WARREN EAST
ORAL HISTORY

COMPUTERWORLD HONORS PROGRAM INTERNATIONAL ARCHIVES

Transcript of a Video History Interview with
Warren East
Chief Executive Officer
ARM Holdings

Recipient of the 2013 Morgan Stanley Leadership Award for Global Commerce

Interviewer: Julia King
National Correspondent
Computerworld, Inc.

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Today is May 8, 2013 and we're interviewing Warren East, Chief Executive Officer of ARM Holdings. Warren is the 2013 recipient of the Morgan Stanley Leadership Award for Global Commerce. This interview is taking place at Morgan Stanley offices in Menlo Park, California, and is made possible by Morgan Stanley and the Computerworld Honors Program.

The interviewer is Julia King, National Correspondent of Computerworld.

The Honors program was established in 1988 to seek out, honor, and preserve the history of the global information technology revolution. It was founded by Patrick McGovern of International Data Group, and Roger Kennedy of the Smithsonian Institution's National Museum of American History. It is now the world's largest IT awards program.

This oral history is being recorded for distribution to more than 350 national archives, museums, universities and research institutions in more than fifty countries on six continents around the world, and program's archives on-line.

Without objection, the complete video, audio and transcripts of this interview will become part of these international scholarly research collections and made available to the public on the web.

This discussion, however, is private and should any participant wish to withhold from the public record any part of these sessions, this request will be honored. All present here are honor-bound to respect this, and by remaining here, they accept the personal, professional and legal responsibility to abide by this agreement.

With no objections being heard, we will proceed.

Warren East: There are no objections.

Julia King: What we want to do with this video is to give viewers a glimpse into what makes you tick, who you are at heart, and what people, influences and experiences shaped you into who you are today. The business and tech media of course focus on ARM's innovative business model, its wild success as the Internet of Things continues to take off, and the technical challenges that lie ahead – and I have questions about those too – but what we really want to do here is get to know you a little better as a human being…learn more about your vision …and let's just get started.

Let's begin at the beginning. Give me a picture of your growing up. Who are the people and/or relatives who made a difference to your life in these early years?

Warren East: So a picture of me growing up. I'm from a family with two children only, myself and my younger sister, who is 6 years younger than me. So it's sort of like two only children. Both my parents worked. My mother was a chemistry teacher. My father, a lab technician and then latterly, more latterly, a market gardener and poultry farmer. And I also lived with grandparents, from my mother's side.

My mother is Welsh. My father is Australian. So I'm a bit of a mongrel. Apart from that I think I had a fairly sort of ordinary childhood. I went to a local school and then I went to a boarding school when I was about 12. That was a great, great break for me. You learn a lot about being independent at boarding schools, and I had a fantastic education, very broad. I enjoyed a lot of sport, rowing, running, that sort of thing. And I enjoyed the sciences in particular. At school I entered dramatics, and while I was there I learned to play the organ as well.

JK: So it sounds like you had a lot of amusements. What did you do, what were you're hobbies and your passions early on?

WE: Well early on, I used to spend a lot of time playing outside. My parents lived out in the country and I had a lot of access to woods to play in and that sort of thing. As I say did quite a lot of sport, in particular rowing and running, and I biked a lot. I still do cycling holidays today. And that all started with delivering eggs on the back of my bike for my parents' poultry farm. So I've been cycling for a long time.

JK: You must have been a very careful bicyclist if you were delivering eggs on the back of bike.

WE: Yes, it was quite a laborious process to deliver eggs on the back of a bike because when you, when you're 10 years old you haven't got a very big bike, and you've got a very big box on the back of the bike. So you have to make quite a lot of trips to deliver eggs, because you can't fit that many in the box.

Anyway, that is a picture of my youth. When I got older my hobbies turned into things like sailing, and skiing, and walking outdoors and that sort of thing.

JK: So who were your childhood heroes?

WE: People often ask me about childhood heroes, and I have to say I don't have that many childhood heroes. As with any child, one respects certain teachers and so on, and certain older children I can remember sort of looking up to them. Being relatively short I spent most of my life looking up to people. But I spent quite a lot of time sort of looking at a lot of people. My parents I suppose are really the role models. My mother comes from a Welsh family where rewards come from hard work and meritocracy, and that's probably what's most ingrained. Her father was a miner, and life's quite difficult for those people. I mentioned my father as a market gardener. That wasn't a wonderful experience commercially, and that also probably taught me quite a lot about the value of hard work, and quite a lot about the necessity for being smart commercially.

