trying at that stage to look at how they could move to current competence, and that's certainly what I was very much involved with. My successor…

Could… Sorry to interrupt. Could you put a timeframe on that?

Through the… About 2008, 9, 10.

Ten.

Yup.

OK, fine.

And indeed, my, the current President of BCS, Paul Martynenko, was absolutely key in that stage too, and has done a huge amount of work on that, with the support of his then employers, IBM. But… But no, current competence is very difficult, because it upsets a lot of members, who may not be currently competent, [laughs]

Mhm.

But it's, it is necessary, as all the dependencies that we talked about earlier on, this technology, data systems, become increasingly embedded in everything that we do. We have to make sure it works, and it's well designed. So, I became President of BCS essentially pursuing this agenda of moving to current competence.

[1:03:37]
Mm. And you became President in 2011.

That's it.

And, I'm conscious that presidents have a theme for their period in office.

Yes.

So, perhaps we can talk about your, your theme that, that you had when you were…

Yah. I can't remember what I said. Well, I'm assuming it was current… No…
[pause] Prior to being elected a Fellow, I had been doing some work with the Royal
Academy of Engineering on the importance of computer science, and in particular
computational thinking. And, this isn't just teaching coding, but it's, teaching an
analytical way of solving problems, and solving… which, which leads you to coding,
but we'll call it computational thinking. And so, my theme as President was, was to
raise the profile of computer science and computational thinking in schools. And, the
BCS was already very active in that area, but was having trouble getting engagement
with Government. And, that engagement came along; I'd like to think I contributed to
it, I don't believe I did at all. There was a certain amount of luck involved, and a
certain amount of preplanning by the staff here at BCS. But the… They got into the
lecture to the Royal Television Society of the Google CEO that year, that the UK was
missing out on a major trick by not teaching coding in schools and so on, who had
lost, if you like, its heritage from the BBC Micro and so on. All the efforts of all the
engineering institutions and the BCS to convince Government up until then had failed.
As if by magic, as soon as the Google CEO sets up in Edinburgh, the phones started
to ring.

Mhm.

And, that has led very much to what we now see in terms of computing in school. I
would argue, it's still not given the, particularly the funding that it deserves. But,
enormous progress has been made, and I pay great credit to the team at BCS in
achieving that and driving it forward.

[1:05:35]
It seems to be a theme, one of the strands to your career, promoting education,
promoting professional development.

Mm. Absolutely.

And in that regard, you've got current involvement, as I understand it, with two
universities.

Yup.

So, we'll come back to your, to Sheffield, but, you're involved with Coventry?

Yes. I'm there because they asked me.

Right.

No particular connection with Coventry. But they did ask. And it was very interesting, because there is some really good engineering, particularly manufacturing engineering that's done in my neck of the woods in Coventry. But also, it was a university breaking the mould, and still is. So Coventry is by far, I would say, the most successful of the old polys, post-1992 universities. It's also driven a very strong diversity agenda, both in terms of diversity of students from all sorts of backgrounds, but also, access to foreign students, access even to refugees who don't have any particular qualifications, wouldn't normally get anywhere near a university. So I think it's done some really, really good things. It's also been a pioneer in some areas, so, in particular in areas like, what we call disruptive media learning. So different ways of teaching. It's, Disruptive Media Learning Laboratory, is a, is a great example that's been widely copied, and has done a great deal of, of very successful sponsored work there. It has always focused on teaching, and, in the last few days the Government's new Teaching Excellence Framework, the TEF, has come out, and depending on how you read the numbers, Coventry is either the second best university in the UK or the best, for teaching. Which is a, a tremendous accolade, and, a great credit to the staff there. The challenge for Coventry is that, having got right to the top of the league tables in what it can do from its history, it's now trying to make that final transition to have a substantial research element at the university, as well as, as brilliant teaching. And that's its next challenge.

Mhm.

