Mark Enzer OBE

Interviewed by

Richard Sharpe

20th February 2024

By Zoom

Copyright

Archives of IT
(Registered Charity 1164198)

Welcome to the Archives of Information Technology where we capture the past and inspire the future. It's Tuesday, 20ᵗʰ February 2024. I'm Richard Sharpe and one way or another I've been covering the IT sector, first of all on the computing side, since the early 1970s. Making his contribution today we have one of the young great and good, Mark Enzer OBE. Mark received his OBE in 2020 for Services to the National Infrastructure, and we will be talking about the national infrastructure, I'm sure, Mark. Mark, you were born in Woking in the UK on 19ᵗʰ December 1963. That was the year IBM launched the 360, which pulled it ahead of everybody else in the game. What were your parents doing?

They were keeping warm, I think. As I understand it, 1963 was one of those very cold winters, you know, back in the days before global warming when we had snow. So my father was a solicitor and my mother was a nurse. It seems like that particular coupling is very common – solicitor plus nurse – I think they used to have dances or something where solicitors and nurses met. So that's what my parents were up to.

And they were living in Woking?

No, no. They were living on a barge on some canal. Woking was just where a convenient hospital was, because it probably wasn't suitable to get born on a barge.

[laughs] They were presumably interested in your education. Did they push you into education hard?

Not really, although my mother was volunteering at a nursery school, so I think I first went to school when I was a few weeks old. [laughs] So I think my schooling was at least long, if not successful, and then after that they kind of put me through a number of different educational experiences, including a Montessori school, of all things.

Yes. Tell me about the Montessori schools.

So the Montessori schools, very interesting. They did phonics before it became widely popular, which meant that I could say things, but I had no idea how to spell them, and I seem to remember that they taught us difficult words, like isthmus, is one

of the early words that I seem to remember. And they had kind of papier mâché things which we could pour water on and say, oh look, this is what an isthmus is. So yeah, that was a Montessori school. It was also vegetarian way before its time. For some reason I still remember the flavour of peanuts and cucumber, which for some reason they had together. Very weird mixture.

Have you become a carnivore?

Yes, yes indeed.

Well, you joined that in 1969 when IBM unbundled and created a huge space for a software industry. Then you went to a preparatory school, High Grove in Bagshot, a private preparatory school, in 1973, which is when IBM launched the Winchester hard drive which allowed online transaction processing. And you were there for four years until '77 when Oracle launched. What do you remember of that?

Yeah, it was Hall Grove in Bagshot, I think it's still going, amazingly. I mainly remember it to be quite fun. I can remember trying to set fire to the school, that was one of my little highlights, I guess. And I can remember enjoying science, I can remember some memorable science lessons, the type of one where the teacher, who happened to be the headmaster, had a huge great big pendulum and – with a big weight on the end – and let it go from just in front of his nose and stood there as the pendulum went all the way across the classroom and came all the way back but didn't hit him in the nose. So I'm sure that was trying to teach us something, but whatever it was, it was more memorable than the science itself. Yeah, so Hall Grove was fun and I think I probably remember the rain and the cross countries more than anything else. One other thing which does suddenly spring to mind is that I was responsible for the headmaster's geese dying, so that wasn't very good.

[00:05:08]

How did you do that?

Well, I was one of the 'goose boys'. There were two goose boys, I was one of them and I was meant to have closed the door to the geese, but I didn't, and the foxes got in and killed the geese. So that wasn't good. Wasn't a successful goose boy.

Was it a boarding school?

No, no, it was a day school.

Right. You then went to Pangbourne College, was that a boarding school?

That was, yes. That was indeed.

Right. And you were fourteen by then?

Indeed. So I joined a term late and a year early, which is not a good way of fitting in. So I was one of the youngest in the year, but like I say, a term late for some reason, so that was a little bit of a kind of weird catching up experience to start off with. But the school itself is also still going, and back in those days it was run along naval lines, military lines, so we all wore uniforms and had to learn how to march, and that was all rather strange.

Did you have a CCF?

We did. We did indeed, but it was a kind of naval version of it. We learnt how to row and how to shoot some ancient old rifles.

And you did fifteen O levels.

Yeah, that was, again, a bit weird. Seemed to try to make up with quantity rather than quality.

And the A levels were maths, physics and chemistry, the classic.

The classic, exactly. Exactly what you do if you're going to be an engineer. Or what you do if you're not very good at English, I think is another way of saying it.

And you always wanted to be an engineer, or just avoid English?

Avoid English was a key thing, but I think that I was pretty much condemned to being an engineer. Nobody knew it, because there weren't any engineers in the family, you know, my father was a lawyer and his father was a surgeon, so engineers weren't kind of what the family did. But I was that kind of kid that was always taking things to pieces and then not quite putting them back together again. And I think I covered most of the different disciplines of engineering by the time I was about fifteen. So, you know, dams in the garden for civil engineering, covered bits of electrical engineering taking radios apart and trying to put them back together. That was more successful, I managed to get a radio to work. Also a bit of chemical engineering, you know, making bombs. So I think I'd kind of done- oh yeah, and probably the thing that was the height of my engineering career, actually, was taking a lawnmower to pieces and turning it into a go-cart, that was pretty good. And in fact, I think that probably got me my place at university, just telling the story of the go-cart.