JK: Were you a reader? Did you like to read?

WE: I was not the world's greatest reader when I was young. I read a few children's books, but I favored the sciences at school, and I was fascinated by the natural world around us, and so most of my reading material was fairly factual. In the 6th form at school probably my favorite subjects were chemistry and biology, and I used to actually spend more time reading around those than reading novels.

I was also very interested in amateur dramatics. I suppose that's where the artistic bit came in, singing and performing. But as for reading novels, I don't really have any favorite authors or anything like that.

JK: What were some of your memorable roles in dramatics?

WE: Ah, goodness me! I did enjoy doing amateur dramatics. I think some of the favorite roles - there's a play by JM Synge called ah, *The Playboy of the Western World*. It's a famous play, and I did very much enjoy that. I played the woman in that. I went to a boy's boarding school so you see somebody had to play the woman. And I played the role of Pegeen Mike, in *The Playboy of the Western World*. I enjoyed that very much. Produced that play as well. I also did have the leading role in *The Miser*, which is another great fun, fun play. As I went on to university I became less interested in amateur dramatics, and more interested in sport and just getting on with the rest of life. So it was a phase that I went through growing up.

JK: It sounds a bit like a harbinger of your leadership and your CEO status. What is it that drew you to dramatics and to be on the stage?

WE: Well I do actually quite like performing. I used to be in the school choir. I still play the organ today. There is probably is part of me that likes standing up and performing. My middle daughter actually is quite keen on dramatics and singing and that sort of thing, and I always tell her that she ought to do a job like I do, because you get to act for a living.

JK: What's your happiest childhood memory?

WE: There are just too many. That's difficult to answer.

JK: Did you have an idea of what you wanted to be when you grew up, as a child? Were you someone who said, "I'm going to be an actor. I'm going to be a chemist. I'm going to be an engineer?" What did you think you wanted to grow up and be?

WE: It's interesting. As I was growing up my career choice changed quite a bit. When I was about 10 years old my parents had a solicitor who drove a fantastic old Bentley. I thought, I want to be a solicitor, because then you get to drive a fantastic old Bentley.

But then when I went to senior school and we started doing science instead of general things then I got sort of sucked into science. And frankly I was going to do medicine because I enjoyed biology. Then when I was about 16, we had a talk at school from some people that were trying to encourage the youth of the day to go into industry. And that talk struck a chord with me because there was a very clear connection between industry, creating things, generating wealth, paying taxes, funding, all of what goes on in society. And from then on I wanted to be in industry, and wanted to be a captain of industry.

JK: Interesting, and did that include a bent toward innovation as well?

WE: Well I suppose I've always been fascinated by the natural world, and when I came to be about 17 decided that probably medicine wasn't for me, that I would put this interest in science to use in engineering. Because engineering really is about taming nature, and taming nature for the benefit of mankind. And I've been sort of on that tack pretty much ever since.

JK: If you hadn't pursued engineering is there another area you would have?

WE: If hadn't pursued engineering then ah, probably my favorite subject was biology. And um, I guess I might have had a career in pharmaceuticals or agri-chemicals or um, in agriculture probably.

JK: You know successful innovators and entrepreneurs often will recall their very first project, much like you're recalling this memory and that pivotal lecture, like their first radio and they're putting back together, or lemonade stand, or lawn mowing business. What was yours?

WE: So my first sort of hands-on, practical engineering was probably at home when I was about 15 or 16, and I was charged with mowing the lawns. My parents had quite a lot of lawn to mow because they were out in the sticks, but quite a small mower. This was before the days on ride-on lawn mowers and that sort of thing. And the lawn mower broke down. So I thought, "Well, I'm sure I can fix that." And I started to fix it, and pulled it apart a little bit, and pulled it apart a little bit more, and a little bit more, and a little bit more, and then I thought, "Oh dear, my parents are going to come back and I can't get the lawn mower back together again." And that was really my first hands-on engineering project, trying to get the lawn mower back together again before my parents came home. After that, I think I decided that probably mechanics wasn't the sort of engineering I wanted to do. I wanted to be more in the sort of design end of engineering.