But, no, it's great fun. I chair its Audit and Risk Committee.

Yes.

And what we have is a £300 million multinational business, not just a university.

Mhm.

Which is another interesting challenge. Yes.

[1:08:00]
And of course, returning for a second to your, I say academic roots, if that's a way of putting it.

Mm.

You're, you're a Visiting Professor at Sheffield.

Sheffield.

Yup.

I've always retained some degree of contact with Sheffield. It's my old department. Not only that, my son went to the same department, and was taught by some of the same people.

Mhm.

[pause] And I have a great affection for Sheffield, both as a university and as a city. I always felt that Sheffield did very badly when the M1 was put right through the worst part of Sheffield. So anyone driving up, all they saw, in the Sixties and Seventies, was a large crowd of smoke and a lot of mills. And there is much more to Sheffield than that, as people now realise. But, no, a good team in that department. I still give occasional lunchtime lectures there. It's nice to make the contact. And indeed, the department is celebrating its centenary this summer. So, a great deal of fun and games has gone into producing a book to record some of the history of the department and so on. So, yes. I still serve on its, the Industrial Liaison Committee.

And again, it's really important that students get the opportunity to, work in teams for example, if they're going to work in industry, go out into industry and get real experience, and not just an academic one. So, again, credit to Sheffield.

[1:09:21]

Thank you. So, I know one of your specialist areas, or, key areas of interest, has always been about security.

Mhm.

And, I really recollect you were involved in an investigation in, what, 2009, 2010.

Mm.

When some papers, emails, were leaked from the University of East Anglia. I'm particularly interested in any lessons that we can all learn from that, that period, and review.

I think, there are a number of lessons from that. The top level one was, always be very careful. And this wasn't East Anglia, this was the, the UN body. Always be very careful to resist simplifying too much. As I discovered when I was a briefer of ministers. Ministers would always like it made simpler, for very understandable reasons. But if you make it too simple, then some of the key message disappears. And so for example, in climatic research there was a key chart which was published by the UN where they left off the error bars. Because it looked so much better without the error bars. [laughs]

Mhm.

But it led to immense subsequent grief. Now, I won't go into what we found at UEA, other than the fact the, in many cases people may have been foolish, but they certainly weren't dishonest. But, what came out of it was, for example, the deficiencies in areas which are of great interest to me, like data curation.

Mhm.

So for example, in those days, the Research Councils didn't pay universities to curate the data they have collected to make it widely available. They didn't pay universities to record the algorithms and publish them properly and so on. And so, one of the things that we found was, if you like, a woeful lack of training of research scientists of all fields in basic computing. Takes us back to earlier things. But also, some real deficiencies in funding. Which have contributed to the problems that, that surfaced at the University of East Anglia. And so subsequently, the Royal Society did some work in this area, and, it is now, I think, assumed that, if you are going to publish research, that the data *will* be properly curated, and indeed the Research Council should pay you to do it; that, if you are asked for that data, you should normally release it. Not only that, you should be able to release the algorithms you used to process it, and increasingly in publications, unless you can escrow both the data and the algorithms, you may not get published. And this is, this is all excellent progress. And it came out of what I think was a, a very unfortunate period, certainly very unfortunate for the people at UEA. But it has had some benefits, long-term.

Yes.

Yup.

Thank you for that.

Mm.

[1:12:14]
Well thank you for that. I think going back to influences, we talked to a little degree about individuals, but are there any individuals or publications that particularly influenced your choice of career or, and your brain?

As, as… As a boy, it would have been *Practical Wireless* and *Wireless World*.

Right.

