Capturing the Past, Inspiring the Future

Sir David Brown

Interviewed by

Jane Bird

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By Zoom

Welcome to the Archives of Information Technology, where we capture the past and inspire the future. It's Tuesday the 27th of April 2021, and we're talking on Zoom, as has become customary during the coronavirus lockdown. I'm Jane Bird, and I've been reporting on the IT industry for newspapers such as the Sunday Times and the Financial Times since the early 1980s. Our contributor today is Sir David Brown, a prominent figure in the telecoms and electronics industries, having held senior posts at Plessey, STC, ICL, and Northern Telecom, and Motorola.

[00:40]

Sir David, your glittering CV includes chairmanships at Motorola, the British Standards Institution, several industry groups, and high level government advisory bodies. You have four honorary doctorates, you are a Visiting Fellow of Oxford University's Kellogg College, and you won the Mountbatten Medal for your leadership contribution to electronics. In 2001 you were knighted for services to British industry. But I suspect that as a regular speaker on the links between engineering and education, you are particularly proud of your work at Bletchley Park, home of the British World War II code-breaking, where you are Chairman of the Board of Trustees. I look forward to hearing more about that in due course. But perhaps we could start at the beginning, with your early life.

[01:28]

So, you were born in Wolverhampton, in May 1959 [corrected to 1950 after the interview], and your father was an engineer and your mother a primary school teacher I think. So, how would you describe your family life? Did you have a happy childhood?

Yes, I certainly had a happy childhood. I don't remember the Wolverhampton days particularly, because we left there when I was three. My father worked in local government, from where he graduated during the war, took his degree at night school, while he was working as a civilian engineer with the RAF at Farnborough. And so, working in local government, as he saw it, helping to rebuild the country after the devastation caused by German bombing during the war, he followed effectively an itinerant career. The only way to get promoted in his walk of life, civil engineering in local government, was either to, wait for, wait for opportunities to occur, when people retired or worse, or move, for a promotion, and that's what he did. So I saw a lot of

the country, all in the north. And it was a very happy childhood indeed. I felt blessed by my parents and still do.

And were they very supportive of your education? Presumably with your mother being a teacher, they were generally in favour.

Oh, hugely. My mother's… My mother was the first of all of her family and all of her line to get what I call a decent education. And her mother was insistent that her youngest daughter would get educated, whatever it took. So of course that feeling was passed on to my mother, and passed on, and I have it, and my sons have it. Life's about learning as much as anything else, it's endless, it never stops.

[03:44]
So… And you enjoyed your school days, did you?

Oh. Yes, I did. Of course I think like all of us, I enjoyed more things that we did at school than other things. And I was well stuck in to the prospects of the scientific or engineering or even possibly mathematical career from my mid-teens onwards. So, a lot, a lot else were a distraction at school to me.

Right. Did you take the Eleven Plus?

Yes, I did.

Yep.

And passed.

Yep.

And I went to… Yeah, yeah, now that was, that was a first in the family as well. And, went to a state grammar school, just outside Warrington, where my father had then achieved, at the extraordinarily young age of 38, the post of Borough Engineer,

Surveyor and Architect of Warrington, and he was setting about building Warrington New Town, that's why we were there.

So he… So your ambition and your sort of high-flying experiences date back perhaps to the example of your father, would you say?

Oh, my father was always interested in science, but he never set out to convert me into an engineer. No no, I'll tell you exactly how that happened, because I can remember it to the hour of the day. That, an outfit I had never heard of, the Institution of Electrical Engineers, apparently every year took a learned roadshow around the country, named for the father of electrical engineering, Michael Faraday, he who invented electromagnetic – not invented, discovered, electromagnetic induction, and all of the rest of the world as we know it is rooted in that. Rooted in a lot of other things as well of course. Well, he said to me, when I got back from a heavy school day one day when I was just coming up fourteen, he said, the Institution of Electrical Engineers is giving this year's Faraday Lecture at the big hall right in the centre of Warrington, I think it was called the Parr Hall. And he said, 'There will be a lot of people there, about 2,000,' he said, 'and I am going to go for sure.' And he didn't say, 'Do you want to come with me David?' He said, 'Oh and you're coming with me.' I said, 'Well, what is it?' He said, 'A sort of lecture.' Now imagine how I greeted the prospect of a lecture at the end of… I was, you know… I really didn't have a lot of choice. A lot of family pressure, my mother saying, 'Oh yeah, go on, go on, why not.' So off we went. I prepared for the worst. A one-hour lecture. And about ten minutes in, this chap from the United Kingdom Atomic Energy Authority at Daresbury had me hooked. There he was, all alone on the stage, and he was doing real demonstrations and experiments, and, and big stuff too, and he was enthusing. And by the end of that I thought, I don't know that I want his job, but boy, do I want a life in engineering. I thought, this is a whole lot more exciting than the kind of engineering my father was doing, building bridges and roads and houses. Of course in the later years I discovered that civil engineering is every bit as exciting and adventuring and fascinating. But, but there I was, determined in fact to be an electrical engineer, just as Harold Wilson was firing us all up with his speech on the white heat of technology, and Jodrell Bank was being built not more than a couple of tens of miles down the road from us. So it started then.