JK: Interesting! In the design end, did you have something that you designed, you're very first design, or some project that you said, "Oh I can build a better lawnmower. I'll design a better lawnmower that can be put back together again."? Tell me about your first design experience.

WE: So after university my first design experience was with a little company that made displays. And a tiny portion of the display is an oscillator that basically provides a tick, tick, tick for the display to work. And this company, surprising though it may seem, designed their own oscillators in those days. So my first design project was to create an oscillator for this company that was making displays. And actually it was that experience which pushed me into semiconductors fairly quickly because I think I realized that frankly, this was not a very good use of time. Because somebody had already designed the oscillators and you could buy these things more or less off the shelf. They were becoming increasingly integrated more and more, the functionality was going into integrated semiconductors in the early 1980s. And that's what pushed me into semiconductors.

JK: So you were not interested in reinventing the wheel? You wanted to do something new and different and exciting.

WE: Well I just wasn't that impressed with continual reinventing of the wheel. And I suppose interestingly that's where we've got to today with ARM and the ARM business model where we design microprocessors and license those microprocessors to semiconductor companies who put them into chips and get them to do things. When we started doing that business then everybody designed their own microprocessors. In reality, there's no need for that. You can build on, on top of what's gone before. And actually if you look at the history of science, the reason that we're making such a lot of progress today over the last 100 years, over the last 300 years, is because developments have always been based on what's gone before. Now that doesn't mean I'm against the idea of checking out first principles. But it means that practically, if we want to go forward then rather than doing everything yourself, then share the task around, and benefit from creative effort of lots of people.

JK: So collaborative innovation, it sounds like you subscribe to that?

WE: I do subscribe very clearly to the theory of collaborative development, innovation coming from a whole variety of sources. You can't just sit in a room one day and say, right now I'm going to innovate, and come up with a bright idea. Because it doesn't work like that. Innovation comes at the most unexpected moments, and often the cleverest innovations come out of sheer necessity when there is a challenge. It needs to be overcome. And it needs to be overcome very, very quickly. That's when somebody has a brain wave, and you get a step forward, and you get some innovation.

JK: Can you tell me when that happened for you, when you had one of those moments when there it was?

WE: It's very difficult for me to put a finger on a particular innovation because I'd have to say that I'm not really one of the world's greatest innovators myself, but I have worked in that business for a long time.

JK: Tell me about your first job out of college. You got out of university and you went to this company where you were working on the oscillator, and can you walk me through your professional career from there?

WE: My professional career, I've spent about 30 years in the semiconductor industry. I did do a very brief spell after I left university working for a company building their own products. Not t really using a lot in the way of semiconductors. I helped design an oscillator from scratch and decided things really ought to be built on top of what's been done before, and use semiconductors.

At the time, I had a Hewlett-Packard calculator. I was very impressed with the Hewlett-Packard calculator. It was a programmable thing. You could write all sorts of programs with it. I wrote a program to help my father. By that time he was working in local government and they needed some program to track car dealers I believe, and so I wrote this program basically on an HP calculator. That was good fun, but we had this sort of HP is better than Texas Instruments type debate going on about calculators amongst the engineers that I knew. So I was aware of Texas Instruments and then I became aware of the fact that of course they made lots of semiconductors. So I went actively seeking a job at Texas Instruments, and that's where I ended up for 11 years doing work on microprocessors, TI 4-bit microprocessors. Then I was doing work on telecom, voice kits, programming dialer chips. One of my babies was a telephone that was very widely deployed by British Telecom around the UK, and I did quite a lot of that phone for BT when I was at Texas Instruments.

Then in about 1989 I became aware of the fact that if you wanted to get on in this world a good thing might be to do an MBA. So I did an MBA, and then took off on a slightly more commercial direction, which took me away from microprocessors. That was a shame because I really enjoyed microprocessors, and after a few years wanted to get back into that area. By that time Texas Instruments bought a license to an ARM microprocessor and became ARM's fourth licensee, and that really got me connected with ARM. A year later I started working for ARM.

JK: Did you have a mentor at Texas Instruments or previously?

WE: Did I have a mentor? You look at people and look at what they're good at. There are certain role models but I can't say I really had a mentor as such. I was very lucky to get married very young, and I've always ah, always sort of bounced ideas and so on around with my wife. So I suppose if I have a mentor it's probably my wife.

JK: I'm sure she'll be glad to hear that.