Which I, which I read avidly, I have to say, from the age of about seven. So, they, they certainly did. Latterly, I'm a, I'm a subscriber to *Nature*, on a personal level, I don't know that many people who actually subscribe to *Nature* on a personal level. And it fascinates me, because, half the articles I can read and get something from, and half of them I can't understand at all, because they're written in language I don't, I can't decode. And so, the articles on, on general science, on astronomy, or, and if you like, on computing are fun. The genetic articles are in a whole language which is completely inaccessible to me. But, you know, even that's an interesting observation I think. So, I'm a subscriber to *Nature* and also to *New Scientist*. So, I try and retain a very broad interest in what's going on across the scientific landscape.
[1:13:28]
I've also been, from childhood, an inveterate reader of science fiction. And I think, OK, you can always pick quotations in hindsight, but some stand out for me, and one is from T S Eliot, his tales, tales from *The Rock*. And I'm probably going to get this wrong, but it goes something like, 'Where is the wisdom we've lost in knowledge? Where is the knowledge we've lost in information? Where is the information we've lost in, in data?' and so on, so on. So that series of abstractions.

Yes.

And he wrote that in 1934. Which is interesting. Similarly, Wells, in his *The Shape of Things to Come*, wrote about a universal network of information systems which will be available by the close of the twentieth century.

Mm.

There.

Individuals before their time.

Absolutely. Just… So, I think it's always been a, a sort of, wonderful stimulus to thinking., has been science fiction. I continue to greatly enjoy.

[1:14:36]

And I know this isn't Desert Island Discs…

No, it's…

But…

Yeah.

Is there any particular book that is a…

Well there's only one, which, which will be a, Isaac Asimov.

Very…

No, two authors. One a very early one, so that's Stapledon, who wrote in the 1920s and '30s, and the other is Isaac Asimov, now, now sadly dead. And also probably Arthur C Clarke. But, Asimov I think, is thinking about the social impacts of technology, and probably what interests me now more than, more than anything else.

Mhm.

So his *Foundation Trilogy*.

Yes.

Yes.

[1:15:07]
And, looking ahead now.

Yes.

What do you think is the biggest challenges and opportunities for the IT industry in, say, the next five to ten years?

There are so many things that have been coming soon for 20 or 30 years which seem to have arrived. One is genuine progress in AI, artificial intelligence. And certainly what's been going on with DeepMind and so on is fascinating. And, obviously Google and DeepMind, but there's another part of Google with yet another area, which has been building something which I think is even more fascinating, and that is, a structured AI which has core AI, and then I think half a dozen sub AIs round it, with each of those AIs specialised for something, vision, sound. Remind you of anything that you can…? [laughs]

Yes. Yes.

But what they've built is a general purpose AI.

Mhm.

So none of those individual sub AIs is quite as good as a device completely focused on that one purpose. But that's not what they're trying to do.

Mhm.

They're trying to build something with all of those components in, which does not have to be a specifically trained. And there are bits of interesting discoveries, such as, the, the central AI appears to be able to coordinate knowledge across the sub AIs, so the training in the sub AI in, in vision, appears to help the training in some of the other sub-AIs in other areas.

Mm.

[1:16:40]
So there's, there's some, there's some really fascinating stuff going on now in AI. But also, quantum, quantum computing.

Mm.

Where again for years we've been thinking it might arrive at some point, but the, the general opinion is that, you need 49 qubits,, or maybe 50, to make a really interesting quantum computer. Google are saying, they're pretty much there with that now. I think they're predicting it next year.

Mhm.

And you also have to get the accuracy up, and, they're pretty close on that too. So, and Google aren't the only game in town you know.

No.

So I think the… Access to genuine quantum computing, and, for example, IBM have been giving access to sort of, time-shared, simple quantum computing to practise with algorithms. It's finally development whose time looks to be, looks to have come.

Mhm.