Okay. And you were still good at sports were you? Were you still running in the rain?

Yeah, it was running in the rain. There is a little bit of a running in the rain story, actually, which is that my parents used to take me swimming each Sunday, and it was one of those survival courses, you know, where you had to swim wearing your pyjamas, for some strange reason. But ended up doing a lot of swimming up and down, every Sunday. And when I was at school I had to do these cross countries and couldn't be bothered, just basically walked round the back with my friend, who was the other goose boy, by the way. And then one cross country he decided that it was boring to stay at the back with me and ran. I found that walking by myself at the back was no fun, so decided to run as well. What I hadn't realised was that all the swimming had actually made me quite fit and that I could run, so suddenly I discovered that running was fun and I was okay at it, and that probably got me more into sport. It was the secret fitness catching up on me because of the swimming.

I used to have to run round the hills of Bath for my school and strategically placed out there somewhere on a road would be a car full of teachers, and they'd wind the window down and mark you off, and this cigarette smoke and whiskey smoke would come out of the car, and then they'd wind the window up again and I carried on running in the rain. I remember that, it's seared in my memory. And now you went to, first of all to Cambridge?

Oxford first.

[00:10:15]

Oxford first. Why did you choose Oxford, or did it choose you?

There was some kind of relationship between the school and the college. I think the thing was that the school didn't send very many people to Oxford, but I think at some stage in the past somebody had gone to that college, and so there was some kind of connection and that therefore seemed like the obvious route to go down. Basically, I just followed where the school suggested and ended up at Pembroke College.

And you left in '81, had you seen a computer by then?

Yes, yes. I'd actually seen a computer, weirdly, back at Pangbourne College. So I did computer science there as an AS level. So that must have been really quite early on and I think that the school must have been quite advanced to have a computer. But I can remember that it had some ticker tape to get it booted up in the morning, and quite often that didn't go through right, and so computers seemed like very frustrating things. But yeah, I can remember somebody taught us this AS level, who had been trained in COBOL, you know, we are going back a long way. So yes, I had seen a computer before going to Oxford, then at Oxford they had this huge great big VAX machine that sat kind of throbbing in a, you know, an isolated box, and we all had to work on that. And my memories of that was always that it was terrifying and that nothing worked there either.

What was wrong with it?

Oh well, I'm sure it was fine, it was me that was wrong. I'm sure I just wasn't coding things properly. But it always seemed like there was some kind of bug, something always making whatever it was I was trying to do not quite work.

What languages were you using?

I don't know, but what I do know is that in a year out from Oxford where I went to work with the Water Research Centre, that I was working with Fortran and there did a bit of coding, which was actually quite fun. And that was to try and do some modelling of what is called a long sea outfall. So this is where sewage flows out to sea. And it was quite an interesting little model because the sea is going up and down with the tide and you've got the sewage kind of trying to flow down the pipe and you're kind of modelling those two things. So I wrote the model in Fortran. That also had a big VAX machine, which was attended to by men in white coats, and what I remember of that is that I sent off my program to run and I can remember using a Runge-Kutta technique of some numerical modelling as part of my solution. But anyway, it went unstable in the middle of the night when it was running, and apparently I used a load of CPU time. So in the morning my manager came along to me and said that under normal circumstances I would be fired because I'd used so much CPU time and it was so expensive, but you know, it was a big lesson, I guess. And the thing is that now, I'm sure that that same program could run on my mobile phone.

I'm sure. What drew you to the water industry?

It was the experience at WRC, the Water Research Centre. I had a lot of fun there, so after I'd kind of moved on from modelling the, this long sea outfall, I got to play with some sensors measuring flow in flumes and it was just playing around, it was playing around with water. And then also did a little bit of work on the early version of the sewerage rehabilitation manual. And that got me slightly into modelling of hydraulics in sewers. But by that time I had kind of started down the route into the water industry. And I guess I also had some kind of misguided view of, you know, trying to

do some good in the world, and it seemed like water supply and sanitation was a useful thing. So I had all of that in mind and the water industry called.

[00:14:58]

It is a very useful thing. You joined Mott MacDonald in '87.

I did indeed. And I'm still there now, amazingly.

And you're still there now.

Yeah.

First of all, why did you join?

One of the people at the Water Research Centre wrote out a little list for me. He explained the difference between consultants and contractors, which was very useful because I didn't know, and then he suggested that probably the way that I worked, I would have been more suitable for a consultant and he wrote out this little list of all the consultants that work in water and MacDonald's, as it was then, Sir M MacDonald and Partners, was one of those. There are a whole load of other names that don't exist any more, like Sir Alexander Gibb, Watson Hawksley, you know, some big famous names of old engineering companies that have done amazing engineering around the world. And MacDonald's is one of the few where the name is still recognisable, albeit as Mott MacDonald now. But I can remember going round to all the interviews. There were five that I applied for, so with the five interviews going round, and MacDonald's just stood out as being the most friendly place. And so it was really on that basis that I went there. It was friendly and it did water.

Why did you stay?

