



Professor Liz Bacon

Interviewed by

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Welcome to the Archives of Information Technology. It's the 22nd of August 2018 and we're in the offices of the Worshipful Company of Information Technologists in Smithfield, London. I'm Ian Symonds and I've been working in information technology and management consultancy since 1976, a period of enormous change in the industry. Today I'm talking to Professor Liz Bacon. Liz is Professor of Software Engineering and Deputy Pro Vice-Chancellor at the University of Greenwich. She's about to take up a new role as Vice-Principal and Deputy Vice-Chancellor at Abertay University in Dundee. Liz has also been very active in promoting the cause of women in IT. We'll be talking about Liz's background, influences and some key events that shaped her career and her views on the industry today.

So Liz, where and when were you born?

Okay, I was born on the 27th September in 1963. I was born in Redhill Hospital but I grew up in a town called Kenley in Surrey, which is fairly close to Croydon. I was born, actually my name was Alison Elizabeth Bacon and about the age of three there were a lot of Alisons in the class and apparently I grew to hate the name so I persuaded my mother to rotate my names at the age of five, and that's how I became Elizabeth, which was then shortened to Liz.

Okay. And your parents did what, what were their occupations?

Okay, my father was a certified accountant and he worked for Courtaulds, a company called John Stanley and then Trinity House. My mother was a chemist. She got as far as doing an HNC through night classes and so she worked until, I think, the first year after she got married to my dad, and then obviously children came along. So yeah, that's kind of what they did. And my mum was really the one that sort of was the person who disciplined us and settled the rules in the house.

Okay. And what was your family life like?

My family life was quite stable, loving parents. My mother was quite religious, my dad wasn't, so my mum would sometimes take us off to Sunday school every week. I had some good friends outside school, we had two boys next door and a couple of

girls across the street, so I remember having a lot of fun outside school time and in the holidays. Holidays were, every year my parents made us walk up some mountain in Wales and Scotland [laughs], so I pretty much climbed every mountain around there, I think. But it wasn't something that I particularly followed afterwards, I preferred to sit on a horse and let them take me somewhere. My parents were quite strict, I can remember them, just to give some examples, where other children would be asking their parents for more pocket money halfway through the week and my parents were no, you've got your pocket money, if you spend it, that's your problem if you find something else you want later. They were very strict on that and that actually turned me into a saver, I didn't dare spend my pocket money in case I found something more that I wanted to spend it on later. So, but yeah, it was a quite...

[0:03:27]

And you were vegetarian from quite an early age and...

Well, actually from when I was born. My parents, my parents are vegetarian, so on my mother's side, her mother had been vegetarian, she had switched early on in life and so she brought my mother up vegetarian. My father had never liked eating meat, he became vegetarian when he was in the teens and they both met as treasurer and assistant treasurer of the Vegetarian Society, which is a bit of a classic. So I was brought up vegetarian and that was actually quite challenging at school, because nobody knew what a vegetarian was when I was a child and I was teased relentlessly, not only by the pupils but also the teachers. And so I had quite a tough time at school through that, especially with the surname Bacon. My sister and I were called the 'Two Little Rashers', as in rashers of bacon.

Okay, so it's obviously very important to you and you've become a vegan actually now, haven't you?

Well, I have, yes. A few years ago I kind of started to understand the horrific pain, misery, fear, torture that we put animals, particularly factory farmed animals through, not just during their lives but also in the slaughterhouse, and I don't want any part of that, I love animals and, yeah, want them to be as happy on this planet as I am.

[0:04:47]

Interesting. Well, tell us, can you tell us a little bit about your education then? Maybe sort of trace your progression through education right from your early schooling through to senior school and university.

Yeah. So my primary school was Hayes Primary School and that was where it really wasn't a terribly happy place for me. My education was not particularly good. The last two years of that I was taught by somebody who had got into the profession who hadn't even got an O level maths herself, she was very keen on art, so we did a lot of art. And every Friday afternoon we had to write a poem. I am not the world's best poet, so she used to sigh in despair at my poetry before I was allowed to write it out all neat. And that actually had a huge, huge effect on my confidence. So I found that quite difficult. As I say, I was teased a lot by the school kids, so they used to say to me, 'You can't run fast because you're a vegetarian'. So I thought well, I'd better go and see how fast I could run, and actually I ended up representing the school doing 100 metres. So that sort of worked out okay afterwards. But that was, I think, a very difficult schooling and it was well recognised that the next school I went to, which was Woodcote High School, that the kids coming from my primary school did need a lot more help to catch up. And I had some great teachers there at Woodcote High School who really believed in me and helped me sort of progress. So that, Woodcote High School I did from the age of eleven to fourteen. I then went to Purley High School for Girls between the ages of fourteen and eighteen, so I did my O levels and A levels there.

So why did you- that's an unusual time to switch school, isn't it?

Well this was normal in those days, yes. It was quite strange, you had two local school who were mixed: Woodcote High School and Taunton Manor and they tended to come together and they split the girls and the boys, it was just how the system was, so it wasn't anything unusual, that was completely normal for my local area. Yes, it is strange, but... looking back on it now.

Okay, sorry to interrupt. You were talking about Purley High School, yeah.

No, no, that's fine, please.

[0:06:57]

So, well, then I guess it comes into, I then went to Thames Polytechnic and there's a long story about that, but I went there initially to do an HND, I didn't want to study for a degree, but I did end up studying for a degree. And then, for various reasons, stayed on and did a PhD at Thames Polytechnic, which then became University Greenwich, and ended up spending my entire career there. Not planned at all, but that's how it panned out.

What subjects did you study then at secondary school, I mean in the sixth form and at university and what did you most enjoy and what were you best at?