Right.

And I became quickly passionate about it, and, spent my pocket money on subscriptions to *Wireless World, the* journal of the day for amateur electronics people. And what was left of my pocket money I spent in, this dates me Jane, the Government Surplus Supplies, shops, that were everywhere, and amongst everything else they sold stripped-down bits of, oscilloscopes and radios, and, telephone exchanges, and, so on. I was having a field day.

[09:05]
Mm. And you went on to Portsmouth Poly then to study electrical engineering.

Ah, I went via Birmingham University.

Ah, OK.

Yeah. This was my first great lesson in life, I think. And, I confess to you and whoever else is listening that, I went there with, the fact is, a substantial knowledge by then about electronics, and electrical engineering as well, and A Levels in, not only in physics and pure and applied maths, but further maths, and discovered that I was taking with me enough knowledge to enable me to effectively coast through the first year, foolishly, but coast through the first year. And I don't know how, but somehow scraped through the first year examinations and into the second year, while I thoroughly explored all of life [laughs] outside engineering with all my new-found friends at Birmingham. And I was at the time, and indeed all through my student days from the age of sixteen, sponsored by the Plessey company, in fact Plessey Telecommunications, on the south coast, in Havant. And they taught me a lot. Two summers with them as well. So… So I go through into the second year. Didn't really think hard enough about whether I should do something different about this, or maintain this way of life. And I just drifted, and found that, thankfully at that stage in my life and no later, that that isn't the way to carry on. If you're going to do something right, do it right. Do it right. Don't depend upon just being lucky all the time; do it right.

Lucky you realised this.

Oh. Oh, wow. And at the end of the second year, Birmingham and I decided to part company. And that's when I took myself off to Portsmouth Polytechnic, and repeated the second year, now on the Council for National Academic Awards, CNAA, degree course, and got it right, and how. And, really, though I say it myself, with not a lot of humility at this stage, I just distinguished myself at Portsmouth. And then have seen no reason to break that habit formed then. So, I later in life met the, met again, the dean of, the then dean of undergraduates when I was at Birmingham, the dean of undergraduates of the undergraduate school at, in the School of Electrical and Electronic Engineering at Birmingham University when I was there, in the most extraordinary circumstance when I was President of the Institution of Electrical Engineers, and presided over the governing council, and he was a member of Council, and I [inaud] the first…

Did he remember you? He remembered you, I take it?

Not immediately, which I'm sort of happy about, but at coffee break. I shook him by the hand and thanked him profusely for making my life in engineering as rewarding and enjoyable as it was, but by telling me not to darken his doors for another… And I, I mean, I meant it then, and I mean it now, I don't recommend that way of learning that lesson to anybody; for the avoidance of doubt, I do not. But I am sure it was going to have to be a lesson that I would have to learn sooner or later, and I'm just glad it was then.

[13:43]
Right. So you've mentioned Birmingham, and you've mentioned the Faraday Lecture, and the importance of your father as well. Are there any other sort of, key influences in your early life, people that, that encouraged you to move into the direction that you've ended up doing, pursuing?

Oh, I think I've been… Yes, I mean the answer is yes, with three exclamation marks after. But I think that's true for everybody in that, at least as much as… They are

offered mentors, whether they realise it or not, and whether they accept it or not. But right from the get-go, after graduate, graduation of course, I was just very very clear, I was just, I, I needed all the education, all the help, all the, oh, teaching about life's wisdom in engineering that I could get. So whenever anybody said to me, 'Well listen young David, if I were you, what I would be thinking about…' I, I never once said, 'OK, got that, thanks very much, cheerio.' I always said, 'Right, got that, I think. And what else? And what else?' And I think, you have to be receptive, openly receptive, trying, really trying your hardest. And that's, you don't have to make, try to make that obvious to people; if you are, it just is.

Yes.

Then people will try and help you, and, and then don't, don't resist, don't ever think, I can do this on my own. Because one of the other great lessons, many other great lessons I've learnt in my engineering adventures so far, is, is, it just, it's impossible to do anything worthwhile alone, to innovate certainly in this field. But, but… Because nobody has a monopoly on wisdom, and especially not yourself.

Mm. That, so that's a certain humility that you've obviously acquired over the years.

Well I don't recognise it. [laughs] I, I don't know, it's a dangerous thing. If you ever think, wow, oh I, I must be humble to have got here, and I don't think anybody who knows me would ever describe me as, as, oh, shy, retiring. In fact, I am very proud of what the people I am privileged to work with achieve. Together achieve. And I do feel, mostly, humble about being accepted by them, being part of them, and, and we do something together.

[17:02]
And did you have other interests outside the world of engineering when you were at university and, and a young man?