Because it's friendly and does water. There's more to it than that, I mean it's been really interesting to be with a company over a long period of time, but doing many different things. And so even though it might seem like staying with one company for

that long means I lack imagination, it is that I've been given so many different opportunities doing many different things, and I have been seconded from Mott MacDonald into other organisations. So I've been seconded into client organisations and contractor organisations, even into government, and most recently into university. So it's not like one organisation, it's like many and lots of different experience. So that's kept me, kept me excited, kept me engaged.

And is it still a UK company?

It is. It is indeed. It operates globally, but it's UK-based. And when I joined, I seem to remember at MacDonald's there were, I think it was about 3/400 people, and now there's 20,000, so it has changed.

Indeed. You say you've been in government, I want to go to the heart of one big question and see what your response is. Maybe you don't have a response. The public sector IT. The public sector IT seemed to be continually in crisis or a mess somehow with some enormous slip-ups [? 00:18:10], not the least of which of course are smart motorways now and Horizon, and in the past, patient records for the NHS. Public sector in the UK doesn't quite get it, does it?

I think that's probably fair to say, but I'm not an expert in public sector IT, but I think there's something that seems to be more general about big IT projects where they can very often go wrong, and I think that maybe one of the issues is to do with the difference between rolling out technology and software solutions versus the importance of the information that underlies it. And I think that my experience over the last quite a few years now is that really it's the information which is what carries the value, and that the software and the projects which kind of wrap around it are enablers. And sometimes I think we get it wrong when we do it the other way round and we think that what we're buying is a solution when actually the solution is in managing the information better. So I'm not claiming in any way to be an expert in public sector IT, but somehow I think that there's something in there about recognising the importance and the value of the information itself and seeing that rather than either the technology or the, just the project.

[00:19:59]

When you have various engineering roles, process engineering roles in your period, '87 to 2005 in what was then Mott MacDonald, did you come across Y2K?

Not much. I was obviously aware of it. It didn't seem to affect us that badly. I think that the people who dealt with those kind of things were working on that in the background, but that was kind of having the IT function supporting the business, and they were the people who were maybe more worried, and then also more thankful on 1st January when the world was still working.

Now you're in the water industry and the water industry is, well, a bit under the cosh at the moment, isn't it?

Indeed it is. Indeed it is.

How has it messed up?

Well, I think as with so many of these things, it's kind of complex, it's not just a simple thing. But I think that if we think back to what the water industry was prior to privatisation, then it was also in a mess then. So there's a little bit of kind of circularity going on. I think that there were some very big changes that were made in the eighties that were really beneficial, so having a more catchment-based approach to the water industry was a really sensible thing to do, so that you end up having water companies based around catchments. I wouldn't want to really get into the rights and wrongs of privatisation, but one of the things which it did lead to in the early days of my career was a lot of investment in trying to sort out some of the big issues of the time. But the issues of the time always move on, and I've lived through a number of the asset management periods and they've all got kind of different areas of focus, some of which were never even part of the thinking in the earlier times. You know, so there's been some which were focussed on removing nutrients, kind of addressing nitrogen and phosphorus, and those kind of things, which in the early days were not part of it, the whole idea was cleaning up beaches or, you know, some kind of focus like that. And I think where we've got to now in the water industry is people very

aware of overflows, combined sewer overflows, and so when it rains you end up with a combination of storm water and waste water going into rivers. And the thing is that the systems have been designed that way for hundreds of years, it's not a new thing, it's just that the public's attention has got to it. And rightly so, nobody wants to swim in sewage in rivers, but it's not as if the water industry has suddenly started messing up, it's that we're working with systems which were designed that way and the decision had been made, you know, a long time back, that we would have combined sewers rather than separate sewers. And so, you know, we're dealing with legacy assets. But in so many ways it's good that we're moving on and we're saying that this is no longer acceptable and we have to do something about it. But I just think it's a little bit unfair on the water industry to say that they're suddenly messing up, which is not quite how it is.

And yet they had some amazing breakthroughs. I think of the London system and Bazalgette, who I think lived quite close to me up in Wimbledon, up in the village, that was an amazing piece of engineering, was it not?

Absolutely, absolutely, some amazing stuff. And you can go back and kind of tell some of the history of the water industry and the whole thing of the Great Stink in London and starting to put in those sewers, and the Royal Commission which identified what type of standards would be required for treatment in order to return treated waste water to the environment, you know, without ruining it. And some really amazing leading work, going back a few hundred years. But there's still leading work going on, it's just in different areas. And I guess the things which now are concerns are things like kind of micro-pollutants and what happens with antibiotics, what happens with endocrine disruptors and these kind of things. It's just that, you know, always the need moves on and the science moves on to keep up with it.

[00:24:58]

Yeah. And he didn't have a computer to help him, did he? Although he probably had people called computers.

Yes, almost certainly, yes.

And he built, oh, I love those pumping stations, don't you?