Well, definitely sort of the maths and the physics and the sciences were my best subjects. So I did ten O levels in total and my As were in the maths and the physics, that was what I liked best. I still struggled and hated English, even though for some bizarre reason my Woodcote High School teacher had got me put in the top O level English group at Purley High School for Girls, I'm not entirely sure it was justified [laughs], because I struggled with that. I then went on to study computer science, but what happened was, I hadn't really enjoyed education. Two of my best friends left at the age of sixteen. In those days only about, I don't know, ten or fifteen per cent of people ever went to university. They'd left at the age of sixteen and I'd looked at that and said well, everybody I knew either went to secretarial college or into a bank and that wasn't for me, I didn't find it appealing. So part of the reason for staying on for A levels was because I thought I'll do something different, but I had no idea what to do. I loved horse riding, so I had thoughts about going into mounted police force, but then discovered I was too short-sighted and too short, I was only five foot two, so that wasn't going to work out. But I really, my heart was in science and it kind of always has been, so there was a careers fair at the school and I went along to find out about careers in science and they said, well, when you have your PhD - I'm thinking, I don't want to do a PhD - and you can earn this amount of money, which was a pathetic amount of money. And then I happened to wander into a room about computing and I thought this sounds quite interesting, so my parents sent me on a six-week course at Croydon College to find out more, I learnt to do a little bit of programming and

thought, that's nice. So again, I wanted to get out into the world of work, so I was just going to do a one-year course at Croydon College.

This was after you'd done your A levels, was it?

This was whilst I was doing my A levels, planning for when I was leaving my A levels, so I just wanted to go and do a one-year course at Croydon College, and it was then a careers adviser, the only bit of careers advice I ever got, that said, no, no, no, you must at least do a two-year course and do an HND, even though I did have A level grades that would have got me into a degree, I just didn't want to study any more. So that took me, I then applied for five polytechnics and got offers at all of them. And the reason I went to Thames Poly was because they gave me a cup of tea. And so this will sound really bizarre, but in those days you just went along, sat somewhere, someone called you in for an interview for ten minutes, you went away and they told you if you had a place. And Thames Poly gave me a cup of tea and I thought, they seem quite nice and friendly. So that was why I went there. So I then did the first year of the HND. My three best friends on the HND, Mike, Tim and Hardev, all wanted to transfer the degree and if you got top grades in the HND you could go to the second year of the degree. So I wanted to go with them, so I studied hard and we all moved up to the degree together and then I did the degree and then the PhD, but that was never the plan. The plan was to try and escape and go and get a job locally.

[0:10:43]

Well, that six-week course you did must have been, it was quite influential then?

Yeah, well it was, yes.

What did you learn on that in that six weeks?

It was just basic, just basic programming, that was it, yeah. And I just thought, okay, this is interesting, something I could do and yeah, so it stemmed from there.

It was a turning point in your life, wasn't it?

Yes. Along with the cup of tea.

[0:11:05]

Good. So, and what was the, your relationship like with your teachers and tutors? Because, you know, you went from relatively modest sort of academic achievement at the beginning to being very successful, so I'm interested to know quite, whether there were some teachers who perhaps pushed you in the right direction?

Yes, I guess so. I mean there were, certainly at primary school, as I said, that was just really, I'm sorry to say, but the education was dreadful, so it really was at the start of Woodcote High where I had some good teachers that started to really inspire me. I particularly had a Latin teacher who was great and she inspired me to do Latin O level. And I had a really nice English teacher there who actually said to me, you know you're quite good at English but I get the impression you don't like doing it. And I said no, you know, admitted that I didn't. So yeah, there were some good teachers, but it was quite a hard school as well. I also lived in fear, I think, of quite a few teachers. You know, in those days they would hit you. We had a geography teacher who would regularly have, every lesson someone at the front, and you got to choose a hard slipper or a soft slipper and he'd [laughs] bend over the desk and wallop you. You know, they used the cane. So I, it was kind of, you know, sometimes a bit fearful. But I did have, generally as I progressed through the education, a lot of teachers who were really good and the, particularly my chemistry teacher at A level, she was absolutely brilliant and there were only nine students in the class and six of us got an A, she was a fantastic teacher, so she was really inspirational as well. And then I think going on to Thames Poly, it was really one teacher in my final year, Don Cowell, who kept trying to say to me, you should do a PhD, Liz. No, no, no, I finally want to go into industry. But he persuaded me to go and see the head of school then, who was Max Bramer, and he sort of made you feel like life wasn't worth living unless you did a PhD. And I was very interested in artificial intelligence at the time, but I'd only done one module in the final year of my degree and I thought that probably wasn't enough to get a job in it, so I never told anybody, but I took up the funded place for the PhD only ever intending to do one year and then I was going to skip off into industry. But I really got into the project, I had a really fascinating

project with Guy's Hospital, working on MRI scanners, which they'd only just got in, so they were very much experimenting about scans and stuff. So I kind of, yeah, stayed, but it was never my intention.

How did you, what made you or how did you develop that interest in artificial intelligence and choose that course?

Well, I think it probably inspired from the subjects that I did on my degree course, so it was in computer science and you've obviously got a whole range and artificial intelligence was sort of coming to the fore a bit then, you know, with a lot of predictions about what it could do and I was just quite interested in it.

[0:14:17]

Okay. You've talked about horse riding as being something that you were very keen on as a teenager. What other enthusiasms and interests did you have?

Right, well at primary school I was quite musical, so I played the piano from the ages of five to twelve. I played the violin for three years, various recorders, guitar, so I did a lot of musical stuff, and I loved that. Sadly, it sort of became uncool to play music and I got a lot of peer pressure from friends to give it up, so yeah, by about the age of twelve when I transferred schools, it, it kind of died, which I sort of regret. I can still bash out the first couple of pages of *Für Elise* if I'm given a piano, but I have quite a long way to go. So that was that. I was also very keen on gymnastics, I was quite a sporty person, having discovered that I could run. But I had a waiting list for two years between the ages of nine and eleven to actually go to Croydon Gymnastics Club, so I started at eleven and I did that all the way through to the age of eighteen. In fact, the last couple of years I was actually doing the rest, I was teaching gymnastics to the youngsters, so that was really good. Horse riding was something I always had a passion for, but my parents would never let me do it, they didn't want me to do it. So what I did was I took up the Duke of Edinburgh's Award at school, and you had to take up a hobby. And so that was a way of forcing my parents to let me go horse riding. And of course, once I'd started they didn't dare stop, I was so passionate about it. And that's carried on, I still occasionally horse ride and I still love it. But for me, it's jumping and going fast that's fun, you know, the walking and

the trotting is the boring bit, so that's fun. I'd also do ski-ing, scuba diving and I think, travel I'd say is also one of my passions, seeing the world. It's great.