I think that will generate some profound changes, not least in security. But I mean, you can build cryptographic systems that are not easily crackable by a quantum computer to… It's not the death of encryption, as some people have said, but nonetheless, it's, it's an interesting challenge.
[1:17:50]
And then you've got the, the linkage between biology and the computing, you might call systems biology. And it was fascinating that, the guy who did produce the first genome, which of course wasn't a government, his name now momentarily escapes me, it'll come to me in a minute, but is still around doing these things, said, his major challenge wasn't the biology, it was the computing power that was available to him at the time. Now, we have vastly more computing power available. And so, the ability to build organisms from scratch, which is, which is now extant, the ability to, to

personalise medicine in genomics, you know, these are all things which will have absolutely profound impact. And it's a wonderful time to be around.

Yes.

Almost we have too many. We have too many opportunities coming too quickly.

Mhm.

And my concern will be the social adoption of that, because I would argue, we're still seeing technological development on exponential growth timescales, whereas human understanding and adoption is linear.

Mhm.

And so, I think we're in dangerous and pretty grave indigestion.

Mm.

So, hence my interest in social science.

Yes.

You know. But, but there's absolutely no shortage of interesting things for IT people to do, let's put it that way. And, we will shortly see AIs battling each other, and attack and defence in cyber security. And… No, we do need to make sure we put in place the governance for some of these things.

Mhm.

I'm not in the 'AI will take over the world' view camp, but I do think we need some basic rules of the road, as to, as to how such systems should be constrained and designed.

Mhm.

So, yes, it's… What I see happening potentially is… My minister, Ian Taylor, had to go into the House of Commons and get annihilated over GM foods, a subject in which he believed passionately, and rightly, that it was of value. But the public dialogue on it, and the lack of public engagement, led to a mass reaction against it, and we still have it today to some extent. We could well see the same in AI. And it really is time that professional bodies like ours actually did some real public engagement here. I've been trying to persuade the Royal Society they ought to be doing that too.

Yes.

So, you know.

Well thank you for that fascinating insight.

Yes.

[1:20:17]
And, talked about the opportunities. [pause] The, the challenges, what, you've said really keeping up for especially keeping up.

Mm. Absolutely.

What advice would you give to anyone entering or considering a career in the IT industry?

Mm. [pause] I think, decide fairly early on what you really want to do.

Mhm.

You know, do you want to stay on the route which is essentially professional engineering?

Mhm.

And we now have companies which recognise the value of that route, and not just, when you get to a certain level, shunting you sideways into management.

Mhm.

So, IBM are very good at that, they have distinguished engineers and so on. Other companies do too. So decide, do you effectively want to be a research engineer, a research scientist, or do you want at some point to move across into management or policy or whatever. Most of those moves are moves that I made by accident. [laughs]

Mhm.

And then had to cope with the results. And don't get locked into one discipline. The… Let me give you an example. There is a… I'm sure he won't mind me saying this. I was talking with the Chief Executive of the Royal Statistical Society, Hetan Shah, a delightful man, and he was saying, his members have discovered that one way to double their salary is, change their job title to data scientist from statistician. And the problem that we have in data analytics for example is, to build a really good data analytic capability, you need computing science skills, you need mathematical skills, you need statistical skills, you need engineering skills, you need sectoral skills in the area you're working. And essentially, unless you're a truly remarkable individual, it's very difficult to ram those into one skull. So, it's the ability to put together a multidisciplinary team, and to manage that team to success.

Mhm.

OK? We're not teaching people yet how to manage multi disciplines.

Mm.

But that will be the critical skill. So I'm looking for someone, a recommendation to somebody to really rise to the top in this, is, get a core discipline, recognise the

importance of all the others, and know enough about them that you can run as multinational – I'm sorry, a multi…

Discipline.

…disciplinary, talented team, that brings them all together for success. Because that's what's going to drive success in the data analytics world and systems data world. And they'll pay it.

Mm.

Yep.

Well sound advice.

[laughs] OK. Yes.

I'd like to thank you very much for agreeing to speak to us today.

My pleasure.

Fascinating. And, I hope that listeners get as much enjoyment out of this interview as I have.

Good. My pleasure.

So, Jim, thank you very much indeed.

Thank you. Good.

Thank you.

[End of Interview]