Yes. And wonderful pumping stations too, the Victorian pumping stations are kind of things of beauty, almost like kind of palaces, palaces of engineering. But the whole engineering has changed. As I'm sure you're aware, there's a big project going on in London just now, the Super Sewer, which in some ways is a similar idea. It's where the storm water is going to be diverted from going straight into the Thames, taken down and treated. But that's a huge great big, a great big sewer, and huge great big pumping stations again. But I think back in Bazalgette's time, the issue was that the pumping stations weren't very efficient and, you know, based on steam, and so what they had to do was have very few of them quite far apart with very kind of low-gradient sewers in between. And the kind of the design parameters based around those constraints end up being very different from what you can do in normal systems with, you know, much smaller pumping stations and higher heads, basically, than can ever be achieved with something as a steam engine.

Do you work internationally?

Indeed, yes. I mean it's quite some time since I've been working in the water industry, I've kind of moved on from… But yes, one of the last roles I had working in water was a global role within Mott MacDonald as the, basically as the lead for water internationally. And the idea there was to identify good practice in one part of the world and take it to another, which seemed like quite a neat way of spreading good practice, but also spreading good business.

I was in Lisbon recently and they have an enormous project there, don't they?

They may do, I'm not aware of it.

Okay. Now, 19… 2005, 2007, you're Framework Manager for the Anglian Water Special Projects. What I want to concentrate on is not the water bit of that, but the management bit of that. What is Mark Enzer's management style?

It's definitely collaborative and kind of working with others, and I think that that's something that the water industry is very good at. And so in that particular context working on special products, there were a number of different organisations working together to deliver the outcomes. In that particular case, what we were looking at was sludge treatment, biosolids is a nicer way to say it, but we were looking to generate more energy from the biosolids treatment, and that had to be a very collaborative exercise. So my leadership style, I would say, was highly collaborative, it's seeking to bring people together to achieve an objective. So, what that kind of means is leaving people to get on with the stuff that they're good at and being more focussed on bringing people together with an objective in mind.

Are you also ruthless?

No. No, not at all. No.

Is that a weakness?

Er, I don't know. I don't think so. I guess it depends if ruthlessness is needed. Maybe if I were in a position that required ruthlessness, that would be a weakness, but I generally don't find that that's the case.

Okay. Have you ever fired people?

Er, no, no. There have been some cases where there's some under-performance and then that leads to a difficult conversation, and I guess there have been people on my team who have eventually been fired. But no, I've not been the guy with the gun.

For five years you were Chief Technical Officer, from 2017 to 2022, at Mott MacDonald. What were the technologies you were dealing with?

All sorts really. So at this point, as the CTO I'd moved from just looking at water to something much more cross-sectorial. So Mott MacDonald basically deals with energy and transport and water and international development, so as the CTO I was

looking across a number, well, all of those different sectors, but the main idea really was about identifying good practice and sharing it. And so that was no longer just in the water sector, but more generally, and I guess that's something that I've been pretty keen on doing, not just within Mott MacDonald, but now more generally. And I think that that approach is very good. So when it comes to the specific technologies, it's kind of, you name it, it's part of the picture. Another thing that was happening within the CTO role was starting to drive more digitalisation across the business and a kind of a more common approach to digitalisation.

[00:30:58]

And how was that achieved?

Well, I think one of the key things is through strategy and doing it on purpose, and so I think I picked up that approach within Anglian Water within the context there. And what we found was that road maps were a really effective way of driving change. So articulating the desired future state in quite a rich way so that we had a good idea where we're trying to get to, and then being very honest about the current state, and then clearly seeing the difference between the where we are and where we want to get to, and then working out what the steps are to get there. And I think one of the things which I recognise in this kind of strategic approach and road mapping is the connection between a number of different streams. Because it's rarely just a linear journey, there are a number of different parallel streams which need to work, because I guess what always seems to be the case is that anything to do with digitalisation is not just a technology and not just an information issue, but it's also a people issue, it's almost always socio-technical, and so there needs to be this attention to what people are doing and adoption as well as to what you're doing as far as the technology's concerned. So that approach was developed in Anglian Water where I was part of implementing BIM – Building Information Modelling – and I think we drove some very successful digitalisation in that context. So driving that kind of back across now to Mott MacDonald, we've gone forward to few years back into the CTO role, coming up with an articulated intentional strategy that covers all those things I said – the starting point, the end point and a number of different streams to get there, and the interface between the streams - that seems like a very good approach. It was

successful, continues to be successful, and I continue to use the same kind of approach now, although I might articulate it slightly differently in terms of Three Horizon thinking, which I think has kind of been developed and now makes more sense.

That's a very complex process.

Yes, I guess so.

Sorry, I didn't say that very well. What I meant to say was, you're involved in a very complex process and you're trying to manage complexity.

Yes. Yes. And I don't think that we should be scared of complexity. You know, complexity is a real thing, it's how the world works, the world is complex. I would just make that distinction between complexity and being complicated, because sometimes we humans go and make things unnecessarily complicated. They might be complex, but we can deal with that, because that kind of complexity is really to do with relationships. So I guess where I've gone now in my career is much more into systems thinking. It feels like there's been a nice progression in that way. But yeah, complexity is definitely part of that and I think that it's something that we can deal with.

Have you heard of Nigel Gilbert at the University of Surrey?

I have indeed, yes.

Do you work with him?

A little bit, and hopefully in the future, a little bit more. So we sit on the same committee in the Royal Academy of Engineering.   So yes, I've come across him recently, and a great pleasure it is.