[0:16:18]

Any other influences on you at this time? You know, anybody else outside of school and university?

Yeah, well I think, I mean one of things that I think steered where I finally ended up and what I wanted to do – and this probably isn't going to sound very good – but looking back is, a lot of the comments about women and their role in society and, you know, throughout my primary school and probably my early teens, so – and I don't think people intended to be sexist – but it certainly came across as that. A lot of just expectations about well, what women will do is, you know, they would just be a housewife and have children, and they weren't spoken about in particularly high terms. You know, if someone had said, wow, aren't women great, they're bringing the next generation and we're so proud of them, I might have had a different view. But they kind of talked about women in fairly derogatory terms, and this is what you do, and this is in the home. And I had a physics teacher at the age of thirteen who stood up in front of the class and said, there's no point in teaching women physics because they just go off and have babies, and sadly, instead of rebelling against that, I went with the rest of the girls and I didn't initially do O level physics, I did it whilst I was doing my A levels. But it was kind of implicit, even in the school structure, looking at Woodcote High School, you know, in those days the girls did needlework and home economics and the boys did metalwork and woodwork. And I would love to have done metalwork and woodwork, but I wasn't allowed to, you know. So it was just kind of those influences and I thought I, I don't want to just be run of the mill or whatever it was. Sorry, that probably isn't a very good term to use, but I wanted to achieve something where I felt people would at least say nice things about me.

[laughs] So I think that was probably an influence, again, coming back to the, you know, I don't wish to be derogatory again, to anybody who went to be a secretary or in the bank, but that wasn't for me and I didn't want to do that. And I also wanted to be financially independent as well, so I had no idea what I wanted to do, but those were important, I think, factors. And I have to say also, partly why maybe – and I don't know this – but I chose not to have children, because, I don't know, I felt it

would probably damage my career. But I also, everyone kept saying to me, those maternal instincts will kick in. Actually they never did for me. So, for whatever reason I didn't have this urge to have children. But yeah, those I think were probably quite considerable factors in my early days that influenced that thinking about where I was going and what I was going to do.

[0:19:11]

Okay. You described your industrial placement year while you were at university, at CERN, which is the European Organization for Nuclear Research in Geneva, as one of the most amazing experiences of your life.

Yeah, yeah.

Tell us a little bit about your time there and what your responsibilities were and...

Sure, yeah.

...what did you take away from that?

Well, it is absolutely the most amazing place. So I was there in 1984/85 and of course that was firstly before the fall of communism, so my first experience there was seeing Americans and Russians working side by side, which first of all shocked me because it was European, so I didn't know anybody else, like that anybody who was outside of Europe was actually working there, and of course there were people from all over the world working there. But the whole experience of it just being so international, you met so many people from different, you know, cultures and countries, that in itself was just an amazing experience. It was also, if you didn't, if you weren't particularly busy at work, there were scientific lectures going on the whole time, so you could just literally walk out of the office, go and listen to a scientific lecture, which was fantastic. I managed to enhance my ski-ing there because I joined the CERN ski club and went to a different resort every weekend, so that was great. But my role there was actually writing a beam observation system for one of the – well – there's a PS booster ring, there's various rings that, you know, sort of boost the beam in various stages, so one of the very early ones is there's four PS booster rings, and so I had to

write a beam observation system that would, you know, show this graphically on a screen. In those days, you know, we didn't have an internet, everything was completely local, so I had to write the program in three different languages, all bespoke to CERN, running on three different machines. And so that in itself, you know, was quite a learning experience. And one of the languages was called P+, that was written by someone called Robert Cailliau, so I don't know whether you know that name, but he basically later on jointly developed the worldwide web with Tim Berners-Lee, so...

Well, I was going to ask you actually, I have to ask this question, I mean did you come across Tim Berners-Lee while you were there?

I didn't.

Because I think you overlapped just a little bit, didn't you?

Probably yes, but no. Robert Cailliau, his partner in crime, was the one that I knew extremely well, yeah, you know, would go for coffee with him most days and stuff. So that's my only claim to fame, but what was lovely last year was we had a student who had got a placement in CERN and I was lucky enough to be the tutor to go and visit. So I went and had a good old reminisce round CERN, found my old office, had a photograph in my old office sitting at my old desk and so that was a nice experience to be able to go back. But I would have to encourage any student who gets the opportunity to go there, it is just truly amazing experience with all the wonderful people there and the different cultures. The learning that you get from there is phenomenal.

Kind of opened your eyes to what...

To what... so especially because I hadn't done a lot of travel, so to be honest, that was my first ever flight out for the interview, I'd never flown in a plane before. [laughs] So it was a lot of firsts for me, doing that. And of course I was able to learn French as well, my division supported and paid for French lessons, and that was something I hadn't done very well, I'd failed my French with a D, first time round, and scraped a

C. But the way the French was taught there, it was so much more immersive, I got reasonably fluent towards the end of the year, so again, that was wonderful for me for someone who thought I'm completely hopeless at languages, so yeah, it was good.

[0:23:00]

Did you form any friendships then during your education that were a help to you in later life? Do you have friends from that day that you still have now?

