



Linda Macaulay

Interviewed by

Elisabetta Mori

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Via Zoom

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Welcome to the Archives of Information Technology. It's 10th November 2022 and we are on Zoom. I am Elisabetta Mori, an interviewer with Archives of IT. Today I'll be talking to Linda Macaulay. I am in Livorno, Tuscany, Italy and Linda is in Manchester. Linda Ann Macaulay is Professor Emerita of Information System Design, University of Manchester. Professor Macaulay's research interests are concerned with how technical system design can be informed by the needs of users and groups of users and fall into the five main areas: human-computer interaction; requirements engineering; e-commerce and e-business; facilitated collaboration and services science; management and engineering. In 1999 she was the first female professor to be appointed to the Department of Computation at the University of Manchester Institute of Science and Technology. She is twice holder of the prestigious IBM Faculty Award. She is also a Fellow of the British Computer Society.

So welcome, Linda.

Thank you. Thank you, Elisabetta.

So, where and when were you born?

I was born in 1949 in Burnley in Lancashire, north of England, yeah. My parents were, my mother was Scottish and she moved down to England to be with my dad after the war. So I lived there with my two sisters and brother.

What was your father's occupation?

My father was a cabinet maker, so he made, just made things out of wood and – at first – and then he worked in a factory as an engineer. As he got more children he had to earn more money. [laughs] And my mother was an accounts clerk, but when she had the children had to give up work, yes.

And what about your grandparents?

My grandparents, I've no idea what my father's mother and father did. My mother's mother and father, so my grandmother on that side was a servant in a house, in a big

house. My dad worked in a chocolate factory and I'm not sure, I think they met on her day off, when she had a day off, and they lived in Glasgow originally and then moved up to Carnoustie in Scotland.

So what was your family life like as a kid?

Well, as a child, we lived in a, you know, a sort of a small house with two bedrooms and a living room and a kitchen, but we were always very, it was very happy, it was very stable, very loving. We didn't have much money but we never thought of ourselves as poor, you know, there was always plenty to go round. And yeah, so everything, everything was fine, until I was about eleven, and then my father died, so he was the main breadwinner and at that point my mother was left with four children. I was eleven, my younger sister was four, my brother was like thirteen and my sister was fourteen, the other sister was fourteen. So she had quite a task on to try to bring us up. She'd been working as a dinner lady at a school, so that didn't bring in much money. She had a widow's allowance and so that didn't bring in much money either, so she had to go to work fulltime and work out care, with the neighbours mainly, and then the rest of us sort of fending for ourselves, yeah. But it was, it was, you know, apart from that, it was, it was a very stable environment, a very loving environment, yeah.

[00:04:47]

So who were the important influences on you in your early life?

Well, my mother of course. My mother, one of the things that she always said was that we had to be – to all three of us girls – she said we had to be financially independent, whatever you do, make sure you can look after yourself, don't depend on a man to look after you. And, so that was a big message for us and the other person who was a big influence was my maths teacher, because my maths teacher introduced me to my first computer, so that was very exciting, when I was seventeen and at school. So, you know, that was a very important time for me.

Let's go slightly back. So what, what school did you attend? What school did you attend?

So I attended a girls' grammar school and this was really very important and I found the intervention of the state in my education as being everything really, because I took the eleven-plus, I got into the grammar school, and then, you know, my mother was able to afford uniforms and all the costs that come with that, and then I could consider going to university because at that time you got a grant from the government to go to university, otherwise I wouldn't have gone. So I was very fortunate in that sense to be able to, you know, feel as though if I worked hard then I would be rewarded by, you know, in a kind of a meritocracy situation so that you could actually benefit from your hard work. But not, not having any money or any sponsors, the only way that I could get an education was because of state support, so that was very important.

So let's go back to the day you saw your first computer. So what year was that, what do you remember of the day, what were the circumstances?

Yeah. So my maths teacher, she came into the classroom one day and she said, you know, who would like to come and see a computer, and most of us were, you know, it was a small maths class, A level maths, and she said, you know, I'm going to organise a trip to Manchester to see a computer. And she was very much aware it was a time of Harold Wilson, the Labour Prime Minister, and he was noted for his speech saying, you know, it's the white heat of technology, the future's going to be all about technology. And so she was kind of enthused by that and she'd also been reading about the woman who, the first woman to get a PhD in computer science, who was also a nun, Sister Mary Kenneth Keller, in Chicago, I think. So she said, well, you know, if she can do it, why can't you do it, you know, why can't my girls do it. So she was very enthusiastic and took us to see the first computer, which was, you know, in quite a big room. It was at Manchester Technical College and it was an Elliott 803. So that was very exciting to be shown how that worked and to be able to have a go at getting it to work.

[00:09:10]

What did you know about computers?

Well, absolutely nothing at that point. And so, yeah, nothing at all. And so we, when we went to the college we were shown how the computer worked, we were shown, there were sort of a series of boxes on desks, what looked like boxes, and several of them had paper tape either going in or coming out. Others were a box with lights flashing and switches to operate and so we were shown how to input a program, we were shown what a program was. I mean it was a very simple program, just to add two numbers together, and then how to- what a paper tape was, how instructions were represented in that, in binary by the holes on a tape and how that was read in, how you flicked the switches to get it to operate and then how you got the results out, which was still on paper tape. And then when you got the results, how to read them through the sort of paper tape reader to get the numbers out, you know. Which I thought was really exciting, you know, I mean I'd never seen a machine actually do a calculation like that in the sense that you could program it, you could tell it what kind of a calculation you wanted it to do and it would follow your instructions, you know. So I found that really exciting, then after that I just thought I've got to find an opportunity to learn more about computers.

So in 1967...

Yes.

... was an important year because you met Patrick.

Oh yes.

So what was this encounter?