Yes, I just interviewed him, a couple of weeks ago.

Very good, very good.

[00:34:45]

Now, you are a real joiner, aren't you, Mark? Institute of Royal Engineers, Chartered Institute of Water and Environment Management, Honorary Fellow Imperial College London, Fellow of the Institution of Sewer Engineers… shall I go on?

I don't know.

Why are you a joiner?

A joiner? What is a joiner?

Someone who joins organisations.

Joins organisations? Yeah, I mean I guess there are some organisations that one kind of has to join, and certainly as a budding water engineer I kind of had to be part of CIWEM, the Chartered Institute of Water Environmental Management, you know, that was kind of the thing that we did. But in order to get chartered as an engineer I needed to be part of an engineering institution, and as a process engineer I was halfway between chemical engineering and civil engineering, it's kind of neither fully one, nor fully the other. So I ended up having to be in both. So that kind of explains why from quite an early stage I was involved in three institutions. And then I would say that the other ones have come and found me, rather than the other way round. So, yeah, I'm a reservist in the British Army, and so as a result of that I get to be a member of the Institute of Royal Engineers.

And what's your rank?

I'm a Lieutenant Colonel.

Lieutenant Colonel? That's rather big. And how many people would work for you, if you were mobilised?

I don't know. Maybe a few hundred, a number of hundred. I think it's an equivalent rank to a centurion, amazingly.

[laughs] But you're also a chartered scientist.

I am, I am. And that's really because, going back to my first degree, I was doing engineering science, and I guess one of the benefits of that degree, though I didn't realise it at the time, was it gives a very broad view of engineering, and engineering as a science. So I kind of came through as kind of a little bit of both, kind of scientist and engineering, with more of a leaning to engineer because it's more about application. But I think that it kind of, it's good to have a foot in both camps. And so through the Institute of Chemical Engineers, I was able to kind of become a chartered scientist as well as a chartered engineer.

2081 [2018?] to 2022, you were Head of the National Digital Twin Programme. What, please, is the National Digital Twin Programme?

So this was born out of a recommendation from the National Infrastructure Commission. They wrote a report called *Data for the Public Good*, which is a really good report, and the kind of the drive of that report is in the name, it's about using data for public good. And one of the recommendations in there, one of the key recommendations was that as a nation we should move towards having a national digital twin. And so they needed to get that established, that recommendation was accepted by Treasury and a new centre had been set up in Cambridge called the Centre for Digital Build Britain, and so they gave the added responsibility to CDBB to drive this National Digital Twin Programme, and I became associated with that, I was appointed as the national champion for it. But what we had to do was kind of define what was meant by a national digital twin. And so what we headed towards was not one massive digital twin, one massive model of everything, but rather an ecosystem of connected digital twins. So, as you're asking, you know, what is a national digital twin, I think the simplest answer is just to say it's an ecosystem of

connected digital twins. And the potential of it is amazing, because the whole idea is to make a connection between the digital and physical worlds. Digital twins are particularly good at that, but there's all sorts of other infrastructure which goes along with it, like data sharing infrastructure, the connection into AI and robotics and the metaverse, you know, all of these are that kind of, that zone which makes a connection between digital and physical worlds. Digital twins are particularly good in that space, but I would say that they're all part of this kind of set of connected approaches and technologies which you can call cyber-physical infrastructure.

[00:40:02]

And who came up with this idea?

I think it was a joint thing, really, and certainly the recommendation in the National Infrastructure Commission report used the name, National Digital Twin, and so I think that when it comes to the naming of it, we should point to the authors of the report, and the lead author is somebody called Sarah Hayes. She's still very active in this space of advocating data sharing infrastructure. So I think maybe when it comes to the naming, it would be Sarah. When it comes to describing it and kind of turning it into something that can be pursued, we had to do the work on, you know, working out that you can't just have one, you need to have an ecosystem, it needs to be federated, you need to have data sharing between digital twins. All of that came out of the team at Cambridge.

That sounded like a good piece of work. But then you moved into Digital Built Britain. Is that a difference?

So the centre at Cambridge that had been established was called the Centre for Digital Built Britain, and that was already established. The work of the National Digital Twin Programme was given to that centre. And because I was Head of the National Digital Programme I was working in the Centre, and then at a particular stage I stepped up to being the Director of the Centre as well.

And it was then, it was for that that you got your OBE?

I'm not quite sure what the OBE specifically related to, because I guess I've been involved in infrastructure things for a while, going back to the Infrastructure Carbon Review, which was about ten years ago. I think that that was quite a useful thing in identifying how across infrastructure you can drive down carbon. It was before the drive to reduce carbon became super-popular, but it was very good, I think, to identify the systems-based solutions which are needed to do that. So I think that that was quite an early input into the whole of infrastructure. Clearly there's the stuff to do with the National Digital Twin as well, which again is across infrastructure, and in many ways it doesn't make sense unless you have a systems-based view of infrastructure. So there's a direct connection there, and I think since then I've continued to be involved in this systems-based view, and if I just expand that, I would say it was outcomes-focussed, systems-based and community-enabled. Those three things, I think, describe kind of where I work and how I work. And so that work has included developing a vision for the built environment, and more recently a shared understanding around the circular economy in the built environment. So all of these things are kind of in this space of built environment, systems thinking, and enabling that, enabling solutions like the digital twin thing, I think is an enabler of the solutions. So who knows what bits of that contributed into the nomination for the OBE, but I guess it was something in there.

