KTN Silent Designers Episode 5 Mark Price Transcription FINAL

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Dr Steve Welch
Hello and welcome to Silent Designers, a podcast about the under the radar design activity which goes on in so many organisations, even though it's not seen as design or even necessarily done by designers. Each month we're talking to an expert guest to share their knowledge and the impact that design has had on what they do in their domain.
I'm Steve Welch from Innovate UK KTN and I'd like to introduce my co-host, Katherine Wildman, founder of B2B copywriting agency Haydn Grey.

00:00:43
Kath Wildman
Hi Steve. Thank you for the introduction. In today's episode of Silent Designers, we are going to be exploring the theme of net zero and sustainable technologies, and we're going to be talking to Professor Mark Price from Biohaviour, which is an initiative of Queen's University of Belfast, and explores bio inspired rules for innovative engineering design. Mark, thank you so much for joining us today.

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Mark Price
Well, thank you, Katherine, and thank you Steve. It's a real pleasure and I'm really happy to have the opportunity to chat over things of interest.

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Dr Steve Welch
Excellent. Well, how about we start easy and ask you to tell us a little bit about yourself and the area of innovation that you working in.

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Mark Price
I'm a Professor of Aeronautics at Queen's here. I'm an engineer by you know, my original training was in Aeronautics and I started my career off in the aircraft industry as a Stress Engineer, working out how strong and things should be. And as technology changed, and it has changed really rapidly in my career, I began to get more involved into design systems and computer aided design and using these advanced techniques. And I actually left the islands to come back and get a Ph.D. on computer aided engineering and then I went back to industry again for a number of years before I turned to academia as a more formal and long term career. And throughout that time, I've just been exploring interesting problems and trying to find out more in particular, how we can make things better and make things differently. It's, we've always found a really interesting challenge in engaging with companies and understanding the challenges they face, to remain competitive and to understand the new opportunities that technology changes bring. And as a consequence, we've just explored more and more of that. And, you know, that's why we ultimately find ourselves today exploring really radical new ways of thinking about how we enact the business of design in industry.

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Kath Wildman
It's interesting that you address the idea of problems and challenges Mark. My next question was to ask you if you could tell us why design is important, how you use design in this area, and why that helps with innovation?

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Mark Price
It's a really good question Kath. For me sits at the core of a major challenge we have, particularly in driving towards net zero and sustainability. In those early days when we started to explore manufacturing issues and how we, and I was interested in how aircraft were made at the time, my interests have expanded much more widely since then. But what we were doing, we were looking at new ways of joining metallic materials together. So, welding as opposed to riveting or other ways of folding and joining these complex ships. And what we started to look and find was that the design methods that were being used were based on older technologies. And so as new technologies came on board, we were only able to distinguish between them from a decision point of view. So how do you determine whether it's a good investment to make something in a new way or using a new material? And when you have safety critical systems and you know, things like that, these are serious decisions to make. So we then started to explore all their tools that would help us distinguish between different solution types, and really that leads you into a zone where you begin to understand that you know, the design process and the decisions that that supports are absolutely critical, not just for the product but for the business and organisation as a whole. There's a classic diagram that came really in the 80's that shows a picture of four or five engineers, I guess you want to call them, but people and a company. And that's the shadow that design casts over the rest of, and the decisions that you make in the early part of the design process. That drives more than 80% of your cost. It locks things in very early on, because you have to say that, I don't know a material or even a supplier or a machine or a factory, and as a consequence, you're then committed to that. And it's a very difficult to undo those. So the more you get involved in it, the more you see that to make decisions about your product and therefore what it's going to be like and how it's going to perform over the years really comes down to design and what you do early on. And that design is not just the product but the whole organisation and systems, because then, when you're setting up a design process and you going through that, you bring teams together and you decide who's making it, where it's made, how it's made. So design really percolates right through the whole organisation and that organisation's wider supply chain.

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Dr Steve Welch
So you and I, I guess share a formal background in more classical systems engineering. And actually there's quite a lot of language we use which is similar but not the same, but the concepts match such a lot. And I'm thinking it's really interesting what perhaps a design and maybe systems engineering we'd think of in terms of holistic thinking, and how relevant that seems to be in the challenge of addressing environmental impact.

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Mark Price
So we were all trained in the use of systems in engineering and for people that don't know, that's how we're solving problems, where you break it down gradually into tractable pieces. So, and then we reassemble this and we verify and validate. And that's been a really powerful mechanism for us to manage a complex process. Where it gets very difficult and where our research has led us to is that, the continual breakdown of the problem is constantly layering in constraints. And as you, that of course allows you to solve problems because you've constrained it to a point where you can solve it. But when you bring in new challenges, like trying to switch to be, you know new processes for net zero, for example, you find a those constraints can block off avenues for innovation and they make it more difficult to do it. So in fact, we've had to start to rethink that process and to try and seek other ways of achieving the same, you know, confidence and trust and management in the process, but giving you ways out and giving you other avenues to explore, to get new, less constrained solutions to the problems.

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Dr Steve Welch
Sometimes entirely new thinking. And I observe a problem in my town. I was trying to investigate why it was that they're still putting in mercury vapor streetlight rather than LED or other really low energy lighting. But of course the people who pay for installing the streetlights get their money from a different budget from the people who pay the bill for the electricity. So what's driving them is different, and that's why I'm so excited to really drive systems engineering and the holistic thinking to pull in the different system owners to try and get them to talk. And I'm also very interested in what I've learned from design colleagues about, well, in systems engineering, we would have considered the requirements capture phase where you're in those early phases about trying to understand your problem and your solution, and wondered what your experiences are there?