Oh, oh yes. It's about balance isn't it. At university, one of the things I spent too much time doing at Birmingham, and then probably not enough time doing at Portsmouth, was cars. And by the time I was nineteen I was well into overnight

rallies, [laughs] of a, of a beaten-up but very, very capable Mini, old Mini that I had bought for next to nothing with a bit of the bursary that Plessey gave me every year to top up the student grant. So, yes, I was forever tuning up cars, and, seeing how, not fast, because you can't do that on public roads, you know, but how well they could be driven, yep.

[18:18]
So, so you left, you left Portsmouth. You did a postgraduate diploma. And then, I guess you went straight to Plessey, did you? Did you graduate, what, early 1970s, 19-

Yes, I grad- Sorry.

Yeah.

I graduated in 1972, having been sponsored by Plessey since I was sixteen. By then I was, just turned 22. In the teeth of a recession. Though until I graduated I had been with Plessey every week of every long summer vacation, working with them in either their telecoms group or their maths research group in Havant. But suddenly, having spent a lot of money on me, and taught me a lot, they, they didn't take on any students that year. And I thought, oh, what on earth is going to happen now? Is the sky going to fall in? And I started writing masses and masses of letters of application to everybody in the electronics world. Everybody was in the same state, really. And finally I had an offer, in avionics in Hatfield. And I thought, oh, I've got to take this, but it, you know, it really does look interesting. And then, the day before I was going to get up the next morning and sign this deal, then, I got a call from Plessey, wanting to offer me a job as an assistant engineer in their ace telecoms research establishment at Taplow Court, just outside…

Fabulous. Yeah. So that was a… You were lucky.

And, you know, I, I saw telecoms then as I see it now, an opportunity to work on the biggest machine on earth. And how can an engineer walk away from that? Particularly since what they were doing at Taplow Court was figuring out the

convergence of communications and computing. They and not many other people were researching and developing processors for the very first stored program control exchanges, switches is the, the technical word. But exchanges. How could I not?

Mm.

So I did.

[21:18]
Mm. But you didn't stay… Oh, well you stayed a while, not, not very long, did you? You moved on to ST-, you moved on to STL.

[hesitates] Yeah. I, I was at Taplow… What I was doing at Taplow, and this much I can tell you but not a whole heck of a lot more, it was work for the Ministry of Defence. It was the early research and specification days for the project Ptarmigan, a landmark tactical mobile cryptographic telecommunications system for the British Army. And, it just dates me that, that was deployed for decades, super successfully, but bits of it are now in a museum somewhere in Dorset, and it's [laughs], it's, it now is no longer. But it, it was the absolute state-of the-art, indeed reaching beyond it, then. Because they were implementing, this I can tell you as well, the heart of it was, the Plessey PP250 processor, computer, a fully-formed computer. And it was the first operational, industrial if you like, computer architected to be a pure Church-Turing machine, fully secured machine, to create a digitally secure platform for trusted software. Well, when the specifications were written for that, in which I had a modest hand, and then Plessey got the contract to develop the entirety of the Ptarmigan switch with the PP250 at its heart, and that development was going to take place at Plessey at Poole, then they said, 'Well, would you like to go down there as part of the development team? And oh, by the way, there's a promotion or two in it as well.' So off I went to Poole. And, without, just a glance in a rear view mirror, not that any human beings are born equipped with rear view mirrors anyway, and they shouldn't imagine that they are, off I went to Poole. And was there, oh, three years till 1976, by then working on the Ptarmigan switch. Met my wife there, a computer scientist, working on the parts of the operating system for that PP250. To give her a tiny bit of fame, the first woman ever to get a First Class Honours degree in computer science

from City University. So we teamed up in every sense of the word, and in 1976, put out feelers and were offered, both of us offered jobs at then Europe's leading telecoms research establishment, STL, Standard Telecommunication Laboratories, at Harlow. Vast. So we went there [laughs] as a team, completely separate divisions. That's probably, probably a good idea as well, and the marriage has lasted 46 years so far, and, so…

Congratulations.

Oh thank you. Yeah, it's probably, probably her you need to congratulate [laughs] really. So I went to, focusing again on me, I went to STL, as a research engineer, and, in fact I ended up there principal research engineer, having spent some time in America for them as well, and, oh, and, spending half the week in the UK for about a year, half the week in Harlow and half the week in Antwerp at the sister laboratory, and, boy, I was learning at a rate of knots, and having a lot of adventures along the way.

[26:23]
What did you think of America? I mean that was quite a big adventure at that time.

Well, yes, it was. In fact… [laughs] Oh. It was Frederick, Maryland, yes, working with Plantronics in their corporation Frederick Electronics. Frederick, Maryland is a huge, beautifully developed industrial, high tech outfit now, just outside Washington. But then, it wasn't. And I felt like the only Brit in town, and, [laughs] I loved it.

But you decided, you didn't want to move to America, and, take your wife, and, you know, the land of, of wealth of course, and opportunity?