Is the rather unsuccessful programme of smart motorways one of those examples where technology is applied?

Well, it's a really interesting one, isn't it? Because, again, I don't know the full details of smart motorways. I mean obviously we read about it and I know some of the people who've been working on those programmes. And I think that one of the things which comes across really, as really interesting in this space is that looking at the statistics, smart motorways apparently are more safe, it's just that people don't feel safe. And so you have this interface between humans and technology which is always interesting, you know, and earlier on, I think I talked about the kind of the socio-technical aspect of solutions, but it's never just technical, it's always got the human aspect. And I think that human and organisational factors are generally the hard part of technical and information-based solutions, because it's got to interface

with us and, you know, we're odd creatures, aren't we? And just because something makes sense or the statistics tell us that it's safer, if we don't feel safer, then we behave in strange ways. And so I think that maybe smart motorways have kind of fallen into this particular trap of the interface between the technical solution and the human behaviour of, you know, real life humans using something. So, yeah, it would be very interesting, wouldn't it, to kind of dig into and really understand the details of smart motorways, but as I understand it, that's kind of where the issue is.

And the politicians have backed off, haven't they?

Yeah. Let's not go down the political route here.

[00:45:43]

Right, yes. As I drive along the M4, as I sometimes do to go and see my grandchildren in Gloucestershire, I'm reminded of - and it's a good motorway, by the way, although it's a smart one, I think it's a very good motorway, I think because they've resurfaced it and it's a beautiful surface – but you're not in that neck of the woods, you're up in Cambridgeshire, aren't you?

That's right, yes, that's right.

But as I drive down there, I'm reminded of the first story that really made my bones as a journalist, which is about the relationship between humans and technology. And there's a dip in the M4, before one of the big bridges across the Severn, and it used to fill with fog, and so a system was developed in the early 1970s for the police to turn on a fog warning – common or garden now, but very special then – and it was installed, but one day there was fog in this dip and cars came into the fog, immediately slammed on the brakes, more cars came behind, enormous pile, people dead. And then the police inspector stood up at the inquest, said, but the computer was wrong, computer made a mistake. Well, I read that story and knew computers couldn't be wrong. So I pursued the story and for some weeks I had the designers of it, a little design company, running one way, blaming the police, too stupid to run the system, the police saying the system was too complex, the Department of Transport

saying they're all idiots, and I was just writing story after story. And instead of a fat man in a suit outside a pavilion on the M4, we had pictures of burnt cars on the M4, which was on the front of the paper, which was excellent. Later on, of course, they got their act together and after about three weeks I was called down to Bristol and then they'd worked out their line. But it is that interface that is the key. If you build systems that people cannot interface with properly, or don't feel safe using, it's not going to work, whatever you do.

Exactly, exactly. I think that is precisely the point. It's the interface between the technological solution and the humans that use it. And to my mind, the outcomes focus, that we've talked about a little bit, is the route to go to get to the right answer, because it's not about just providing a very clever solution, if it doesn't work, then it's no good and you need to be looking at the outcomes. And actually be driven by the outcomes, I think, that's where the starting point should be, is us working out what kind of outcomes we want and then relentlessly working together towards achieving those outcomes. And yes, technology's going to be part of the solution, but what it can't be is just technology being the whole solution and then expecting humans to fit in with it.

I'm glad you mentioned two letters that I wanted to ask you about, AI.

Did I mention that?

Yes, you did, sir, you did. Would you have, or did you sign that petition to pause the development of AI?

No, I didn't sign it, I'm nowhere near that kind of community to be asked to sign it or to be part of it. But I probably wouldn't sign it, just because of the kind of pragmatic point that irrespective of who signs that, it's not going to make any difference, because people are just going to carry on and do it anyway. And this is actually a little bit of an echo of what we were just talking about, of humans and technology. You know, human behaviour is such that if they can do it, they will, they'll just get on with it, and it doesn't matter whose signature's on a piece of paper, you know, that genie is out of the bottle and humans will keep developing it irrespective.

[00:49:33]

And it seems to me that this comes back to your issue about mapping outcomes, that AI is to a certain extent a technology in desperate search of an application, and they're going to apply it.