Well, I do actually, yes. There's a friend, Paul, who I'm still in touch with. So yeah, he worked for CERN for a long time. We're kind of down to mostly exchanging Christmas cards and the odd email, but yeah, I do have friends that- but not just, outside of that, obviously I've made friends like most people do throughout your lives. But they- and I'm still in touch with my three friends from that first year of the HND, you know, still in touch with them, one of them's my closest friend. But I don't think I would say that any of them had a particular influence on my direction of travel. I think my direction of travel has been mostly influenced by talking to people at work at the time, you know, colleagues that I've collaborated with and external people. So it's sort of, there hasn't been one or two particular people that have kind of influenced me going forward, it's sort of at a particular point in time, it's, yeah, just, you know, taken advice from people and done things.

From what you've said about your IT work as a student and during your PhD you were... they were both in the sort of area of control systems, weren't they? One in the nuclear research area and then in medicine in your PhD?

Yes, it's true. Yes, yeah. Well, again, it's that hankering for science and wanting to know how things work, yeah. I like, I'm definitely more at the coalface of where things are black and white, and maybe that's why I like programming because that's kind of, you know, logic, and it works or it doesn't. I'm personally less good on sort of the creative side of things, but again, I take that back to my schooling where I was really sort of quite humiliated over, you know, my efforts at poetry and things.

[laughs]

[0:25:17]

Okay. So, what persuaded you then, what persuaded you then to make a career in academia, if indeed you did make a decision to stay in academia, you know, rather than, for example...

Go off into the...

Go going off into industry, for example?

Yeah, yeah. Well, as I was sort of hinting at before, my intention was very much to go off into industry. In the early days I'd had enough of education, I just kind of wanted to get qualified at something and then I felt I could go and launch my career in the world, and it really was that going back to, I guess the key decisions are first of all being persuaded by the careers adviser to do an HND, not just a one-year college – sorry – course at a local college. Then getting with friends who we then went up to the second year of the degree. And then the key thing was my final year tutor who kept trying to persuade me to do the PhD. So I then did the PhD, obviously not with the intention of completing it, but what happened was that I took on a lot of teaching during that time and far too much, to be honest, seventy per cent of my week, I think, was taken up with teaching. But one of the reasons I did that was because I was incredibly shy. I had really no confidence as a student or confidence in life, and that again goes back to my primary school, what they did to me. And my PhD tutors were threatening to send me to conferences to speak on my research, so I thought I'd better confront my fear of public speaking. So starting to teach was one of those things. So, what then happened was obviously I didn't finish my PhD in the time, so I got hired as a lecturer, with the intention of completing my PhD, which I did eventually. And then I thought, right, I will now go into the IT industry and said right, what languages do I need to learn. And so you're constantly chasing your tail. You know, it was C and then C++ and then Java, and then basically I got a series of promotions and was just enjoying what I was doing and kind of drifted into the academic life and never looked back. So it wasn't a conscious decision, it was something that just, you know, just happened, just kind of fell into.

One thing led to another.

Yes, exactly. Yeah.

[0:27:44]

And you lectured in a wide range of IT topics didn't you?

Mm.

I don't know whether this was during your PhD or afterwards, or maybe both, but...

A bit of both.

...there's a whole long list of things you were doing. You know, systems analysis, COMAL, Fortran, Assembler, computer games development.

Yeah.

Distributed systems, Artificial Intelligence. There's... it's amazing.

It was, and I think...

How did you...

Well, one of the things, I guess I have...

How did you cope with all of that?

... to give credit to the then head of department, Nick Dunleavy, who, it was him I think who rotated – I mean he told you what you would teach in the following year – and he kind of rotated people around subjects. So I don't actually know the rationale, but I guess there's flexibility, there's back-up cover and stuff. But I'm very grateful that he did that, because I learnt so much. I mean obviously you'd studied all those subjects as a student but it's not until you have to teach something that you really, really make sure that you understand what you're talking about. And I think it's a

shame actually that many people don't get to do that these days. And part of the reason is because I think it's so complex and so difficult to stay up with technology in your one area that if you're hired as a database lecturer you tend to teach that most of your life. And so I was lucky that, you know, it wasn't the case, that wasn't how things worked back then, so I got to teach a whole range of things. But really my main focus was probably on the expert systems artificial intelligence and then the programming, because I loved the programming, so it was very much a, you know, Java and the framework, sort of the high-end difficult stuff. And yeah, it was good fun and I enjoyed it.

[0:29:27]

Okay. I mean, well tell us a little bit about how your career developed at the University of Greenwich. I mean, you start off as a lecturer, you're now Professor of Software Engineering.

How did I get from one to the other? Yeah, yeah.

How did you get from one to the other and who was influential, if anybody was in getting you there?

Okay, so obviously I started as a lecturer, eventually finished my PhD. I first of all got a promotion to senior lecturer and that was simply that a post came up and I applied for it and I managed to beat the external candidates and got it. There were then some internal promotions for Principal Lecturer, and again, I applied and I got it. There was then an advert for, what were they called at the time? A senior academic, which was kind of deputy head of school. So again, I applied and got it, but in the meantime I, it wasn't, you know, I was working really hard to learn stuff to, you know, develop my CV, to, you know. So it wasn't just that I happened to randomly get it, I was really working incredibly hard to build my CV and my knowledge and skills in a wide variety of portfolios, you know, to try and make those promotions.

Where did you think you might be going?

I had no idea. I had no idea, and I didn't, I didn't particularly – sounds bizarre – I didn't particularly have any ambitions to become vice-chancellor or anything like that. It was really more just seeing the opportunities. So I think the major sort of trigger, or switch to sort of the senior, you know, more to the senior management was in 2003, the then head of school left and I applied, I was his deputy, I applied, and I didn't get shortlisted and I didn't get shortlisted because I wasn't a professor. They only shortlisted professors. To cut a long story short, they didn't appoint, I was acting head for about six months, opened it up again, I applied again and I got it, I got the position that time. But I did then recognise that life was changing, you know, in the early world of polytechnics research wasn't particularly a focus, it was nice if you did it, but it wasn't a requirement, and I could see the world was changing. I was also managing several world class professors, so just in terms of being able to have a conversation with them when they say, you don't know what it's like, I made a decision that I needed to do some research and become a professor. So I started on that journey and I made it in 2012, but it was very tough being dean, I had quite a large school, I had about 170 staff, about 70 PhD students, I had 6,000 students and about three and a half thousand of those were scattered in twenty countries in thirty institutions across the world, so it was quite a complex unit to manage.