No. I… I also saw, then, and continuously through till now, the UK as the land of milk and honey and opportunity equally with America. I've always felt completely at home in America, and indeed Motorola was ultimately America-owned where, I was Chairman of Motorola [Ltd – Motorola's UK company] for, a few months short of twelve years. I retired from that when I was 58, time served, you know.

Mm.

And I've always felt completely comfortable with North Americans. So I've just had the best of both worlds. But, I have a profound, and I think completely well-grounded, belief in what this country can do in technology, and I've seen that borne out again and again and again. I'm a Brit. I'm a Brit, and, yeah, you're back to humility. What am I proud of? I'm proud of being a Brit. There you go.

[28:36]
So… Yeah, so, well that must be very encouraging for young people, but we'll talk about your sort of, inspirational talks a bit later on. Just to sort of complete the career though. You went, in 1979 you joined STC. So what was the, when… Looking back, you were there till 1991. What were the sort of, exciting things that you did there, or experienced there?

Yeah, well, I came to be STC rather than STL, because STC and STL were both owned then by the giant ITT Corporation. And as part of some restructuring, or, or other, suddenly STL was part of STC. So, it had been a very close working between the two. Now you asked about people who have been a great influence on my life. Well, the technical director of STC, so a great telecommunications engineer, Bernie Mills, now not with us any longer I'm afraid, he invited me to come and be STC Telecommunications' first ever director of software engineering, as a staff function, reporting to him.

Yes.

And, I, I remember as if it were yesterday, sitting in front of him in his office in the Strand, and saying to him, 'But, why me?' I said, 'I don't have a background in software.' I do have a background in the stuff that software runs on, and I was well into the leading edge of integrated circuits, then, and, like everybody, saw the huge potential in telecommunications, of the prospect of embedding the, then it was, Intel 8086 or 8088, and a prospect of never again having to worry about whether you would have enough on-board processing power in a telecoms gizmo, or in, were going

to be behind us. 'Well,' I said, 'I know, I know nothing about software.' He said, 'Oh I know that. But you do know about engineering.'

Yes.

He said, 'They're all called programmers.' He said, 'And they're geniuses. Geniuses. And very much to be respected, and it's amazing what they do. But, you're presumably a capable mathematician, and that's the way software is going, and, methodologically anyway, and you're a chartered engineer, with that rigour. And,' he said, 'I just want to bring the two together, and take STC quickly and massively into the software engineering age.' And he was right of course. Most of software then was a DP culture. Well anyway, at about that time STC employed about 100 people that we would quickly begin to call software engineers, and it had by then major contracts to engineer software, bits of the software, for the System X electronic stored progress – stored process… Stop. Sorry. Stored program controlled exchanges, SPC exchanges, System X. And we needed to recruit 1300 software engineers from 100, and not all in one team either.

Mm.

And that was just never going to happen, just following our noses; there had to be a plan. I just approached it, just from an engineering point of view, just with old-fashioned tools and rigour. And really, nobody was more astonished than I was by how well-received this was. And soon, something magic happened – I always love it when it happens – the tables turned and I started following the team, you know. [laughs] And me saying to them, 'So what do we do next?'

[34:16]
Right. But you like, you obviously like these leadership roles. You've had many, many leadership roles over the years. So, that's, that's clearly something that you excel at, and presumably enjoy.

Oh I could never, I'd never have wanted to start my own company, you know, or work for myself. I love working…

Why is that? Why not?

I, I love working with other people.

OK.

I… Well, I just, I've said it to you before in this talk, but, maybe it bears saying again. It just is impossible to innovate alone. It always has been. It's just, never so immediately evident in the past as it is these days. Faraday, the father of electrical engineering. Well, you would think that he did all this all on his own in his dingy basement lab in the Royal Institution in Albemarle Street. But he was corresponding daily with the other great scientists of the day across Europe, all of them. And they were writing back to him, and him, he, him writing again to them. They were innovating together, they were collaborating. It's just, that was happening at the speed of, steamships and horses. And today it happens at the speed of light. But it's always been true throughout human history I am sure, and certainly through recorded human history, that very little worthwhile ever is achieved working on your own. And I think if people get that from the start, and get it as well, that nobody has a right to be correct, and, everybody's wisdom is important in cracking any great innovation, then, I think you immediately drop into the mode of, I want to work with other people. And why wouldn't I want to? And if I don't want to for some reason, that's a whole other issue, and I should get over that.

[36:49]
Right. So you were, in 1991, then, you moved to Motorola. So what was behind that move, and what happened at Motorola that, that sticks in your brain?

[laughs] Well what was behind… Because a move has two components, doesn't it. It has the leaving and the joining.

Yup.