[laughs] Well yes, I met Patrick, it was All Hallows and the tradition in Burnley was to go up Pendle Hill, which is kind of noted for witches, you know, and witch hunting for many centuries. So myself and a group of friends from school met up with Patrick

and a group of his friends. So it was actually, I was already going out with one of his friends. And we met up and we went up to, we went up to Pendle Hill and came back down again. And then we went to stay with – it was too late to go home – so we went to a friend's house and stayed there overnight and just all laid around on the living room floor talking all night. And I just thought at that point, you know, I saw Patrick and I thought, ah, you know, as long as I live I'll never really get to know him. And I just thought, oh, that's amazing to think, you know, how could that be true. Anyway, it's turned out to be true. [laughs] And so, I was going out with his friend and so somehow we managed to get together, although we were very different people. We still are. [laughs] But yeah, 1967, it was a big year.

The next year you went to university. So what subjects did you choose?

Yeah. So, well, at the time I think the first computer science course was just about coming on stream at Manchester University, but although my maths teacher was excited by computing as well, she thought it would be better to do maths at first, you know, and then you could have the opportunity to go into computing later, but it would also give me options. And I applied to Sheffield because they had just introduced a second-year module in computing, so I could do maths the first year and then opt to do it in the second, to do computing in the second year. And we learnt Fortran programming. And it was about the same time as the Apollo mission and if you've ever seen the film, *Hidden Figures*, it was about the same time there that they were learning Fortran as well, you know, so we were learning Fortran IV, but again that was very much a manual process in the sense that you wrote a program and punched it up onto punch cards this time, graduated from paper tape. And you'd have a big box of cards that you took to the computer room, asked them to run it through the computer, and then get your results, you know. So at that time the computer only ran one program at once, so it would put your program into a queue and it would just have to wait until the previous one had been run. And so you tended typically to run your programs overnight. So you'd maybe take it in in the afternoon so the program would be punched onto this boxful of cards with your data and then you'd take it to the computer room in the afternoon and then pick up usually a printout afterwards, which showed you the program and the results, and then you could see whether you'd got it right. It was quite tedious, but it did teach you to check what you did, you

know, because otherwise you could spend months, if you only corrected one error at once and you keep running back. So you did a lot of desk checking. But that was great fun anyway.

[00:16:02]

So what are your memories of those years, of university years, when you finished, what was the...

Yeah. I mean I enjoyed university and the, I enjoyed the maths and we were very much encouraged to do research in maths and go to the library, find out about mathematicians and hold kind of seminars between us, you know, between the students and talk about the research that we'd found out, so I enjoyed doing that and so, yeah. So one of the things I found about learning about computers and doing programming, I mean we were doing scientific programming, but what I felt at the end of it was that I didn't really understand how the computer worked and I really wanted to learn a lot more about that, so I was looking potentially to do, you know, hopefully a Masters, so, which I was lucky enough to get to do.

So, and what brought you to the University of St Andrews in 1971?

Yeah.

So it's eventually where you found your Masters programme, right?

That's right. I mean at the time the UK Science Research Council was offering bursaries for students to study computer science or do Masters, you know, to do a Masters. So there was a place available at St Andrew's University, Department of Computational Science, so I, you know, I applied for that and was successful. So when I went to St Andrew's, just did a one-year's Masters and my supervisor, you know, obviously guided me into a project that would help me understand more about how the computer worked. So the Masters was about, was a simulation of a timeshare computer system and the idea of the timeshare computer system was really to overcome the problem of only being able to do one job at once. So the idea was that

with a timeshare you would share the use of memory and the use of, mainly the use of the processor between jobs and you'd maybe carry out part of a job in the processor, then you'd swap it out, and then you do part of another job and so on. And if, so the idea, the idea of the Masters was to come up with some algorithms for timesharing, sharing the time of the processor among different jobs so that you could run several jobs at once. And this was a topic that was popular at the time, which was, you know, up and coming at the time, and something that the, you know, it was thought would be good to be able to teach students about. So the idea of the simulation was so that you could show students how it worked and the impact of different algorithms on the use of a processor and the memory. So after I'd done that, I kind of felt as though I did know a bit more about how computers worked, how the memory worked and how, you know, how you might develop different algorithms for doing that.

[00:20:24]

So when you finished in 1972, what did you do?

Well, I really enjoyed being in St Andrew's and I kind of wanted to stay in Scotland, because my mother was from Scotland. So I was then looking round for a job, really. They did suggest stay on to do a PhD, but in the back of my mind all the time is, you know, I've got to be financially independent, I've got to get a job, you know. And fortunately the professor who I was working with, Professor Cole, Professor A J Cole at St Andrew's, you know, had been asked by a professor in Dundee at the teaching hospital, he'd made him aware of a job opportunity, basically. They were looking for an applications programmer, and I thought, well, you know, I could do that. [laughs] So I did apply, I applied for that job. So it was very fortunate really, it was very lucky.

So you joined the hospital in Dundee also in 1973, and what computers did you use, what were you doing?

Well, it was interesting, you know, at that time the British government was really, told everybody they should buy British computers, you know, so you had ICL computers and the one that we had was called CTL, which was a British computer. So, and the

CTL, Modular One it was, and as the name suggests, it is designed to be modular. So when we came to use it, it was actually all in boxes and it wasn't connected together. So you had the disks in one box, the processor in another, the memory in another, you know. And then my first task was actually to put it all together, you know. And of course there was a paper tape and there was the teletype, paper tape reader and the teletype. That was a real interesting project, you know, because we were, there was a small team of us. There was a project manager, a systems analyst and a programmer, right, so I was the programmer. And the professor of pharmacology whose project it was, it was called a ward-based computer system, and at that time there weren't any computers on hospital wards, you know, but there'd been a few research projects going on, you know, in London or... Anyway, this was one in Dundee with the professor of pharmacology. And of course he was absolute... and he'd got some funding from the Medical Research Council to do this, and of course he was full of ideas about what a computer could do, you know, in a hospital. And we'd got no spec about what he wanted us to do, so we used to go to meetings every week and say – and he would explain to us what he wanted, you know – and then you'd go the next week and he'd explain again, but something completely different. And so I learnt a lot from that, which was, you know, how you work out what the requirements are, you know, for a computer system and – or for, you know, an application specially – so in the end myself and the systems analyst, we said, look, we're not going to any more meetings, we're just going to do what we think we should do and look at research from elsewhere and make a start, you know.