WE: It's true! (laughter)

JK: Tell me about your early years at ARM. I've read that the company started in a turkey barn, and then it wasn't clear when you joined whether the company would indeed have the money on which you could draw a paycheck. So describe the scene for me, take me back. Who was there, and what made you take that leap? What was the vision that you saw? What was the promise that you obviously saw there?

WE: Joining ARM was quite an experience. I wanted to join ARM. I was seduced by the technology. I thought the ARM technology was elegant. One of the things that had been drummed into me during engineering at university was the elegance of certain engineering. And I often liken engineering, and what we do as engineers, with what mother nature does as an engineer. I think mother nature is a fantastic engineer, and comes up with some really elegant solutions. You see a lot of that in the natural world. So the concept of elegant design was very much something that I subscribed to. And the slight quirkiness but hidden elegance of the ARM design seduced me. That's really what got me into ARM.

When I went along for an interview, the interview started at about 5 o'clock at night, and I eventually emerged at about 10 o'clock at night having had this conversation with the incredibly enthusiastic CEO at the time. He was a founding CEO, Robin Saxby. And he was such an enthusiast. So passionate about how he described the business, his vision for the business, how with 5 billion people on the planet, one day there would be an ARM microprocessor for every person on the planet. He was really quite captivating. And before I got home, I phoned my wife and I said, "Well the interview, I don't know how it went, but I've just got to work for that company." Fortunately the interview must have gone reasonably well because they gave me a job.

JK: And what was your first job there?

WE: My first job at ARM was to establish a business out of design consulting. At the time we didn't have many licensees and we needed to stimulate designs around our own microprocessor. We had precious few people in the company and so we were being pulled to do design work for our licensees. And if we were doing design work for our licensees then we didn't have a lot of time to design our product so that we could go on and license more product. So what we needed to do is turn that design activity into a business, and make some money from it. And then could afford to hire some more engineers to develop more new designs. That was my first job at ARM, creating a business out of the design consulting that we were doing.

After a few years of course, it actually worked quite well, and through a mixture of that design consulting work and, and lots of the other hard work that people of ARM did we were getting sufficient numbers of designs through with our partners. They were selling their ARM-based solutions to a larger and larger number of customers and we didn't need to do that design work any more. So I think we stopped it after I had been there for about 4 or 5 years.

JK: I was really intrigued by the intellectual property model of ARM, and I'm wondering if this was the genesis of that being a design IT company, versus intellectual property or designer or manufacturer?

WE: I wasn't around at the start of ARM. I was employee number 70. I joined after ARM had been going almost 4 years. So ARM in some ways wasn't a start-up at all when I joined. Although I do remember being quite alarmed, you know, coming from a large company like Texas Instruments, I was quite alarmed at the fact that joining ARM in the summer, and we weren't really sure how we were going to pay the salaries at the end of the year if we didn't get some business in. That wasn't the sort of thing I was exposed to at Texas Instruments at that stage in my career. So we were a startup but we were quite an established startup by that time.

JK: Tell me what ARM does, in layman's terms.

WE: So what does ARM actually do as a business? We design microprocessors. And they are all ARM microprocessors so its a common ARM instruction set. But if you look at the huge range of different applications that ARM microprocessors go into, from tiny little sensors right up to supercomputers, well, you need more than one flavor of microprocessors to do that. So we have about 15 to 20 different microprocessor designs. And we sell those designs to semiconductor companies, people who are making chips. And they take that microprocessor, which becomes the brain of the chip, and they put their own, other functionality on the chip. So it becomes something like the apps processor in a mobile phone, or in a digital television, or a camera, maybe even the controller in an electric motor, which might be in a compressor in a refrigerator, or an electric motor in a washing machine. So there is a huge range of different products that get built around these chips that the ARM semiconductor companies make. Our semiconductor partners make the chips, but they all share the same type of brain, an ARM microprocessor.

JK: In 2001 ARM had one processor product line found mainly in mobile phones, and now ARM provides one of the broadest portfolios of technology in the industry, used by more than 300 semiconductor customers in nearly 9-billion chips. How did you do that? And, how did you lead this company from that one product line to a near-monopoly in this area?