Just the leaving bit first. Why was I in a frame of mind even to consider leaving STC after, what, sixteen years, probably, if I include the bit at STL first? Well STC had changed hugely, and in some good, but disguised good ways, like the, how shall we describe it? The coming together of STC and ICL in the pursuit of the convergence of communication and computing, which was a very very difficult episode, because as the history books record, it happened through a dawn raid by STC in August 1984 if my memory serves me well, and was a big surprise to everybody, and therefore it was a very very difficult settling period indeed, and probably never fully did settle. A little margin note. Taught me there and then, should I ever need to know that lesson, that hostile takeover bids are really never ever a smart thing to do. Never ever. Well, because all that never fully settled, the cash-generating machine in the companies of course, the identities never were properly merged either. Started to, just stutter a bit, and STC then reached out to Northern Telecom to bring cash in return for an awful lot of control. And in the end of it really, the company I was working for was now owned and controlled by another company that was shortly going to be in the same situation but didn't quite realise it: Northern Telecom of Canada, Nortel.

Yes. Yeah.

And I thought… And this is, what we're doing now has very very little to do with the convergence of communication and computing, which has been the, certainly a driving vision of mine right from the beginnings of my career.

Yes.

And, we had had an opportunity, in STC, to get into cellular telephony in a big way. Hadn't started. And they had walked away from it, because the cash wasn't there, and probably the belief wasn't there in, at the centre. And so that's why I was receptive. [40:16]
Now then, where I went. Motorola was a smallish company in the UK, then, in 1991. Big in what's called land mobile communications, supplying the army and, so on, and with a lot of technology, a couple of good early successes, and a huge passion to be very big in cellular communications, in fact to be the number one in what today we call mobile phones. Nobody called anything a smartphone in 1991.

No.

And they had a small outfit in, inside Motorola Limited, the name of the UK company. And they wanted to expand it rapidly, and invest in engineering and research, and, oh, massive ambition. And I thought, absolutely spot on.

Mm.

So when an American flew over, on his way from Chicago to somewhere else in the world, and decided to stop off at Heathrow, just to try to persuade me to become the director of UK operations, and, help make this happen, over a very long dinner indeed, an intellectually intense dinner, he was a software engineer, telecoms software engineer, we did the deal. And I took probably the biggest financial risk of my life walking away from, all the financial security, and so on, of a life, life as a well-remunerated executive of STC, to this uncertain role. Well, and the rest is history. It was, oh, intensive. All my days with Motorola were full-on, pretty well every day, every day an adventure.

[42:43]
Why… And so why was that, what was the big adventure, what were the challenges and the opportunities then?

Well, the challenges, the challenge simply was, how fast could we do all this, that we felt confident we knew we could do? I don't mean, we knew how to do it. It wasn't just like playing sheet music. But, you know, I'm reminded of those, or, have been reminded often of those days, every time I've picked up one of my, probably only one, go-to management textbooks, you know? If you've ever read Jim Collins's great book *Good to Great*. Twenty years old this year. How to take a really good company to be a really great company.

Yes.

And, he coined the term the Stockdale Paradox. And he said… Named after a US vice-admiral, who had suffered outrageously for six or seven years in a Vietnamese jail back in the day. He said, to be, to be really great, you have to be able to do two things at once, carry in your mind two things at once. You have to be able to retain your absolute faith in your purpose and that it can be done and you will do it. At the same time, you have to confront the brutal facts which are combining to stop you doing it. And if you look just at the brutal facts on their own, you will conclude logically, there are too many, they're too brutal, the combinations are outrageous, it's never going to happen. Why carry on? Why not cut and run and do something… You've got to do both together. And so it was, in those early days of pursuing our purpose, put the purpose very crisply, the purpose was simply to untether every phone on earth. We none of us… When I say us, I mean thousands, tens of thousands of such engineers around the world, we none of us believed that it was at all reasonable that, whatever the population was then, five billion, why they should have to be tethered to a telephone line, why we were in this habit, had never tried to break it, that, you didn't try to communicate with people but with places. You dialled a number and it was in [inaud] place.

Yes.

Not a person. And we thought, this is ridiculous And that was the faith; but the obstacles, the brutal facts, were huge. And to weave in the computing bit again, because it's crucial. Without the embedding vast processing power and vast memory, at least vast relative to what had been done before, the brutal fact of the amount of usable spectrum, radio spectrum for this purpose, is limited, and it isn't being manufactured any more, could not be overcome. Simply because, there is no solution other than rapid CPU processing that will enable you to hand off a hand sized, they were bricks then, but, all right, big hand sized, mobile handsets from one base station to another, fast enough so that the call didn't drop. And cellular telephony depends at least as much on computing as it does on communications. And we saw all that, and again I don't claim any, any special knowledge, insight, or credit, part of the team, because the we is, again, tens of thousands of people. But Motorola got there first, with analogue, cellular.

Yes.

And then, so when I was Director of UK Operations of Motorola Limited, I had the privilege of that being the team that built the first GSM network in the UK formally. Provider then called Cellnet. It was part of BT, or partly owned by BT, and partly by G4S, Group 4. And went on to build a number of other networks in Europe. Well, we were already then, by then we had built the biggest telecoms lab in Europe, at Swindon, of any company, and the Queen opened that for us in 1997. And, I had not long become Chairman then. These were great days. And, honestly, we got a lot wrong.

[49:20]
Well I was going to ask, what would you, you know, what would you have done differently perhaps?