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And that was the only really sensible thing we could do, but, you know, of course the professor had bought this computer with his grant and of course he'd been sold, you know, the salesman, you know, oh yeah, you can do anything with this, it's modular, you can do... you know. And then it was a real shock to us, you know, to find it wasn't even connected or anything. Anyway, whatever, we connected it together, mainly I did that, and then got it all, you know, the tape readers talked to the processor disks and everything. And then, and then the other side of it was, well, we were talking about a computer on a hospital ward, right, and of course the computer was the size of a room, you know, the size of a small room. So there was no way you

were going to put the computer in there. So maybe you could put the teletype in there, but the teletype itself was really big and heavy and noisy, so you know, so we had the teletype in another room. And then of course nobody knew what the computer could do, you know, I mean the nurses had never used one and yet we were talking about designing something that a nurse could use for their ward round or the doctor, and the doctors could use. So the first thing really was then to understand the, you know, understand the potential user, if you like. What they knew, how they worked, you know, how this would change how they worked, potentially. And also to educate them, you know, what is it capable of. It was like talking two completely different languages, you know, we were talking computerese, if you like, and they were talking medical and, you know, anyway. So this is where I learned a lot about people and computers, for sure. So the kind of techniques we'd use there would be, had it interviewing, you know, interview the nurses. I put together like a programmed learning tool so that they could have a go at using the teletype, input, output, you know, kind of have a conversation with the computer. And so they got the feel, you know, for the whole input process, output thing. And so then we tried, you know, to show them things. So it was very, very interesting, you know, from that point of view, so much to learn.

So were nurses actually typing in the...

Yeah, yeah. [laughs] Well, so that they could, it was really a programmed learning tool so that they could understand what the process might be, you know. I mean we didn't... anyway, it was the beginning of a journey really, for hospital-based systems, ward-based systems.

[00:28:46]

What did you do after that job experience?

Yeah, so, well, we got- Patrick was working in Dundee as well, he was working at a print, he was a compositor, so he set type for print and it was very much a, he'd served a five-year apprenticeship to do that, so it was all metal type, little pieces of metal type that you made up the print. And anyway, so he was enjoying his work as

well, but I just thought, I don't know why, after a little bit he was starting to get a bit restless and he was saying, well, why don't we go travelling, you know, before we have any children. So anyway, we went travelling for a while and then...

Where did you go?

Well, we set off to go to India, as you would in the seventies, but we never got there. We got as far as Istanbul, because mainly, mainly we were hitchhiking and, yeah, yeah. So it was, that was... it took a long time, it took such a long time when you were hitchhiking. [laughs] So that was quite good. And then I think, yeah, and then we had to come back because Patrick's mother was ill. So we came back to Burnley and we were living with her for a little while, but when we got back I found I was expecting my first child, with Jon. And so we'd only been back six months when Jon was born, but in that time his mother died, so we were still in the house and Patrick had got a new job in Burnley. And then I was thinking, oh no, what's happened now, you know. I'm in his mother's old house, they're calling me Mrs Macauley as if I was his mother, what am I going to do. Anyway, fortunately- I just felt as though in the 1970s we might have been a bit more enlightened, you know, but when it came to the crunch, it was still very much, you know, the man goes to work and the woman stays at home and it didn't really, it just seemed a waste to me, you know, because I'd been working all my two years or something, and then, so now I've got to- I mean much as I love my son and everything. Anyway, I just got a bit restless and then I saw this job in *Computer Weekly* and that was another hospital, but down in Dorset, in Poole. And so anyway, I went for that job, got that job. Yeah.

[00:32:06]

What were the tasks that you had to accomplish, what was the competition?

Yeah, well it was actually another CTL modular computer, but a little bit more sophisticated. We didn't have paper tape input, we had screens, we had multiple screens, which I thought was really good fun because you could write a program and run it, and then – so on one screen – and then on the other screen you could actually see it in execution. So you could see kind of in real time where the problems were

and then correct them and then let it run a bit more and then correct again. So I quite enjoyed that. I mean we did, we used a language called CORAL 66, which was thought of to be a real-time language. And whereas in the previous job in Dundee we used Assembler language, mainly. So yeah, what kind of tasks were there? Well, the tasks were to do with, you know, pharmacy. So a pathology lab and in the pathology lab at that time, well yeah, they probably still have it now, but it had lots and lots of different tests that you do on all kinds of weird and wonderful fluids that come from the human body and, you know, you'd have a machine for each different type of fluid and one machine'd print out paper tape and another machine'd print out a graph, and another machine'd print out an X-ray report or whatever. So they were all different outputs and they were all in different numerical units. So the task was really to write, you know, so the doctors ended up with five or six reports on one patient, so the task was just to unify the output from all these different machines into single units and then let the doctor have just one report, right, that covered all the tests that had been carried out. And that was another one of those where well, yeah, that sounds fairly easy, you know, we can do that. But of course then you had to think about how the doctor would use it and you'd also to think about whether your results were correct. I mean if you're measuring somebody's glucose level and you're out by a decimal point, a factor of ten, you could end up giving somebody, the doctor could end up giving them some glucose when in fact they've already got too much, you know, or something like this. So you could see that it was potentially, your calculations would potentially result in a life or death situation. So that made me quite worried in the sense that, you know, there was talk at that time about making programmers liable for what they actually did, which, you know, may well- you know, maybe they should be, you know, I mean never... So, but I did at that point become kind of interested in the like ethics statements of the British Computer Society, you know, what are the responsibilities, how should programmers behave in a professional way and, you know, the move towards computing as a profession with standards, ethics and levels of attainment, you know, so that you could move up the ladder of attainment like a proper profession, you know. So that to me was, you know, very important to be supported by that. We didn't, as far as I know, make mistakes, but we did do one heck of a lot of testing. We spent much more time testing than we did writing the programs.