WE: So, over the last 10, 12 years or so, we've evolved the business and we've gone from a company where we basically have one product family, but three or four different microprocessors. And we had a lot of success at initial design into mobile phones, but ARM was basically a company that provided a few microprocessor designs for a few companies making chips for mobile phones. And we realized that this was a fantastic opportunity. But a mobile phone is a very demanding environment for a microprocessor. You have to do a lot of computing, and you don't have a lot of energy to do that in computing with. We realized that you could take microprocessors design for mobile phones and put them into a whole range of other products as well. You'd have to make some slightly different flavors of the same microprocessor to do that, but we could scale this business.

And going right back to the time when I joined and I had an interview, and was told by the CEO that there was going to be an ARM processor for every person on the planet, we did have a dream that one day that could happen, and it could be more than just a microprocessor in a mobile phone. So we created several different flavors. And we started working with the customers of our customers to understand what they would really need in their microprocessor chips that they were gong to buy from our customers. And we made sure that our microprocessors would address those needs in a whole range of products. That meant that if we got it right, then our customers would want to buy our microprocessors an incorporate those in their chips more than do it themselves. Because they'd have a ready market. People would want to buy them and they wouldn't have to incur the cost of designing their own microprocessor, maintaining their own ecosystem as to exist around a microprocessor to make the architecture successful. So over the years we've broadened the range of applications. We've grown the number of semiconductor partners. We've enriched that ecosystem to create now, probably the world's most powerful microprocessor ecosystem.

JK: You call yourself a little bit of a Luddite, relying on few electronic gadgets. And yet, here you are as the CEO of the world's largest microchip design company whose products are par of billions of gadgets. Talk to me a little bit about that dichotomy.

WE: I have said that I am a bit of a technology Luddite, and I realize that that is somewhat at odds with running a fantastic technology company like ARM. I don't really see it as being too much at odds. I think a health degree of cynicism is a good idea. I love walking round the shops where you can see these huge range of products with ARM technology. And it's fantastic to say that our company has created that, the brain that's inside that camera, or phone, or television, or whatever. But I think it's important to keep your feet on the ground. I think engineering is about making nature do things for us, for the benefits of people, rather than the other way around. So technology should be our slave rather than the other way around. So what really turns me on is the idea of putting ARM technology into all sorts of things that really make life better. And we're starting to see that now. When we look at healthcare applications, countries all around the world can't afford health as populations age and so on. They can't afford to make people better in the same way. And one of the tools, not the only tool, but one of the tools is use of technology. Because if we can use technology rather than employ more doctors, then it becomes more of an affordable problem, and the doctors can concentrate on developing more therapies and cures and looking after people. And the machines can do more of the monitoring, and the day-to-day data gathering, and generally help those doctors.

So that's just one example and obviously the world has other huge problems, shortages of water, fundamentally, shortages of energy. Ah deploying technology like ARM technology to help with those sorts of problems is a good thing. Electric motors use nearly half the world's electricity. Lighting uses nearly a fifth of the world's electricity, transport, all these things use lots and lots of energy, and if we can make that energy usage much, much more efficient through the use of technology, then it's a good thing.

JK: What do you see as the biggest technical challenges as we move forward?

WE: As we move forward for I will say the next decade, there are some big technical challenges. I'm an optimist, and I'm totally confident that if we take a collective sensible approach, we'll overcome those challenges. But use of energy is an important challenge. If we just look at ICT (Information and Communication Technology) today, it consumes about 10% of the world's electricity. That doesn't seem like much, but on the other hand, we talk about growth of products like smart phones. We talk about tablet computers, all these things getting much more sophisticated. They're generating much more data. And we look forward and we talk about the Internet of Things that's talking about volumes of ten times that of mobile phones and beyond. And all those things are going to be very, very useful if they can be deployed intelligence sensors collecting data, gathering it together, analyzing that data and so on. But all of that takes energy, and if we don't change the way that we design the products that process that data, change the way that we design the products that transmit that data, then when we're generating and using ten times the amount of data that we are today, we won't be able to afford the electricity to run the ICT. And so the key technical challenge is how do we do that? ARM isn't the only answer. ARM is an efficient way of micro processing. Our business model enables lots of innovation, and we believe we have a role to play. ARM is a tool in the kitbag that will enable us to overcome that sort of technical challenge.

JK: What will be driving growth in 2020 and beyond? You mentioned the Internet of Things. What areas of technology will require the greatest innovation? You also mentioned energy usage, are there others as well?