Oh, stop angsting about getting things wrong. What began to dawn on me, eventually I suppose, just on the cusp of me moving on from being, you know, in a narrowly focused role… By then I was, had been on the board of Motorola Limited for a little while, and I was Senior Director, Radio Access for that product line, just on the point of moving from there to becoming Chairman of the Board. On the, 1st of January 1997 when I was 47, the penny dropped. Purpose. It's obvious when I say it to you now, and I think, you know, why, why did it take you so long, David? Purpose is, essential, easy to understand, but it's useless unless you're in motion. Static purpose is no help at all.

No.

And, and I say to this day to teams I'm privileged to work with, when they say, quite reasonably, 'How do we work out whether to go this way, or that way?' And they might be 180 degree different directions now. I would simply say, yeah, been there. Let's discuss whether we're utterly clear about the purpose, and then it really doesn't matter in which direction you take the first step. Take it.

Yes.

Because you're clear about the purpose, you will know that where you land then, whether that is contributing to the purpose or it's detracting, are you going in the right direction. If it turns out wrong, just do a 180 degree U-turn and take two steps, and then you're in the money again.

Right. Yeah.

People shouldn't freeze. They… They shouldn't think, if I don't know, if I can't see the right way to go now, that must be my fault; what am I not doing? It just is. And move on.

So you build, you build the future sort of, step by step; you don't try to have the… You kind of have the long-term vision, but you don't try to plot those intermediate steps on the way, in advance?

Yeah. Not finely. I think, it's foolish. Even to imagine that, you can see further ahead than the car's headlamps, you know. That, in any field of life, I'm sure, but certainly in technology, it is like driving down a dark road. Because nobody's been there before, they can't have installed the street lights, you know, because, you're at the front.

Yes.

Driving down this dark road, and, you don't know where the turns are, or whether you're going to go into a hairpin or a cliff edge or whatever. And, you can only see as far as the headlight range will take you. And the trap is to try to see further, or to imagine you can see further. Just because the road is gently bending to the right, doesn't mean it's going to keep gently bend- Don't be fooled. And that's key when you're thinking about planning. There's no reason why you shouldn't have a fairly granular short-term plan, and a rather less granular mid-term plan, and an ultra-clear long-range purpose. And just have faith, that when you come across these brutal facts, the cliff edge, or the hairpin, that hanging onto the purpose will help you to draw up the next bit of the plan in sufficient granularity to overcome that.

[54:17]
So you stepped down from Motorola in 2008. What have been your main activities since then?

Oh. Yeah. Well I imagined that I might just dial down the number of hours a week I would be working. I can't… I can't think why I even thought that might be a good idea, then, you know. But I was stuck into, boating in a big way: well, motor yachting, and, lots of other stuff. I was accumulating air miles, or had accumulated air miles that I knew I'd never burn off in my whole life, and… You just think, well, you owe it to yourself and to your family now to back it off a bit. Of course my family very quickly told me, 'No mate. You owe it to us to, [laughs] go and run off all these energies, just like you used to do.'

Yeah.

But in a heartbeat I found myself very happily as the chairman of an IT company, DRS, Data Research and Services. I found myself a director, a non-executive director, in fact senior non-executive director of a hydrogen fuel cell developing company, Ceres; a non-executive director of a FTSE 250 high tech company manufacturing all the way round the world, Domino Printing Sciences. And, lots of other things, including pro bono things I was doing. And I've just carried on that way. Of course, you don't have to, in a plural non-executive life, you don't really have to plan when would be a good time to retire from this or that, because corporate governance rules just take care of it.

Yes.

It's limited anyway. I think Chairs need to be conscious that they need to exercise a bit of self-discipline in planning their own exit, and not just carrying on and carrying on, because it's a nice comfortable billet.

Yes.

But, otherwise, I've just found myself, again and again, since then, thinking, oh, oh oh, this is coming to an end. Perhaps, perhaps I won't look for another, something to fill that. Then the phone rings. Or I trip over something. But what is it that guides me in what I have done since, chosen to do since I was 58 and now, and I imagine is the foreseeable future? Well not gain, not financial gain. Nice if it happens. These days, when given a choice, I choose to do what I think is going to be really edgy and fun, with people who are filled with a sense of purpose. And I'm going to enjoy working with them, and beating the brutal facts. And that's where….

And where have you mainly found that then in recent years?

Well, I've found that in every single one of the companies I've worked for. But… I… I'm not going to pick apart company by company publicly, it wouldn't be fair on them. [pause] But, sweeping statement but I'll risk it. I… No company, no company that I would want to work with anyway, I wouldn't want to work with companies that are finding what they're doing easy, you know? I think… You learn, it's almost a selfish statement, you learn such a lot from working with people who are doing really difficult things with big chunks of the world saying to them, 'You're not going to attempt *that*, are you? Don't you realise…' But if they've got a clear purpose, and they can see, to the end of their headlight range anyway, then I'm up for it.