[00:36:58]

So yeah, and at that point Patrick was, he said well, if you want to go back to work, that's fine, and so he moved down to Poole with me and brought Jon and then we'd meet at lunchtime, you know, in the park, in Poole Park. So that was quite a nice, a quite nice time really, because it seemed like the weather was always nice. And of course it was about 1976 when in fact there was a heatwave. I remember we were on the beach in Bournemouth at New Year's Day. It was a very strange year, yeah. And...

And afterwards you moved back to the north?

Yeah. I, I don't really know... one of the things about working there, I mean I was still in a small team and one of the great things about being in a small team is that you see the whole project through, you know, you don't just see a small part of it. So I was able to, we were able to work in a small team to, you know, understand the problem, design the solution, write the programs, train people how to use it, you know. So we went through the whole cycle with a pathology, path lab system and the... and then, at the time, although I was working in Poole I was actually employed by Wessex Regional Computer Services and they said well, when this project's finished, the next thing we want you to do is a waiting list system, you know. And I kind of, couldn't really connect with that and I knew it would be very complicated. I thought, how you automate a waiting list, I mean, and it's still, I always say that's one of the big unsolved problems of our lifetime, how to efficiently allocate hospital resources and schedule the waiting lists. Anyway, whatever. So it didn't excite me at all and I'd thought all the time that I was really interested in maybe working with business and, you know, to help people learn the potential of computers in business. And also I kind of felt as though I didn't really fit in. I mean again, I was working with two men and the only female company was really the women in the office and they were kind of, oh, why are you going to work when you've got a young child, you know, you should really be at home looking after him. They were very, very unsympathetic. You know, and I would say things like, well, he's with his dad, you

know, his dad loves him and wants to look after him, what could be better than that, you know? Anyway.

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So I didn't really kind of get much, if you like, female company and the guys I worked with were just complete geeks. I mean they were nice, they were nice, you know, but they were... you wouldn't really socialise with them, they were just geeks. Anyway, whatever, it was time, next job. So anyway, I saw this job in *Computer Weekly* - again, it keeps occurring - at a technical college in Halifax and I didn't, I must admit, I didn't really know what a technical college was and also I didn't know Halifax at all, either. But anyway, I moved there. And it did provide me with the opportunity to work with business mostly and it was a time when microprocessors were, you know, everybody was talking about microprocessors and what they could do and I always liked to know about what the new technology is. And one of the things I did was to go round a number of the factories where they made machine parts, you know, that kind of manufacturing, in Halifax and talked to them about the potential of the microprocessor. They were often into, they were usually into numerically controlled machines and of course, you know, them being able to program the machine was another step up and, you know, would revolutionise really, how the manufacturing was done. So that was exciting. Also a lot of the students were mature students who were learning about computers, not all of them. But one thing I did find there at the college was I really liked the people. The staff, the staff were such great fun, you know. They were all, they all were so enthusiastic about their subject, whatever it was that, you know, everybody was a delight to listen to and hear about their, you know. They were all characters, so I really enjoyed it there. So anyway, we moved to Halifax.

So you were saying you moved to Huddersfield in 1979. Right?

Yeah. That's right.

Yes?

Yeah. So what happened there was, all the time I'd been thinking about my experience about people and computers and, you know, like the interaction between them. Not just about the design, but how it fits in with the way they work, how you, how you, you know, how the change happens, what happens, how, you know. And so I'd wanted to do some research and so I moved to Huddersfield, which was a polytechnic at the time, and one of the reasons for going there was that I could, we could stay living where we were, because Patrick had got another job, got a job. We could stay living where we were and I could just drive to work, so you know, it was convenient. But it was also, the computing department, I think it was called Computer Studies and Maths, was very applied, you know, I really, really liked that, you know, I really liked the idea of working with business, you know, so doing things that business would, you know, I could learn from them and they could learn from me, so that was really one motivation for moving there. So... yeah. So then there was the opportunity to really get into doing some research in human/computer interaction.

[00:45:14]

So, yes, so can you tell us more about the views of human-computer interaction or man-machine interface as it was called in those years? So what, can you describe, you know, the field and your views in respect to the developing and the like new-born discipline in some sense?

Yeah, yeah. Well, I mean it was called man-machine interface at first and I think it was more because it was about things like designing the cockpit for an aeroplane, you know, that where it was, you know, where are the dials, which dials go where, etc, etc. So it was very much a man-machine interface. And I was, you know, looking for opportunities to learn more. And so I came across Professor Ernest Edmonds at Loughborough University and the, again, the Science Research Council was beginning to look at that, and the Alvey Programme as it was in those days, and so I had ideas about what I wanted to do. Because one of the things that I found was, well, you know, you've only got one interface to the computer but people are very different, you know, the way people think, the way they see things, the way they process information is very different, so could you develop an adaptive interface,