Yes, and I'm sure that those applications will come, they already are, and I guess now that there's more capability, all sorts of use cases will come along to make use of that capability. And, you know, it's interesting isn't it, how sometimes it works one way round, and sometimes the other way round. You know, sometimes you need a capability so you go and develop the technology to fill it. You know, it's a problem looking for a solution. But sometimes it is the other way round, where you have a solution looking for a problem, but you know, they come along. So I think with AI, there clearly are loads, millions of use cases already, and each day people are finding more. So I don't think we'll be short of use cases in AI. The thing which I'm in some ways more interested in is how it will be integrated into other technologies, because one of the things I said a few minutes back was that I rarely see technology as being a kind of a silver bullet, a single solution where it's all of the answer. What it seems more, is that technology needs to be implemented wisely, it needs to be integrated, and it's technology being integrated with other technologies that then ends up being more useful for delivering outcomes. And so it's the integration that I think is really interesting and important, and also, not just the technology but the information that the technology is serving. And then also, not just the information, but the people that are being served. So there's a lot of different strands going on there, it's not just, like it's definitely not just an isolated technology, it's integrated technology. It's not just integrated technology, it's the information that it serves. It's not just the information it serves, and just a little bit on that, I think that information as a carrier of value, that that value gets released when you make better decisions. So it's a lot about better decisions faster, it's like that's what the point is, that's where the value comes. But you only know it's a better decision if it leads to a better outcome. So there we are straightaway back at these better outcomes for people and nature. So I think all these strands end up being connected, and you asked earlier on about complexity, I think that we need to deal with that complexity, and particularly if we want to get better outcomes, we need to understand how these strands come together to deliver them.

What are you working on now?

Lots of things. So there's work that I do within the context of Mott MacDonald serving projects and clients. I'm a strategic adviser, so I seek to bring useful strategic advice to add value to our projects and clients. There's all sorts of interesting projects that I get involved in. Now for me it's really good that I can be involved in a number of different projects across a number of different sectors, so that does include transport and energy and water, and so I think that this kind of systems overview is useful in that space. So that's within the context of Mott MacDonald. As you would expect, working for an engineering consultancy, or an engineering and management consultancy, it has to be kind of project and client focussed. But thankfully, I also get involved in a whole bunch of stuff externally, so more around the industry. And a thing which I'm most kind of particularly keen on advancing at the moment is this systems thinking at a national level across infrastructure and the built environment, because it feels like we really need to be more joined up now. And I don't know if there's time just to kind of dig into that and where I hope it might go.

Please, please do. Yeah.

[00:53:53]

I think that we face a particular set of challenges just now that demand systems-based solutions, and so I think if we just look at the built environment as a system of systems – so I haven't described what that is yet, but I'll just do it very briefly. Within the built environment you have what's called economic infrastructure, so that's our energy and transport, water, waste and telecoms. So each one of those is a complex system, but they're inter-connected with each other and inter-dependent. So transport doesn't work without energy, energy doesn't work without telecoms. You can see how they're all connected. And you also have this thing now where you can have cascade failure from one sector across the other. You know, if you take out the telecoms, it takes out the energy, it takes out the water system. So that's just economic infrastructure. Then you also have social infrastructure: hospitals, prisons, schools, commercial, residential and industrial buildings, all of which depend on that economic infrastructure. And then there's also the interface with the natural

environment. So you get all those things together, and you talked about complexity earlier on, those layers add up to the built environment. And the built environment is this amazing thing that we live within and I think sometimes we don't notice it, because it's hiding in plain sight. But it's essential to society, you know, society does not function without this built environment working, as I'm saying, it's amazing, and connected, but it's now facing really substantial challenges at the level of the whole system, so clearly climate change is one of those. So to achieve net zero or to provide climate resilience, or moving beyond that to achieve a circular economy or protect biodiversity, you know, you can't solve that in silos, it affects the whole system. So we have these two very joined up things. You know, joined up built environment and joined up challenges to the built environment. However, the way we run it is in silos, we've got these big stovepipes and kind of a lack of co-ordination between the organisations that run it. And then also, in the data realm, the kind of the data's in a bit of a mess. And so you have silos of data and a lack of interoperability. So if I was just to characterise it, you know, very simply, you've got the joined up built environment and you've got joined up challenges, but you've got siloed organisations running it and siloed data. So we've got a problem and if we want to address those big challenges we really do need to be firstly, more joined up, but more strategic and more long term. And at the moment that's not how it is, so the thing which I'm most keen on doing right now is to advance systems thinking in the built environment, but actually not just systems thinking, also systems change, because we do need to change the system, otherwise we won't be able to address these big problems. And I think it sort of comes down to if we want to solve the problems, we'd better do something different.

[00:57:13]

And in a different way.

In a different way, exactly, exactly. It's almost like we've got to the end of the track of doing it the way that we used to do it, and maybe in the old days we could get away with it, because things weren't so interconnected, you know, it was maybe possible to try and run infrastructure in silos, because infrastructure itself might have been more siloed. But it's not like that any more, it's all interconnected, so we need more

interconnected solutions, and I think that we can see all over the place signs of isolated siloed systems just simply not working any more. And so, you know, a big example would be in health and healthcare, you know, where the important outcome that we want is better health, better health for the nation, that's obviously the outcome, it's about health outcomes. But the route to better health outcomes is not just by, for example, building cheaper hospitals. What we need is a whole load of different solutions which come together into delivering health. And so, for example, addressing air quality contributes to health in a big way, but it's got nothing to do with a hospital. And likewise, having transport options which provide kind of more healthy ways of getting around the place, and having people with kind of more access to greenery. All of those things really benefit health outcomes, but they're not to do with cheap hospitals. And so we kind of need to move into this space of seeing that what we actually want is the outcome, and then working out, how do we get that outcome from the systems that we have, and therefore we need to understand the systems better, we need to intervene more effectively. But I think that if we do this right, then we can do it in a much more cost-effective way. I've got some statistics which might help with that if you were interested, but…

[00:59:16]

Course I am, tell us.