[0:32:40]

So head of school and dean...

Yeah, so the head of school then became dean, it was simply renamed dean, it was the same thing. So I did that for eleven years.

I have to say, 'scuse the ignorance, I wasn't actually totally sure what the role of a dean is in university. Perhaps you can say a few words about that and...

The size and shape of units managed by deans does vary across institutions, but they're generally sort of, I don't know, I guess I'd say at the bottom level of the senior management in the institution. And so they will run an academic unit, some sort of coherent academic unit. So mine was the whole of computing and maths. Sometimes deans run faculties that can be more diverse and larger. But they're really, yes, they're taking sort of the pressure from above, from the senior manager just saying make it

so, and the pressure from the bottom from the staff, you know, obviously trying to make it so, but obviously managing both those things. So it's kind of a middle to senior management position in a university and it is quite challenging, because you are right from talking to the vice-chancellor to the students, you know, you've kind of got the whole range.

So you're responsible for the people?

Yeah, responsible for the whole people, delivery of the university strategy within your portfolio, and setting your own strategy as well, as how you're going to do that. So it's people management. I had three or four departments within my school to manage that, because I couldn't obviously directly manage 170 staff, that was too big.

And financial side as well?

Oh yes, responsible for budgets, yes. No problem, yes.

So it's...

It's...

It's a position analogous to being in industry in a management position.

Absolutely, yes, yes.

Okay, good.

[0:34:39]

You worked, I mean we touched earlier on about your time at CERN and so on, and you've worked with others outside the UK quite extensively, haven't you, as part of your research projects and so on. Was that important to you in your career progression or... did you get a lot out of that?

I think so, I mean in terms of academic life, there are some attempts to try and make, in recent times, with the teaching excellence framework, to try and sort of balance the prestige of teaching and research. But the reality is that research is what's important if you want to get promotion or, you know, move institutions, you really need to be research active. And I discovered, although I said, you know, I set out to become a professor, I actually discovered that having started research I absolutely loved it and that's really where my heart was, as I'm sure many researchers can relate to. So, it's quite challenging, because bidding for funds is hard, it's very competitive, you know, it's not uncommon to stick in ten bids and only have one successful. But my research has been wonderful, I've absolutely loved it. I've had several European funded projects, so typically they will have ten to fifteen partners around Europe, so you get to work with them and visit them, but they can allow you to travel all over the world because you publish in different conferences, I've done keynotes all over the world. One of my research projects has been working with firefighters in Corsica and in Melbourne, Australia, so it's been a lot of fun, so I absolutely love it. Yeah, working with people all over the world and experiencing, yeah, new things is great.

Well, let's hope that continues.

Yeah, I hope so very much.

[0:36:27]

I was going to ask you actually, I mean the, you know, having to bid for research funding and so on, that's quite a challenge and also obviously quite analogous to what happens in industry as well.

Yeah, yeah.

I mean that is so important. Did you personally achieve any great successes in securing funding?

Well yes, I mean I don't know, it depends on your definition of success. But you know, I've managed to bring in, actually to Greenwich, not the total value of grants, but sort of, you know, over a million and a half pounds over the sort of ten years, I

guess I've been doing research. It's not hugely great, but if you're trying to be a dean at the same time it's not a bad achievement. I think it is becoming quite tough these days, because especially when you're looking at Brexit, the analysis has already been done that the UK as a whole, so we're not just talking post-92s, but Russell Group as well, the UK as a whole is potentially already down about half a billion pounds in funding and one of our heads of department was dropped from a bid the day after Brexit. They basically said, oh, you're too much risk now, it's going to be easier to find the expertise somewhere else than risk you damaging our bid, and that's happened quite a lot, which is a shame. And of course we're still sitting in the unknown, we don't know where that's going, so it's tough.

Mm, challenging. Challenging times, yeah.

[0:38:01]

So as dean, you were still doing, bidding for research and doing research. Were you still teaching as well, or did you drop that?

I was. Well, I sort of drifted out to the point where I was kind of sharing a unit with a colleague who would be very nice to me and sort of box and cox on the teaching when I had to travel and had meetings and other stuff. So I did teach for many years, but probably about halfway through being a dean it pretty much dropped and it just went to teaching PhD students, because it wasn't just that, doing the research and being the dean, I was also doing a lot of external activities. So whilst I was dean I was also chair of the Council of Heads and Professors of Computing, I helped set up the BCS Academy Computing, I was the inaugural chair for that, I was BCS president. I was heavily involved in EQANIE, the European Quality Assurance Network for Informatics Education. I'm now president of that, so I did a lot of work for the European Commission on advice to them. So there was a lot of external activities that were taking my time that I think also really helped develop me as a person and as well as my career.

Okay, we'll come on to some of those things in a few minutes, actually. But I just wanted to ask you, in terms of your research, and you know, you've got an enormous

number of research topics on your CV, which were the ones... was there any particular focus in there and which ones interested you the most?