something that adapts to different users, you know. So this was the idea that I was working on and he was helping, he encouraged me, you know, let's say that. Because, you know, when you start off something new, you're not sure, you know, you think it's the right thing to do but, you know, it's good to get some support, isn't it, you know? Other people think this is what... Yeah, so I got this grant, adaptive dialogues in the man-machine interface. And of course at that time you just had, people just had one screen in front of them and so a lot of people in computers used command line interfaces, you know, they used short codes and everything was done very quickly. But we thought like, well, what about secretaries or admin staff, how will they get on, you know, and would they prefer, would they prefer a menu or would they be able to do this command line interface. And what we did was look at people's cognitive style, you know, what is, are they field dependent, field independent or, you know, there's seven different spectrums, you know. So we picked out a couple of different spectrums - field dependence, field independence – designed different interfaces and then got staff to use it. Amazingly, we recruited forty admin staff to take part in like a three-hour experiment. We managed to get, you know, permission, we got everybody. And so, because we felt that the only way to prove really that people really do think differently is to run experiments and try it out, you know, try it out. And so the... we had a behavioural scientist working with us, Chris Fowler, Dr Chris Fowler, and he was able to run GEFT tests, which are a kind of, give you, enable you to assess somebody's cognitive style, I mean broadly speaking. And then compare the results of GEFT tests with the performance of the individual with different user interfaces. So, yeah, so that was really what, where we started with the human-computer interaction.

[00:49:57]

Were there other communities in the UK at the time? So...

Well, yeah, well, interestingly, one person who I was interested in was at UMIST, who was called Alistair Sutcliffe. And then Yvonne Rogers, who was at the Open University. And then of course the group, there was a group at York and then in Loughborough. You know, but it was very much in its infancy and people were kind of looking at different aspects of that. Yeah.

So did you have meetings among the different groups? Or did you...

Well...

... wrote also maybe with other communities that wrote?

Yeah. So one of the things around that was trying to find out more what other people were doing. And at that time, you know, I think there was the beginning of an HCI group in London, but there wasn't really, it wasn't, you know, it just wasn't practical for me personally with a family to go to an evening meeting in London. So anyway, there were lots of people, if you like, north, you know, Liverpool to, you know, York and across the Pennines. So we started off our own group, you know, and at first we were looking at HCI and expert systems, and so we were having meetings pretty well every month, and that was a great way to, well, to build contacts and also learn what other people were thinking about. You know, you can't underestimate really the power of these kind of networks sharing information, meetings. Because it also builds your own confidence if you talk to somebody about something and then it makes sense to them, you know.

So how do you see the evolution of users changing computers and the other way around? So what was the mutual influence, how do you, can you... if you can summarise?

Yeah, yeah. Well, I mean the thing was, things change, you know, because in the, like the eighties, if you like, most people were working in offices and they had a computer that was centrally controlled, you know. And most people were doing like office work, you know, they didn't have much discretion about what they did or how they did it. So, you know, so that, you know, they might be running a payroll or they might be, you know, doing some accounting or whatever they were doing on the computer. But once the internet caught on in the late nineties, things changed massively, you know. So where we, where people were part of an organisation you now, without much discretion about what they did on the computer, we now move to a situation where people have discretion, they have choices, they can use it or not use

it. They're not just in the office, they're in their home, they're at leisure and a computer affords new opportunities at home and in leisure. But it also from the human-computer interaction... [00:53:52 – 00:54:03 sound lost] ...looking at the individual as a consumer, so now you're bringing in kind of consumer behaviour, you're bringing in marketing. So the whole interest in human-computer interaction broadens, or broadened, you know. So you're interested in the user experience, the user's journey, but at the same time, so you know, that's from a kind of human-computer interaction, if you like, investigation, understanding the interaction.

[00:54:43]

But at the same time what's changing is what people can do with a computer, you know, and how their perception of things changed. You know, at first, you know, we had a project with, I've just done a little project with *Manchester Evening News* which was called 'Internet Usability', and the idea, so this was like, you know, maybe it was 1990, but it was just on the beginning there of people talking about getting onto the internet, you know, and the time when you began to, saw people advertising that they had a website, you know, even though it was a very basic one. Anyway, what we did with the *Manchester Evening News* was, well, one of the members of staff there, he had said that people were very sceptical about the internet and they thought, you know, the newspaper couldn't be changed. So, you know, at that time and still today, a computer, a newspaper is defined by its layout, you know, what goes on what page, how big the columns are, what the heading looks like, etc. And so their staff were like, well, we can't, we can't, how do we get all that on a big screen, on a small screen, you know, how do we do that? And, you know, we can't change, we've got to keep it as it is. So what we did with them is to run some experiments where we had the traditional design of a newspaper on the screen and that you could kind of move it around, or we had something that was designed to take into account that you had links and, you know, hyperlinks and, you know, you could move around, you could have menus, you could have options, all the things that you could do. And then we ran some experiments, recruited lots of users to, you know, to say well, which one do you like best, you know. And in the end what the outcome was, was that when you look at the statistics of who accessed the experimental online system was the *Manchester Evening News* was now being accessed by hundreds of people all over the world, you

know. So then as soon as the sceptics saw that, and they could see, oh my goodness, you know, it's not just Manchester, you know, it's China, it's Malaysia, it's everywhere, you know, we have all these people who are interested in Manchester. And, you know, and in that way, that business changed, you know. That spark changed the way they thought about their own business and their opportunity. So the technology is changing, you know, the interaction between the readers of the newspaper and the actual, you know, newspaper business itself. So I mean that's been a, you know, that was a time, you know, the early 2000s was just the time of massive, massive change both in the way people interacted with computers and the opportunities that computers could give them, you know.

[00:58:43]

So what brought you to get a PhD in 1997?