Shall I go? Shall I go with it?

Yeah.

So on the healthcare side, just to kind of continue from that, just because I've started down that route and because it's, I think, a great example, apparently at the moment we spend something like 97% of the health budget on treating ill health and 3% on trying to promote health. Now, the BMA, I understand, have done a study, and they reckon that if you were to prevent the preventable illnesses, then you would save 40% of that budget. So those two numbers kind of don't stack up, of what we're actually spending our health budget on versus what we should be doing in order to have a healthy nation. And one of the things which becomes very difficult in this space is

that clearly we do need more hospitals at the moment, because we've got a lot of sick people, but where we need to get to, and it's a long-run thing, is that we need to invest in health rather than invest in treating ill health. And it needs a systems change, because if we just keep doing what we're already doing we drive ourselves inevitably towards more people being more sick and the bar rises for how sick you have to be to get treatment. So the incentives end up pushing us towards more ill health, and we need to flip the system and get to a place where we're investing in health, and yes, there will be some people who will have ill health, like of course there will, they're not preventable illnesses, but then there'll be more money to kind of pay for treating the lower proportion of ill health. So I'm just using that as an example. We could point to pretty much any other sector and you see the same kind of picture where if you start with the outcome of what we really want, you can see that there's a way of using the systems better to deliver those outcomes. So, going back quite a few minutes now, you asked me, what am I up to just now? What I'm up to is trying to bring together some people around these concepts of focussing on the outcomes. So outcomes-focussed, systems-based and community-enabled. The community-enabled is because we have to work together to make this happen, you can't do it in silos, so you've got to bring the people together, and I think that probably illustrates why I use those three hyphenated words.

And community what?

Community-enabled.

Enabled.

Yeah, so outcomes-focussed, systems-based, community-enabled.

That example of health absolutely resonates with me because I'm researching the history of the welfare state, and Bevan was talking about it, Beveridge was talking about exactly that, joined up. But basically what they did was nationalised the hospitals, that's what they did, instead of all the rest of it. Where were the health centres that were meant to be established, weren't established. And then of course, then somebody comes along and chips away at the local authority budgets and there

*are no district nurses and there is no that, and there is no the other. They just don't
see it as a system.*

Yes.

*I think to an extent – sorry, I'm going to stop in a sec – but I think to an extent the
very word 'state', welfare state is a mistake there, because we see something as a
solid state, but it's not. It's a system which has enormous dynamics within it. Very
good work.*

Exactly, sounds like I need to sign you up for this…

[01:03:12]

*I've got one last nasty question. What are the biggest mistakes you've made in your
career, Mark, and what did you learn from them?*

Hm, you're right, that is a nasty question. Erm… Yeah, I have made some mistakes.
I mean there's a couple that come to mind. One ended up being trivial, but it really
made me think, and the other is maybe more substantial. So the trivial one was that I
was training to be a civil engineer. As I've already said, I was kind of halfway
between two different types of engineering, but I had to do the civil stuff. So I was
setting out a carpark so that somebody later on could come in and put the blacktop
down, and I got it completely wrong and I had a very bad sleepless night thinking that
I'd got somebody to dig out an extra 300 millimetres of earth that basically had to go
back in again. So that was a horrible nightmare and it's the type of thing where you
just don't want to go there. But the thing was, I had to put my hand up to it, you
know, I made a mistake and I needed to own up to it. So I guess there's a lesson in
there. So that was the trivial one. The more important one, I think, is maybe from the
Centre for Digital Built Britain, because I think that we could have continued to
provide really good value if I'd spotted earlier on how the world works. And I guess
part of what I observed is that the way that policy works is not what I thought. I
thought that the way round it was, was that some very clever people come up with
policy and then industry adopts the policy and everyone moves forward and the world

becomes a better place.   But I don't think it does work like that, I think quite often it's almost the other way round, where industry does something useful and interesting, and then policy kind of backfits it. And so quite often the policy backfits it so well and so neatly that it looks like it came first. But I don't think it does. And I think that if I had realised that earlier on, then I might well have done things differently. But what it tells me, for now, and the way it informs me for what we're talking about in the systems thinking, is that we shouldn't wait until government comes up with a strategy for systems thinking and then implement that policy, because I don't think it works that way. I think that if we're waiting for that kind of systems thinking from government, we'll be waiting forever. What we have to do is get on and do something, and do something useful and interesting in industry and then government will definitely pick it up and then it will become policy, and it might do it so well that we never even realise that the policy didn't come first. But the important thing is to get to the better outcomes, so in some ways it doesn't matter, you know, I'm not pointing a finger and blaming anyone, I'm not saying that government isn't doing its job right, I'm just saying that if we want to get to these better outcomes, then actually we've got to start, we've got to do some stuff, we've got to make this systems thinking work. And I think that it's people in the industry who can do that. So yeah, it was actually quite a big lesson, but I hopefully am in a position to make something of the lesson.

And you've made a lesson for me and also for those who are going to access the Archives to listen to and to read your fascinating contribution. Thank you very much for your thoughts and contribution, Mark Enzer OBE. Thank you.

Thank you very much.

[recording ends]