Yeah. So the main focus and the main thread of my research for probably the last ten years has been in immersive learning systems. So it was particularly triggered off by a project, a European project, Framework 7 project, that ran between 2010 and '12. And that was about training people for crisis management, so things like 9/11. And typically what happens in a crisis like that is you need many agencies to come together, so you need your chief of police, your chief of fire, your health, your local mayor, whoever else is involved. And as a norm they will come together in advance of a crisis to try and debate issues, be presented with a scenario, see how they would respond. Because many of the agencies have different agendas, different priorities and they can conflict in the time of a crisis. So typically the way people are trained is in two ways. Very much table top exercises, so you're given a sheet of paper and you imagine a scenario and then you try to say what you would do, or you'd try and simulate, do a live simulation of part of a scenario, but you can get very, those are very immersive, obviously, but you get very limited outcomes of what you can actually simulate. So we were trying to find something in the middle, which was obviously an immersive system that would present you with, you know, videos, text messages, whatever would happen in real life, but the key focus was about putting people under pressure, because when people are under pressure they will make different decisions. So there's no point in sort of sitting there in a relaxed mode, saying well, this is what I would do, it actually put those people under pressure. So that's really kind of the system that, called Pandora, that we developed from that project and that has now gone on and been developed in a second European project, Framework 7, and that was very much about population alerting, so it was trying to actually use the system which got developed to actually alert the population to do training for the public. And that's now currently being used in two other European projects, Horizon 2020 projects, that one is focussing on, say, the firefighters in Corsica and Melbourne, but also training members of the public, and the other one was in security and training the police across Europe. So there's that. So that's really been one of my key focuses, yeah.

[0:42:04]

So, has it moved across from the academic – Pandora I mean – has it moved across from the academic world into implementation in...

Into...

... in real world environments as a training tool?

Absolutely, we are in the process of commercialising it. The reality is, the system isn't bespoke to crisis management. As long as you have a scenario that is time-based and events happen at a certain time and you want people to make decisions and you want people to experience the consequence of those decisions, Pandora can do it. So yeah, we're in discussion with various companies at the moment. But as I say, you could train somebody on the stock market, you know, this has gone up, this has gone down, would you buy it, make a decision, so it's really just a scenario you put into Pandora.

Interesting. And what's been the reaction of participants who have been immersed in this?

Very positive, yes, yes. I mean we also have biometric monitoring when people want to do the stress, so in the original trials we had heart monitors on people, which our risk assessment said we should probably have a doctor on hand in case we send their stress levels too high. [laughs] So yeah, we're experimenting with brainwaves and all sorts of other biometrics as well.

[0:43:18]

Fascinating. And you've been Professor of Software Engineering now since 2012.

Mm-hm.

What have been your biggest challenges so far?

I [laughs], I would say, I mean my biggest challenge is just juggling everything, because trying to match the research teaching enterprise activities, all my external committees, overseas work, publishing, staff and student queries, it's just been juggling that. But I have a fantastic husband who looks after me, so whenever I come home and I sit on the sofa and I get my laptop out to continue working, he serves me with a delicious meal, so he's very supportive and I don't think I could have got there without him.

Does he work as well?

He does work, but it's not as intense as mine, so- and he loves cooking, so that's why he picks up that side.

Fantastic.

[0:44:14]

Okay. And you're, well, having, as you said, having been at Greenwich University for your, whole of your career to date, actually, you're just about to take up a new role at Abertay University in Dundee, how does that feel?

Well, it's quite exciting and quite, I'm really looking forward to it, it's quite a significant promotion for me to take that role. I think one of the things that I really like, normally when you're at that level you're kind of either focussed in research or focussed on teaching, it's not uncommon to have, you know, a deputy vice-chancellor or a vice-principal for research and one for teaching, but I actually have both in my portfolio, which is great because I love both of them, you know, teaching's really been, I think, where my heart was for a long time, but the research is, you know, I have a balance in where I am, so I can't wait to, I start that on the 3rd of September. So, all hell is letting loose in the packing at home at the moment. [laughs]

Well, good luck with, in your new role.

Thank you very much.

[0:45:32]

Shall we just, can we talk a little bit about some of your other activities, which you mentioned earlier on. You've, you were president of BCS from 2014 to 2015, how important was that to you and how did you see the role, or how do you see the role of BCS and what were your key achievements?

Well, I think, I mean BCS is a professional body and I think it's hugely important, especially with the changes in society and the impact of technology, I think it was, you know, to be honest, never more relevant. The situation, I think pretty much with all professional bodies in IT around the world is that for the most part it's not compulsory to be a member, so obviously they have to work hard to attract membership. They have a good membership base, they have about 70,000, but I think there's well over a million people working in the IT industry, so we have to have some way to grow that and persuade people of more relevance. In terms of the importance to me, it wasn't something I ever planned on, but having been involved in the set-up of the Academy of Computing, and then there were opportunities and I had a few people sort of say, Liz, you should apply to do this. And I thought yeah, this would be an interesting thing to do, and all of my external activities, I've always seen as an interesting challenge, but I think it helps develop me as a person, I learn a lot from it as much as I give to it. So, I stood for election and I won, and that was, it was quite an amazing year, but it was quite a difficult time for BCS. The chief executive had just decided to retire, so we had two new chief executives come in because they had split the charity into a company, a profit making company and then the charity, so we had two new chief executives arrive in that year, so obviously I was working with them, I knew more about BCS than they did before they walked through the door, so tried to help mentor them a bit into that position, but obviously they got up to speed pretty quickly and they were both doing great stuff. So it was an amazing time. Each president has a theme, so one of my, well actually I kind of stole it and had two themes, so one of my passions was obviously about the technology and the learning, so I did a lot of features on that, but also particularly the women in computing because that's something I've been involved with for 30 years. And sadly, I mean there are so many activities going on around the world, so many organisations trying to do things with coding clubs and everything else, and sadly we're still not really making an impression. If you look at the number of women in computing, depending on which

report you look at, it's probably around fourteen to eighteen per cent in the IT industry, but it's still slowly going down. And I think an awful lot of that, in my view, comes down to biases in society and peer pressure at school and it's very, very hard to turn that round. And if you look at sort of the more technical areas like coding or security, you'll be down at ten per cent and it's a real tragedy.

I'm quite surprised. My recollection was that back in the seventies when I started in IT, I would have said about a third of people doing programming were women in those days. And I'm sure, I mean...