[laughs] Yeah well, good question. We'd always worked with lots of businesses and we had this centre of expertise in e-commerce and as a result of that we had some very good collaborators in ICL, right, and we worked with the head of their HCI group, who was Dr Andrew Hutt, right? And we'd been talking around, you know, the whole problem, you know, it's not just the fact the way they design the interface, it's about how you get the requirements, how you think about the design, how you take that design into the technical, you know, the technical system, the technical system design. So he was, you know, we talked about this quite a lot, and then he was saying, well, one of the problems is that people don't work together, you know, it's a linear process and the people, you know, the systems analysts who ask the questions pass something on to design, and then they pass it on, you know, break it into modules, and they pass it on to the programmers. And there's always been this natural tendency of engineers to, you know – I'll probably get crucified for saying this – but people to kind of factor out people, you know. When they get to the real technical bit, oh well, yeah, that's fine, they'll learn how to use it, you know, let's factor all that out because it's too difficult, and actually get on with the machine itself, you know, inside the machine. And so what he was trying to do as well as us is to kind of get people together as a group to talk to each other very early on about what the problem was. So anyway, what happened was that myself and Chris Fowler and

Andrew, we worked with him to put together a user-centred process, I suppose, you know, a user-centred process that they could, that teams from ICL could work through. So the team would be people from marketing, people from product design, software engineers, technical authors, you know, all the people involved in that linear process and bring them together as a group and then we would run workshops. And the workshops ran for two or three days and we'd usually start off with a vague problem and – well, it wasn't vague really – in the sense that it was a real business problem it started off, but the idea was to really kind of flesh that out over those days, but to flesh it out by focussing on the user, what they did, what objects they handled, what they were like, you know, and so we felt over the three days we really got to grips with what the product was going to do, who was going to use it. And that then formed the basis of an agreed kind of specification that the different people, you know, in the process understood and agreed with. And so the... anyway, so we did these workshops and we did them for quite a few years and what happened was, I, myself and Chris, we facilitated these workshops because we were guiding them through the process and also at the same time behaving like, not only, if you like, technical experts but also professional facilitators. So- and this really fascinated me because you were like operational on so many levels. I mean, you know, you know yourself kind of like, well, there's a, you know, what are the politics of the situation, who's vying with who, what are the personalities, you know, how, who's, you know... And we came up with all these different syndromes, you know, like the multi-headed beast syndrome, you know, you'd like be in a meeting and two people'd be against each other or, you know, they'd meet round the... Yeah, anyway, you know what all these things are like, you know, they meet round the water cooler and, you know, they decide the outcome without consulting anybody else and all that kind of thing. Anyway, whatever. The professional facilitator can see all these things happening and deal with them as they are happening and keep everybody together through the whole... and all that kind of thing.

[01:04:14]

So, to answer your question [laughs], to answer your question, so I learned a lot about facilitation, went to many facilitation conferences and workshops and also all the time I'm thinking, how can we computerise this, you know, how can I, how could I run

these workshops, which obviously were very expensive, you know, we always went to a hotel, everything, everything was very... how could you run these workshops online, right? And still have the same level of facilitation, you know, what tools would the facilitator need, how would you know what's happening in the team during a meeting. And so that's what my PhD was about really, it was about computer support or facilitation, distributed teamwork, right? And, you know, because also you see at that time, you know, video conferencing wasn't great, you know. I mean it existed. I mean it's not that great now, I mean I don't have really professional level Zoom. I don't know what tools are available, but it seems to me that it still relies very much on... anyway, there don't seem to be many tools available even now for facilitating a meeting. But at that time, it was about, we actually ran a series of experiments and had a, you know, funded project and we brought in teams, we brought in teams and they were all in different rooms and nobody could see anybody else, and so it was all based on the textual input and the messages. So we tried to visualise people's behaviour through little figures, you know. So the more active somebody was, the nearer to the table they moved, and the more passive they were, the further away, you know, and eventually looked like they were snoring or something. Or if people were arguing, you know, then we just tried to sort of interpret the text that was there in terms of visual images. And then we had a channel that was just for the facilitator and the facilitator could see all the messages between everybody and could monitor what was going on, and there was a lot of monitoring going on. Yeah, so it was a way of doing that. And we could also follow the conversation by doing a kind of textual analysis of what was in the messages that were sent, yeah.

Could we say that in some sense this was human-human interaction via computer, in some sense?

Absolutely, yeah. And so there was, you know, there was a field of work called computer supported co-operative working, you know, so that worked into that. Group decision making as well is another that kind of fits into that category. But, yeah, so it's human-to-human interaction via computer.

[01:07:56]

Yes, and in 1999, two years after getting your PhD you became Professor of System Design at the School of Informatics in Manchester. How did you feel about it, what were the circumstances around it?

Well, I think, well, I suppose like anybody, you know, who wants to be a professor in a UK university, you've got to try and work out how that happens, you know, what do you do, and it's sort of, at the time, I don't know whether it's different now, but it was always harder to get a promotion from within the university than it was to get something from outside. And I thought, well, you know, looking round my colleagues it kind of, well, if he could be a professor, why can't I, you know. And anyway, spent about three years planning, you know, what were the criteria, who did I have to influence, you know, what did I have to do, you know. And I think, I found that partly, I mean again it might be different now, but partly it's, you know, like what's on your CV, what's written down, and then partly it's all about what other people say about you, what people think about you. And so trying to influence other people was also a task, you know. Not to influence them, but to kind of [laughs], to kind of get them to give the right reference, you know, because if you didn't get good references from everybody you'd probably, you know, any reason to pick a fault and it wouldn't work. So... But in the department, at Computation, there weren't many women. There was myself and one other most of the time. I mean as time, you know, later, you know, after I'd become a professor and so on, we recruited more women, but still they were in the minority, but most of the time there was just myself and Dr Alison Arden [sp? 1:10:33] and, you know, the men used to get us confused, you know. Oh, we didn't look anything like each other, you know, in any way, you know. But, you know, we were women and so, you know, they used to call me Alison [sp?] and they used to call her... Anyway, so it was, I mean not everybody, not all the men were like that, you know, I mean there were some very nice men there as well. But, you know, I felt... And at the time there weren't many women professors in computing either, so it seemed like, you know, you had to work extra hard, really, to get to where you wanted to be, or to be exceptional, or just have the absolute certain determination to keep going really. [laughs] Yeah. So obviously I was very pleased. And I mean one reason I was pleased was because it meant I could do other things,

people accept you in a different way, you know. And so it was, it was, you know, definitely the right thing to do. But, yeah, definitely was a good step forward, I think.