[01:00:17]
And is that mostly small, fast-moving, innovative start-ups, but where you see the innovation and the ground-breaking technology, would you say? I mean I know you've worked for these large corporations, but, classically one tends to think they are, they're the leviathans, they're the slow-moving dinosaurs, they, that real innovation comes from outside. What do you think?

Oh no, I don't think so, I don't think size has a whole lot to do with it actually. One of the companies I chair at the moment, the Manufacturing Technology Centre. It's the biggest part, the biggest centre in the High Value Manufacturing Catapult, in the UK obviously. And it's grown like Topsy in the last ten years since it was founded. Ten people ten years ago; 850 people today, most of them PhDs, in manufacturing

and associated disciplines. Now, that's a company that some would say, smallish, might just be on the edge of a FTSE 350 at the rate it's going, but it's not a leviathan. Yet every day we are working with really small manufacturing companies, and really huge ones, like British Aerospace, and Rolls Royce. And I tell you, in all of those companies they all have innovation challenges in spades, and they are up with the [glitch in recording]… Because they've got clear purpose. They understand, it's all about partnering. They're not trying to do it alone; they're reaching out. And I love that.

[01:02:32]
So, looking at society generally, and the man on the street if you like, or the woman on the Clapham omnibus, how would you see, how do you see society having changed, and life having changed, for ordinary people as a result of the technologies that you've been involved with during your life?

Well, it is unbelievably better connected at every level, one to one. You and me today. Two people connected, regardless of distance and cost, what it is we want to convey. That's brought with it huge transparency. Now we worry about, and rightly, all the dark corners as well, but at least now we're, we're worrying about them and tackling them, because this same technology gives us ways of doing that. So society is a lot more transparent. You have to believe that if we carry on this way it's going to become progressively, and never fast enough, more level, more equal, and levelling up and never down, more inclusive. It certainly was not inclusive all those years ago, it was not, not even on the scale. And although great strides have been made, we've really, we've really only just started.

[01:04:21]
So you're very optimistic, looking into your crystal ball?

I am as optimistic now as I was as that young lad. My sense of purpose is just as strong, in engineering, in telecoms, in IT. I think, the future is a multiple of the present, and what characterises it and must characterise that field, three things: interdisciplinarity, inclusivity, globality. And interdisciplinarity, I mean, back in the day, just take computing and communications, great strides were being made in

computing, computing science, drilling ever deeper in a silo labelled computing. And next door, the same thing was happening in a silo called communications. Almost all the innovation was happening inside those silos. But the modern world today of telecommunications and IT is built largely on the sudden realisation that you need more innovation in the space between the silos, not at the expense of drilling deeper in the silos, but balancing at least the same innovation between. So, I use to the word interdisciplinarity rather than multidisciplinary.

Yes.

Because it's, the important breakthrough innovations increasingly are happening between silos. That's going to characterise the future. Inclusivity? Well as if it did't speak for itself. I mean diversity of everything. That, by the way, is just one of the reasons that Bletchley Park is so important to me. The popular view…..

[01:06:54]
Were you actively… It was quite a battle to get Bletchley Park off the ground, wasn't it.

Yes, I…

Were you involved, you know, from the early days?

No. I watched that from afar. And now I… Oh two years ago I was given the opportunity to chair the board of trustees and work with it through the next stages. It's a very robust charity now.

It's future is assured?

No. Nobody's future is assured. It's an independent heritage site, museum and visitor attraction, about 300,000 paying visitors a year, about 30,000 schoolchildren, and, well we reach about another 20,000 schoolchildren through outreach. And it's wrong to regard it simply as the home of code-breaking in World War II. No it's how that was done that made it the birthplace of computing science, of artificial intelligence, of

digital communications. Would you believe, even the first transmission of digital voice happened there, not in the commercial world, and well ahead of PCM, Alec Reeves and PCM. But it's inclusivity. People can too easily, who have never been there, and 'Go, you've got to go', can just identify it with Alan Turing. Great man that he was, oh Alan Turing was the genius who did all this code-breaking, and computing science, and artificial intelligence, in his too-short life. But it's not right. There were 11,000 people working there. And I think he would be, really quite upset to think that people today think that the other [laughs] 10,999 weren't as big contributors as he was. And they all came from, very different backgrounds. There were mathematicians like him, but *all* walks of life. Bletchley Park even tried to recruit Tolkien.

Yes. And of course there were lots of women as well, weren't there.

Well… Oh, the great majority of the 11,000 were women.

Yes.

Yes.

Because that's very important, if you're trying to inspire the younger generation, I think, that not enough women are going into computing.