And it wasn't, there are places where there were 50%, and certainly when I started on my HND degree course, I would say there was a good proportion, 30 or 40% women. But I don't know what's happened. I think a lot of it is, well, I've come to the conclusion it's really hard to inspire women. A lot of people go out into schools and will do that inspiration, but then, if you look at sort of the typical reasons why women run away from it, it's not cool, it has a nerdy image, the media don't portray it particularly well. If you look at the teachers in schools, there are many fantastic teachers in schools but there is still an absolute huge shortage. And one of my best friends, she was trained in economics, but she was asked to teach IT and I remember her saying to me – this goes back ten or fifteen years – she said I'm barely keeping up with the kids, I'm barely one week ahead and I'm damn sure I'm not inspiring them, so I think probably she wasn't alone in being the only teacher sort of pressurised into trying to teach IT. So I think we haven't really inspired the generation from within and yeah, it's a really sorry state of affairs, it needs a lot more investment and we need to encourage some of those great teachers back into the profession or from industry into teaching to really try and inspire the next generation.

[0:50:35]

So as a result of your presidential year at BCS you set up STELLAR, which was... well, tell us a bit more about it, it was an organisation to promote women in IT?

Yes, yes, it is. I mean...

So how does it do that?

Right. Well, just to say, we don't actually have any funding, so primarily we're a network of senior women, and I've never really decided what the definition of senior is [laughs], you know, basically just say to the women in the group, if you want to recommend someone, then please do and come along and join. So we meet about four times a year in London and we, first of all it's very much networking and sharing, but we try to support other organisations and events with mentoring or speakers. So it's really a kind of knowledge sharing. We want to do a lot more, but because we don't have funding it's quite difficult to do that, but it seems to be working quite well, people are getting a lot out of that and a lot of contacts have been made and we've managed to support quite a bit going on.

Give me a couple of examples of what STELLAR has done then recently.

Well, in terms of, I think it's like putting people in touch with each other, so we have provided speakers to various events and I've certainly – sorry, I can't remember the names of people – but...

Would this be for schoolchildren or something like that?

Sometimes for schoolchildren, but the events can be anything, it can be a conference on women in technology. So just to give you an example, there's one that's coming up at the moment that I was asked to chair, but I can't chair, so I'm getting hold of one of my STELLAR women to say please can you step in and chair, and various, you know, so people at various events, it's, yeah.

Okay, okay. And you'll be carrying on?

Well, I will be carrying on. I'm going to admit it's something of a challenge because we are London-centric, because most people are around London, so I can do a lot of it remotely, so I have a close team around me who are going to help me try and, yeah, keep STELLAR going and push that. But I'm expecting, because of my external committee work, that I probably will be in London quite regularly for BCS events. I

do work for, you know, Science Council, I'll be down here for Bletchley Park and things, so yeah, keep the contact.

[0:52:51]

We're just, just like to talk to you briefly about Bletchley Park, but before we do that, you mentioned the Academy that you were, I think, had a role in setting up at BCS?

Yeah.

Can you tell us a bit more about that and how it, maybe how it differs from what, it has a different focus from what, from BCS hitherto?

Yeah. I mean the Academy's part of BCS, so it's sort of one branch of what it does, but it's really sort of the academic focus and about 2009 there were various discussions between various groups, so I got involved because I was chair of the Council of Professors and Heads of Computing. So to cut a long story short, I became the inaugural chair of the Academy and the big focus at that time was trying to get the curriculum changed in schools because the ICT curriculum, whilst, you know, was perfectly valid, it wasn't really inspiring the kids, they didn't learn anything about computing, it was more about how to use computers, how to, you know, use PowerPoint, how to use Word, how to use applications, but there wasn't much under the bonnet. And especially with sort of the continuing invasion of technology into society, not only did we want to inspire the next generation to study computer science, but also to inspire the next generation to understand the world that they were going to live in and understand more about technology. So there was a campaign that industry, academia, professional bodies all agreed on, that we wanted this changed. And to cut a long story short, we did get the curriculum changed in 2014, which was a huge achievement. As a result of that there was some government funding that came through the Academy and I can't, I don't want to take credit for this, I was part of the Academy, it was a huge team effort and masses of people involved, but setting up what is now over 200 hubs across the UK. So we had a sort of a train the trainer type thing, so we trained some master teachers and then those master teachers trained local teachers in their area. So there's, and there is still a huge, massive computing at school network and hubs that go on around the country that are forever more trying to

help local teachers. But the funding has dried up, so I ran one of those local hubs with an absolutely fantastic master teacher, Chris, and he still, out of the sheer dedication and commitment, will help local teachers, but he's doing it, you know, for free, there is actually no funding to help that. So in some areas and in my area we are actually going backwards, there's fewer teachers now than there were, so there's some issues there. But it was hugely successful, I think, and we had several thousand resources were being shared by teachers across the country. So...

So it's had a kind of a...

So it's had a huge impact in... yeah.

...huge impact on IT education.

Yes, on the IT education and the support for schools, yeah.

[0:55:55]

Okay. Oh, that's great. And you mentioned just now Bletchley Park. You're a trustee and a director of Bletchley Park Trust, since last year. Can you just say a few words about your role there and what developments maybe are in the offing?

Yeah. Well, yes, so I became a trustee and director about a year ago and it's a huge honour to be involved with, you know, what is the home of British, you know, codebreaking. They had before I arrived already a ten-year masterplan for restoration, so there's lots of restoration that has taken place, but there's still a big plan for more to do and they need to obviously continue to bid for funds to be able to do that and they have donors as well as bids that they put in. So the role of a trustee is very much they support the executive in defining the strategic direction going forward. One of the items on the agenda is very much looking at the learning programme that they have, so they've recently set up a learning committee and what- they already have a very successful programme with schools, so they have schoolkids coming in groups where they do some really inspirational stuff with them. They also have an outreach programme where people go to schools, and they're completely over-subscribed. So one of the strategies is looking at how can we grow that sensibly, how can we- but not

just for schoolkids, we would like to involve people from, you know, all areas of education, so all up to universities. But that is a smaller programme at the moment. But I think the whole prospect of the learning is when people go to somewhere to visit somewhere like Bletchley Park, they are actually learning, so we're looking at the future directions and what's going to happen in museum space and exhibits, you know, will they be walking through the door and put their, you know, their virtual reality glasses on, and how will this work. So I think combining technology and learning is what I'm interested in and that's what I can hopefully bring to Bletchley Park. But it's an amazing place and if you haven't visited, I thoroughly recommend it, but of course I'm biased. [laughs]

[0:58:08]

Okay. Is there anything else you do in your spare, in what little spare time you must have left after being involved in all these things, either on a sort of personal or professional capacity?