WE: I think if we look forward 10 years or more, then being optimistic, we probably will be getting technology to be more of our slave than the other way around. There are challenges to overcome. People talk today about the Internet of Things, who knows exactly what form that's going to take, but I'm confident that if you take the sort of intelligence that we find in today's smart phones and make it very, very, very small, and enable it work with very, very little power, then we'll be able to embed that intelligence in all sorts of everyday objects to gather data, to monitor what's going on around them, to enable these things to communicate amongst themselves without having to through humans, and then those sorts of systems will be generating growth in, in 10 years and beyond. And a huge amount of the functionality in all these systems is much better implemented in software than in dedicated electronics. And that's where the microprocessor comes in. And that's why we at ARM are so optimistic if you'd like, about the business opportunity that lies behind that as well.

JK: How do you define innovation? Where do you think it comes from, and what are the traits or qualities of innovators in your experience?

WE: Innovation is an interesting topic, and there's all sorts of definitions but it's basically about either doing something completely new or doing something that we do already, but in a new and different way. I think a lot of innovation is incremental. There aren't that many serious, major breakthroughs. Every now and again you get a serious breakthrough which enables lots more. The classic examples, if you go back a few hundred years and think about printing - and then there's an analogy between printing and the internet - and exactly what was the innovative step that enabled the internet to happen? Well there wasn't one really. it was a combination of lots of things coming together.

And, I think often the best innovations, you almost don't seem them happening when they're happening. A lot of innovation happens out of sheer necessity, either a technical challenge or probably more likely a combination of a technical and a business challenge. And the innovations don't happen because bright people sit in rooms and think, "We're going to have some innovation now. Let's sit on a beanbag and be innovative." They come because people have to solve real problems, and sometimes solving a problem that has been intractable for some time. There's no point in trying to solve it in the same way that has failed lots of times. You look for different ways for solving it, and that's where the innovation happens. And a lot of smart innovators unfortunately in this world go completely unrecognized and rewarded, unnoticed. I'm sure we've got lots and lots of very clever innovations that have come out of our own company. The engineers that were actually responsible for those innovations, some of them have patented some of their techniques, but lots of it's a team effort, and it's very hard to put your finger on exactly who had the breakthrough.

JK: I would like to ask you the same question about leadership. How do you define leadership, and do you believe it's innate, or learned? And what are the traits and qualities of a good leader in your view?

WE: Leadership is about taking a collection of people and enabling that collection of people to do something more than is just the sum of those peoples' efforts. And it comes at all sorts of shapes and sizes, and all sorts of walks of life. Some times it is necessary for the leader to be the classic table banging, follow me into the breech leader. Sometimes it's necessary to be the quiet conductor, working perhaps a little bit more behind the scenes. I don't think there's a right style of leadership for every occasion. There's a style for different occasions and different situations, and also different people who are being led.

I'm a great believer that two heads are better than one, and multiple heads are better than two. But when you put these heads together then you need some kind of a leadership to coordinate the efforts of those people. Sometimes the collection of people doesn't necessarily believe that the task can be accomplished so the leader needs to be persuasive. The leader needs to get people to believe that they can collectively solve the problem. The leader needs to be available all the time for the people who, who are being led. So it's a really multifaceted role.

I know there are many, many books written about leadership. I've read a few, but I don't think it can be learned. I think it can be only learned on the job with practice. And as I say, it happens in all sorts of walks of life, and it isn't just about business. We talked some moments ago about my childhood and producing plays and that sort of thing. I see absolutely that there are elements of leadership there, where you need to convince people that they can do something. You need them to turn up and work hard. And people don't necessarily like working hard. I used to take people walking up mountains and had to persuade them that that, it's nothing, we can do this. But leadership is being responsible as well. It isn't just confidently persuading people to do silly things. It's about ah, it's about making sure that everybody ah, everybody's successful and the team as well.

JK: Did you think you would be leading a company like ARM when you were a young engineer starting out? Did you see yourself as a leader?

WE: When I was setting out from university I didn't necessarily say I'm sure I'm going to be lucky enough one day to lead a company like ARM. I certainly wanted to, and I certainly knew that outside of the commercial world I could lead people, because somehow they seemed to go along with what I wanted to do. I mean I'm barely two jam pots high and I'm not a very imposing type of individual, so clearly I must have done it through some form of persuasion instead. I guess inwardly I'm actually quite self confident, and had a feeling that I could do that, and I really wanted to. But ARM has been fantastic. I have the best job there is in the semiconductor industry, and it has surpassed my expectations and the expectations of many around me.