And so you were Professor of System Design at the School of Informatics from 1999 to 2007, and then you were in the Manchester Business School from 2007 to 2011.

What caused this change in...

Yeah, well we were, originally when I was appointed we were still in the Department of Computation, and then around 2002 UMIST and University of Manchester decided they would merge, right, and the merge took place, the merging actually took place in 2004. But in the lead-up to that there were all kinds of debates about, well, we've got a Department of Computation at UMIST and we've got Computer Science at Manchester, anybody would just say well, just put the two of them together, you know, as one department. But that wasn't how it turned out. And we'd been following a kind of a more multidisciplinary view of computing and we had people with us who were, you know, had a background in psychology who were working in HCI in the computing department and, you know, we had more different backgrounds, you know. So we had, we were trying to develop this idea of computers and software on the one hand, and then data on the other hand, and then people, people and organisations and users. So we kind of like wanted to bring those three areas together, because most of the collaborators that we had with business, they were always saying this to us, you know, and we were very receptive to it as well, you know, that we need multidisciplinary teams in business, you know, we were doing multi... we were, you know, I got funding to start a new degree course called IT Management for Business and the idea was to bring in all these thoughts, you know, about organisations, users, data, technical, get students to work in teams on business problems. And so we needed the multidisciplinary team in the staff as well, you know, so this is what we'd been working on. And when it came to the merger we weren't really a good fit with computer science and so we said okay, we'll form our own school and call it informatics, right, because that was more how other universities were describing what we wanted to do.

[01:15:25]

So we became the School of Informatics for a few years, until... I don't know what happened, but one day we were just told there is no more School of Informatics and you've either got to go in the Business School or go in Computer Science, so I ended up the Business School. Which was fine, I mean I didn't mind. And they based it mainly I think on your publications, you know, which RAE or REF would you go to. Anyway, it was nice in the Business School as well. Anyway, that's why I ended up there, I didn't apply for a job there. [laughs]

But we should look retrospectively to your career, how do you see your most important contributions to the development of HCI?

Erm... well, I don't know. I mean I think, I think really the, well, the book I brought out early on which is about the human-computer interaction for software designers, and then the book on requirements engineering. Now, you know, you may think when you look at the disciplines that, you know – yeah, that's the one – and then the other one, the requirements engineering, which is available as an e-book, still available as an e-book, and you, they're all parts of the same picture, aren't they? How to include users into the design. And I think that if I have been able to influence people in that, and then I think, yeah, so I would say one of the things that I've done is been able to embrace new technologies, you know, and then help others to do that as well, but with the human interaction in mind all the time, because the technology is just changing and there's always something new. I mean when I moved to the Business School we... they had a visit from somebody from IBM and a woman from IBM was showing them their site on Second Life, you know, the virtual world, and the head of the Business School was, you know, suitably impressed and he said to me, oh, you could do that, Linda, you could put the Business School on the virtual world, you know. So that was it, that was a challenge and that's what I did, and I got people together and we didn't know, I didn't know anything about it, you know, you just learn, learn about it, get people together, help each other, try, experiment, etc, get some money together. And, you know, and in the end they ended up doing graduations in Second Life, you know, real, actual graduations of the executive, one of the executive and BA programmes, you know. And, and obviously in the virtual

world, and this is all going to be coming through now, now the second wave of all this is coming through with the metaverse, is all the things you can do in the virtual world, you know. So we were looking at, you know, well how will it change shopping, how will it change medical consultations, how will it change education. You know, some of our- how will it change facilitation, so one of my PhD students was studying, you know, facilitation in the virtual world. And students were doing teamwork, you know, they had presentations and flipcharts and all sorts of things. Yeah, so, you know, so something new, you know. And they're all part of a continuum in my view. Because at the same time we were looking at the whole area of service science, you know, a service, really, which started much earlier as looking at software as a service, how will things change, you know. You don't buy software any more, you just use it, you know, and you don't own things. You know, the whole nature of ownership changed, and again, that changed interaction with people, you know. So it's what are the new technologies, bring new opportunities and challenges for interaction and, you know, so that's why it's such an exciting subject.

[01:20:44]

Do you think there is a, let's call it a British school of HCI? So I'm thinking, you know, Brian Shackel, Ergonomics for a Computer, 1959, the Alvey Programme during the eighties. So do you think there is anything specific to Britain or to British research or to a British attitude that can be identified?

No, I don't know. I mean the thing, the nearest thing I've come across is really like the *HCI Handbook*, which I'm not sure – it's still available – I'm not sure how much updated it is, but that was like drawing in contributions from lots of different, you know, disciplines within HCI. But, you know, I don't, I'm not really aware of a particular, you know, the idea of a school of HCI, could be wrong. I mean one of my colleagues, Alistair Sutcliffe, who I mentioned earlier, you know, I mean I think he is, he has always been very much in touch with what everybody's doing more, and still is, and is still active, you know, so he may say something different, but I think it's quite fragmented really, as far as I know.

Okay. So let's slightly change topic. So what did it mean to be a woman in a predominantly male profession? What did it mean to be a mother – you sometimes mentioned that – but also, you know, in your book you talk several times about what it is to be a woman. So your book, which is Hello Computer, the book you published this year, in 2022. Now, so another thing that comes to my mind by reading your book is that in 1974 you expressed your views on equal pay in a local newspaper, or another title of your book is, title of chapter 19 is 'Who Codes Matters'. So what do you think, what are your views on women and computing as a job?