Yeah. Well, one of the things that I do in my spare time, not too much these days, is scuba diving, that's how I met my husband, so that's something that I really do enjoy. Ski-ing, obviously I still just about keep that up. I had a break for a while. My husband doesn't ski so I go ski-ing with my sister and her family and they're all really good, fit ski-ing instructors, so it's a bit of a challenge keeping up with them, but that's a lot of fun. And my cats, I have to put my cats in there, my three cats.

[0:58:56]

What do you think are the biggest challenges and opportunities for the IT industry going forward, say over the next ten years?

Yeah, well I think it's, it's kind of difficult to unpick the IT industry from the whole of the impact on society, really, because I think it's going to be huge. So clearly things like artificial intelligence, big data, internet of things, you know, autonomous vehicles are on the horizon. So I think it's going to be a hugely exciting time, but the one thing that really worries me is the security and the privacy, because we're in a constant game of cat and mouse, you know, with those who seek to defraud, and I think that's going to get harder and it's going to get worse, specially when you're

using artificial intelligence, it's going to learn to mimic people and it's going to seem more real. I remember a few years ago I was sitting at a dinner with someone from the police force who was actually, you know, very senior in investigating cybersecurity crime and fraud, and I actually asked him and said, well you know, you do this on a daily basis, are you confident that you won't be, you know, caught out yourself. And his immediate reaction was absolutely not, it's becoming so complex that even he felt that he could succumb to some sort of, you know, perhaps social engineering. So I'm thinking, what hope have the rest of us got if someone in his position can't do it. But I think that's going to be a huge issue for society and the IT industry to address, because we're very good at inventing things and people will just grab their mobile phone, download the latest app and they don't understand what it's doing, what potentially the risks are. You know, even the smart meters in homes have potential risks that I don't think most of the population know about. So I think we do need to do a lot more to educate the public on the benefits as well as the challenges so they can make more educated decisions. But it's going to be an interesting time.

[1:00:52]

Yeah. Without wishing to put you on the spot, I mean there's a lot of talk about autonomous vehicles at the moment, do you think some of that is a bit overblown or are they really just a year or two away from...

I can't say when they were... I think the autonomous vehicles can probably perform pretty well, I think the issue may be more insurance, although I have actually seen, I did see an advert a little while back from an insurance company that were inviting people to test autonomous vehicles. So, and I think there's huge issues around, you know, who to blame when someone goes wrong, I'm not entirely sure we've sorted out the legal side of this, but I think the practicalities of getting autonomous vehicles to actually drive you from A to B is pretty much there. And personally I can't wait for it, the hours I waste in my car, although I quite like driving, but I'd be very happy for my car to drive me somewhere and, you know, and do something better with the time.

Right, yeah. So it's not the technology, it's the social...

I think it's the social and the business and the legal issues that are going to be some of the big challenges. Because I think there's no doubt that they will have some accidents, but they'll probably have different accidents to the ones the humans have at the moment, you know, and you have to make those, you know, standard decisions, but as to if someone steps out in front of an autonomous vehicle who are you going to kill if you can't save both. And that's huge, at the moment, humans do what they do in that split second decision, but when you're actually programming a vehicle, you have to decide who to kill, and I think that's... difficult.

Interesting.

Yes. Not a decision I would like to make, you know.

[1:02:35]

Yes, okay. Well, I mean that's obviously one big, well, potential big impact on society and the- and there's the question of security that you alluded to and I suppose we can include in that things like being able to manipulate images and the whole debate around fake news and so on.

Oh absolutely, yes. Fake everything, it's, yeah. The fraudsters are out there, as I said, it's a whole game of cat and mouse in this industry as we go forward.

Are you confident that there are the people out there who can, as you, you know, as you suggested, can be the cat to the mouse?

No, to be honest, I think, you know, it is, often you don't discover, you know, a problem until something happens. And, you know, sort of even nowadays the message is just assume you've been hacked. If you don't think you've been hacked, that means you probably haven't found it. There are- I think it's very hard to think in the different ways that people will use technology against you. And I don't know, it's going to be a challenge, I think, for society and for IT developers going forward.

[1:03:47]

What about the industry more generally, I mean in terms of the actual technology, where are things going there?

Yeah, it's an interesting one, isn't it, because obviously different languages and tools and techniques come along the whole time, so I think anybody, you know, going into the industry has got to be very flexible on that. But- and I can only go with what people are predicting, but looking at the rise of robots and their status and working with them, so, you know, your message to your graduate these days is learn to work with both robots and people. And not only that, I love the quote from – I can't remember who said it – but think about the fact that you could be actually developing software that becomes your co-worker or your boss and how would you feel about that. [laughs] I'm not sure that's an unrealistic comment to make.

Sounds- that could be a fascinating discussion.

It could be, yes, you provide...

Which we probably haven't got time for today, but...

... back door into the boss so that it will always give you a great day on your annual appraisal, yeah. [laughs]

[1:04:54]

Okay. What advice would you give someone entering into the IT industry today?

Yeah, I think be flexible, be caring, don't stop learning because things are going to change. And I guess learn to work with robots, which they are coming. [laughs]

Okay. Well, thank you Professor, it's been fascinating hearing your life story and your views about the industry. On behalf of Archives IT, thank you very much for taking the time to talk to us.

You're very welcome, thank you.

Thank you.

[recording ends at 1:05:31]