JK: Mobility and consumer devices and social networks, a lot of these gadgets in technology have pretty much erased boundaries between traditional work life and non-work life. What do you think about this, and what are the implications for technology and for society overall going forward in this always-on world we live in now?

WE: The way in which some of the products we've enabled have sort of blurred the boundaries between work life and social life for the so-called "always-on" generation, and I think it isn't necessarily all good. But that's the same with any type of technology when it arrives in our society. There's always a down side as well as an up side, and it takes some time for us to collectively learn how to use that technology more for the good than the bad.

So I'm not really afraid of that situation right now. I'm aware of the fact that you're getting young people spending frankly far too much time on video games, talking to computer screens instead of being outside. Kids are locked up looking at screens instead of being outside playing in trees and fields and all that sort of things. It's obviously not healthy. Typically though, when new things get introduced, you get a bit of overreaction. And then you get a bit of reaction going the other way, and things settle down. We have seen that over multiple generations. If you read about the history of printing then you know there were all sorts of people who thought it was a terrible thing, that information could be disseminated so easily because all sorts of bad people could exchange ideas about being bad, and creating revolution and, and so on. Fundamentally, printing is a jolly good thing because sharing that information generally does more for the good than it does for the bad. It just took a little while for things to settle down, and I think the same is true for the sharing of information which we've effectively got with the always-on generation today.

JK: What are you hoping for the ongoing internet revolution and the betterment of global society? What societal good would you, or could you see accomplished in your lifetime?

WE: I hope in my lifetime the internet is going to help us solve some of the world's ills. There will be other world ills that will face societies in generations to come, but I think we've got a fantastic tool with the internet and everything that goes with it. The rapid sharing of information, the rapid collection of lots of information, the synthesis of trends across vast quantities of so-called "big data," and so on. We have got problems with health. We have got problems with energy usage. We have got problems with food and water shortages and so on.

Fundamentally we've still got problems with education in the world. Not enough people are sufficiently educated. You're getting a tremendous societal social divide going on between the educated and the non-educated parts of the world. And I think the internet has a role to play in all of these issues. In health, collecting data, analyzing data, enabling, enabling services in use of energy by removing inefficiencies, where energy is generated, where energy is used and so on. Similarly with water, and obviously with education, where it's about information sharing.

JK: What are the greatest obstacles in the path ahead, and are they technical, social, economic, all of these?

WE: I think there are lots of obstacles obviously. In terms of underlying technology, we'll always have challenges. One close to home at ARM, if I look at peoples' expectations of the compute demands for mobile phones over the next decade or so, we're talking about battery capacity improving about a factor of 2, which means the efficiency of the microprocessor obviously has to improve by a factor of 15. That doesn't come easily. There's a lot of challenges associated with that. But technical challenges can be overcome. I think the bigger challenges are probably commercial, where there are multiple business interests that have to work together. But typically businesses look after themselves. Sometimes they don't necessarily look after the greater good that is achieved by collaboration. Ah then you go beyond businesses and you get into politics and society, and I think some of the barriers to progress are, again, in vested political interests, rather like vested commercial interests, where maybe we're not getting the best collective solution because of political dogma.

JK: My final question has to do with your legacy. How would you like your role in this ongoing information technology revolution to be remembered?

WE: How would I like to remembered professionally? I've spent the last 12 years leading one of the companies which has enabled a portion of these great technical leaps that we've seen over the last decade or so. And by the way, I think we're going to see more over the next decade or so. And I'd like to be remembered as the person who helped ARM become a company that will endure. ARM was a very promising technology startup when I joined it. It was even more promising technology startup when I took over as CEO, but it was still a technology startup. We're now an established FTSE 100 company with the sort of business that other companies will literally bet the farm on, and that I think, is what we've collectively achieved at ARM over the last 12 years. We've transformed into something which is mature, which I'm confident going to endure.

So when we look back in 30, 40 years time at this period of the digital age, then ARM is really remembered as the essence of the digital age and you know, my contribution has been part of that, part of transforming a startup into the essence of the digital age.

JK: It sounds like it's been a marvelous stewardship of that startup to now.

WE: Thank you.

JK: Warren, thank you for your time and these wonderful insights into your life and career.

WE: My pleasure.