[01:23:39]

Yeah. Well, I think it's... there's been a lot of, there is now a lot of activity, there are lots of groups, you know, women in IT groups and so on, and also the British Computer Society, you know, the group there, and they've published a book telling employers what to do to recruit more women. And I don't know where it, it's maybe going up very slowly. And some people say, oh, you know, they work in tech, women in tech, but then you find out they're actually on the marketing side or, you know, that kind of thing, and they're working in a tech company but on the marketing side. Whereas, you know, I mean not that there's anything wrong with that, that's fine, but what I would like to see is more women working on the design side, on the decision making side so that they can bring a fresh look to things, but also inclusive look, you know. It's like anything, if you've only got one section of society working on it, then, anyway, if it's all men that work on it then you're going to get a male viewpoint, you know. Or if it's all women that work on it you're going to get maybe a female viewpoint. But we just need to have these teams that are inclusive. Now, why doesn't that happen and why aren't there more senior people, senior women? I mean I was talking to somebody the other day, she's a very capable woman, and she said, oh well, our business probably, you know, on the tech side is about half women. I said, oh, that's really good, you know. And I said, well what do they do? And she said, oh, we're all programmers, but all the bosses are men, you know. And you kind of like, you know. That... and why is that, you know. I mean there are so many reasons. You know, I mean I did a session once for women returning to work and you find they've been at home with the children for ten years and then they come back and the technology's, you know, like another world. Why... they need to be able to come

back into the workforce and also, I don't know, there's a lot of reasons why women don't... I mean... I don't know. It's a very complicated subject, isn't it, you know. You would hope now, now we have computing in schools and children are learning about computing from the age of eight, that they will just come up and naturally want to be in that subject, like any other subject, you know. Yeah, so maybe things will change, but I think, you know, you've got to... Caroline Perez, I don't know, in her book she talks all about, it's called *Invisible Women*, I think, and, you know, she cites lots and lots of examples of where, say, the data that's been used is biased against women, or not including, not inclusive of women. And I just think you need a broader view, you know. I don't know whether that makes any sense or I didn't answer your question. What do I think? I just think, I mean I must admit that while I was at work, most of the time I never really thought much about being a woman, I just thought I, just get on with it, you know, just get on with what you're doing, you know. And it's kind of when you reflect that you realise that in fact your situation was different, you know. You know, you weren't one of the boys, you know. So even for example at conferences, you know yourself, I mean I wouldn't go out, you know, you go to a conference, you go for a drink afterwards, they have all the interesting discussions in the bar and then they go out on the town afterwards, you know. But if all the other people there are men and you're the only woman, you know, are you going to go out with them? Well, personally I wouldn't go out, I wouldn't do that, you know. So you miss out on conversations and you miss out on all the camaraderie that goes on, you know. Anyway, that's another topic.

[01:29:00]

What would you do differently if you had your time again and why?

[laughs] I don't know really. Not much. I don't know. I mean I have thought sometimes it took me too long to become a professor. I should have been more, you know, like I didn't really have any particular role model or adviser or, you know, but anyway, that's that. But I mean, so for example, at UMIST, and I could have gone there as soon as I got my MSc, because at that time in computing there weren't many people around who were actually qualified in computing, you know, so I could possibly have gone there in about 1974 or 6 or something like that. But then on the

other hand I wouldn't have had all these world experiences that have been very useful, you know. But also I think, well maybe I tended to be a bit reserved in what I could do next, you know. So, yeah, I mean I'll give you an example, I'd go for a job as a programmer, a system designer, and there's a guy there who's gone, is a project manager and, you know, is the same age as me, and I go, like, why are you applying for a job as a project manager, what, you know, have you been one before, have you worked in this sector before? No, he's not worked in... And yet his salary will be like, you know, six or seven thousand more than mine, but it wouldn't occur to me to apply for a job that was, you know, if you like, two rungs up the ladder from what I could do, you know. I knew I could do the job, it was a technical job. I probably knew more about the technical work than anybody on the interviewing panel and, you know, but... you know. I mean I could have been a project manager. I don't really want to be a project manager, but you know what I mean? You can kind of like underestimate your own abilities.

[01:31:22]

What advice would you give to someone willing to pursue your career today?

Well, I think you've got to be, well... Well, for me anyway, there's only one subject, isn't there, and that's climate change. You know, whatever you do, you've got to help save the world. But in terms of technology and human-computer interaction, this is such an important subject, you know, and you've got to kind of want to do it with your heart, you know, you've got to really, really I think, reach out to people that are involved and, you know, your users, your organisations, really kind of be empathetic towards them and how things will change. So I really think, I still think it's a tremendous subject area to go into and there are so many opportunities, and opportunities at so many different levels, you know. You know, not just about, you know, about the user interface design or web design or, you know, things like that, but also how are we all going to interact with, you know, the metaverse, with the future of social media. You know, I mean everything's there to be understood, because in the end, you know, my view is that people really don't change that much. You know, like their fundamental needs don't really change that much, but the technology changes a lot and it's about how to meet the needs of people with that new technology, yeah. So

I just think what would you do first? Personally, I would do an apprenticeship, go and do an apprenticeship in a technical college and, you know, and learn more about how to apply computing in real situations, you know, and then follow up from there. But anything that you can do, really, to get into HCI. Design, thinking about the range of people's needs and things.

Is there anything that you would like to say that I haven't asked you about?

I don't think so. I mean I haven't kind of talked about design as much as I might have liked to have done. But anyway, you know, the... I'm fine with what we talked about. We've covered a lot of ground in an hour or so. Yeah, no I'm happy. Thank you very much for all the questions.

Okay. So thank you very much, Linda. It's been a real pleasure talking to you today.

[end of recording]