Oh absolutely right. Well, so what Bletchley Park teaches all those kids who we're blessed with seeing every year is not just… Mathematics, if you approach it right, isn't as difficult and dull as you might imagine it to be. And I'm convinced, and so are a lot of the maths teachers who come to us, that Bletchley Park is actually having a measurable effect in lifting the grades that are achieved at GCSE maths as a result, and engaging people for life. But it also teaches the value of getting education early on. Turing and his young contemporaries, they invested a lot of their time and effort in their education before they got to Bletchley Park. They took advantage of everything the school system and the university system offered them in return for very hard work. And then, boy, did they leverage that when they got to Bletchley Park. It teaches you that nobody can do anything alone, and the value of teamwork. It teaches

you the importance of self-discipline, that you can be as, and must be, as creative, as innovative, as you can be, in the commercial world entrepreneurial, as you can be; you owe it to yourself, if not to others. But you can only do that safely if you are operating within a framework of discipline. And Bletchley Park was the first time and the first place ever where the processes of code-breaking and, turned into computing with the Bombe machine and then Colossus, the first place to industrialise that process. Imagine 11,000 people three shifts, seven days a week.

Mm.

But within their roles, they were encouraged to be as utterly creative as it was possible to be. Because, all, all of the three Vs, of what we used to call big data and now all data science, were present there, and confronting Turing and Michie and co, volume, variety and velocity, of all the data coming in to them.

Yes.

So you have, have to productionise that. But because of the V for variety, every single person operating in that framework has to be at their creative best. And it teaches you… You know, most of all, what I say to them all is, I've spent my career so far adventuring. To be an engineer is to be an adventurer. And that's as true for software engineering and, as it is for any other field of engineering. And it all started with a dream. And every day we dream about what could be. We dream about untethering every phone on earth. We dream about killing not only distance as a brutal fact, or, processing power as a brutal fact, or storage as a brutal fact, demolish them one at a time. Now it's about velocity. So 6G, and, and on, and on. So, ladies and gentlemen, and especially youngsters, really, it's OK to dream, and it's OK to be an adventurer. It really is. It's how we got to where we got to, and we mustn't ever stop.

[01:14:24]
So in 2001, in 2001 you met the Queen. I don't know whether that was ever part of your dream. That must be quite an exciting high point though, looking back over your, your life.

Yes, it wasn't the first time I had met her.

You met her several times, yeah.

Yeah, including opening the Motorola factory. Several times, several times. I think you just naturally, I don't know, it's natural to me anyway, and I know it is to a great deal of other people that I know, whether they've been as lucky as me or not, that if you just see something that needs doing, and somebody asks you to help, you make yourself useful, and… And anyway, so you're quite right, I ended up on one knee in 2001 in front of the Queen, and, oh yeah, it makes you gulp, it does. But the biggest effect of all, Jane, 20 years ago now, 20 years ago, on the 1st of January this year, and you set about thinking, now I'd better do something to earn this. And it changes you in that sense, that you think, you think, well why me?

[01:15:44]
So what, what do you it's made you do differently since then?

Oh try, try even harder. And, try not ever to say no. As long as they're clear about the purpose. And just be there. When, you know, when, when people ask you for help, sometimes just because, you carry the title. And, and therefore they think, you must have a better understanding, you must know more than them. Of course you never do. But what they want is for you to listen. And, I just, I just resolved, 20 years ago, just to be there for the country like it's always been there for me. Especially when things have never been as easy as I should have allowed them to be. [laughs] Mm.

[01:16:54]
What would your advice be to young people who might be thinking about going into the IT industry today?

I would say, you don't want to be anywhere where you don't believe you can be really successful, majorly successful. What you need to know, from this long in the tooth chap, is, success without passion is luck. Don't let any of your life, and certainly not

your career, depend on luck. Take such a deep, hard look at the whole width of the IT field, and you will, invest your time looking at it, you will find reasons aplenty to believe that you can be passionate about it. When you are convinced that you are going to be getting passionate if you're not already, jump in, both feet. Let it show. And don't be the tiniest bit surprised when everybody welcomes you and says, 'Go for it, and I'll help you.' And don't ever imagine that just because something looks impenetrably difficult from the outside, that that's how it looks from the inside.

Mm.

One step at a time. If it looks hard, it's only because you're on the outside. Get in. You can do it.

[01:18:50]
And what do you think will be the impact of IT on the, on society over the next ten years?

Well, at the risk of repeating myself, I think it will cause society to become exponentially more transparent. It will remove at a rate of knots hiding places for people who think that, more equality is too hard for this reason or that reason; inclusivity's too hard; levelling up's too hard. It will make an increasingly evident it isn't. It isn't. It's about clarity of purpose and one step at a time. I think, grubby word perhaps, but, it will have a magnificent economic effect on the country. I make no apologies for, for dragging the economy into it, but it is. The industry, every industry and IT no less than any other, is the economic engine of the country. Cash comes from nowhere else.

Mm.

That's where taxes come from. Directly or indirectly, it's how we fund all our great institutions. And I think, it's never too late to stick another gear in that economic gearbox and shift the country up another gear. And I think IT has a major role to play in that.

Well, Sir David, I think, thank you very much indeed, that's been truly inspirational, talking to you. And I'm sure that young people in future, when they come to listen to what you had to say, will find that it spurs them on. So thank you very much.

Thank you, it's been an absolute privilege. Thank you.

[End of Interview]