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Mark Price
Yeah again that's a, it's a critical part and in fact relates for me to the general principle of trying to set the design context from which you go then and solve your problem. And requirements are interesting because depending on the domain of application you are in, you have a different initial set of conditions. And as you observe there with the lights, there are examples of this across many industries. I really like it because we've got lots of things that are locked in by the processes and systems of the past, and particularly when you involve regulatory bodies and the requirements with certification, you know, and that really important aspect of ensuring that your product is safe and complies with all of that. So it's quite interesting because when you start to overlay those requirements, if you were to step back and look at it, you mightn't with a clean sheet of paper do the same thing. But requirements that both offer you, if you like, a shelter in the context of where you're operating, but they also can really constrain you and that will remain for us, I think a particular challenge in really understanding how we can explore new avenues for again back to net zero. And we have to be obsessed by that and we have to really see where we can open up these. And I was at a really interesting seminar workshop yesterday run by Eye McGee on simulation and the whole validation and testing and the regulatory environment that many industries set in today and some of that is based on what we knew from decades ago. And so therefore they're flowing in as requirements before you start. So you're given a

new challenge and all of a sudden you find yourself restricted. And that's a, I think, a particular challenge for us in how we manage requirements and how we flow that into the design context to allow you to explore new ways of solving problems.

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Kath Wildman
I think that's a really interesting point, Mark, and one of the things that makes me think is when you began integrating design into your own practice, did you start by seeking advice from experts? Did you embark on some self-learning or were there specific frameworks that you turned to? How did that start from that traditional education?

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Mark Price
I suppose you could look back and say that I planned it very systematically. But it really was an evolution Katherine. I got involved in a range of projects. And actually one of them was with a project initiated really by BAE Systems at the time, and it was about network and naval capabilities. And they were thinking very much about the systems engineering frameworks and how we use it. So coming in as a more, at that time, conventional or traditional engineering background and thought process, we learned a little bit more about those systems and we were exploring. In my case the involvement was around cost and how we cost in these dynamic environments. So we learned a bit there. And then as you learned a bit more by that and you were doing other research, you were bringing over that cost and value. So we started to look at, you know, lifetime costs and whole life costs and we started to think about, well, what's the real value of something? Because many of these requirements we talk about, some of them are quite quantifiable and quite clear and others are less so. So you have to start to think about how do you monetise things and give a, that kind of value. That's not always, well, don't always think it's necessarily ethical to do it either, but it's a way that the world works. And when you start to open up this space of thinking about the whole life of something and thinking about how systems interact, you need to explore different ways. And it was that gradual picking up then and looking at, okay, how do innovate, so when you innovate. You know, again, I'm an academic, so your inclination is to as I say, you get your scalpel out and you peel everything back layer by layer and you learn about other frameworks like TRIZ, which is a really clever piece of thinking that came from you know, a Russian, actually a patent officer, a really deep thinker. So you begin to learn about these systems and other frameworks and then you start to put… Again from an academic, you want to put some underlying foundational thought process or framework or theories, if you want to call it that, to the work that you do. And when you get those foundational principles, it starts to open up other avenues. So if see there's a process there that leads you to explore opportunities. You peel it back, you make sure you are understanding foundational principles and then you explore more things. And it just iterates Katherine, you know, you just expand out more and more until you start to ask questions of yourself, why am I doing it this way? What's my benefit? What's the benefit to those work and why? What's the benefit to the organisations you're trying to deliver for? When you ask those questions, you just have to keep learning and learning and learning and trying new things all the time.

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Kath Wildman
Sounds like it's never dull.

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Mark Price
No, it's certainly not.

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Dr Steve Welch
I think it also suggests there's a role for being aware of not just rules and regulations and the impact to regulations, but also the potential for regulations to drive behaviour. And so how we can work together with organisations like Innovate UK, but others to try and affect how regulations, whether it's relaxing outdated regulations, or considering how the need to meet certain targets could then drive innovation where businesses would otherwise only be aiming for a profit angle.

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Mark Price
Yeah, I think that's right. And I don't know, you know, if you're finding that as you talk to people in different sectors and different backgrounds, I think that's really true. And it's not so easy to unpick because the, you know, many regulations are there for a very good reason. People typically don't go out and meet them up to try and stop people doing things. They're there for, for safety or whatever it is, or the health of the organisation if it's a local thing. And I think that's quite important for us to understand that context in what we're doing and to unpick it. There's a really interesting problem. I think we were talking about this, this week in the different domains, that lots of regulatory authorities really like physical testing at the end, so prove that it works, show me that it's safe. But it's hugely expensive and there's a complex system built up to try and allow that confidence of the regulator then can have to say, okay, I trust what you've done. I trust that this is correct and therefore you get your certification from it. But if you look at some of these, it's a very small number of tests that go on. So, you know, we as a community in engineering and science in particular, and technology, we use simulation a lot. What you find this… I don't know if it's a human behavioural thing, but you know, many people will not trust the simulation but they will trust, you know, a single test. So you might replace, you know, lots of information with a very small amount of information. And I think that's the challenge that we have in doing that and working with ourselves as a community and actually with the regulators to ensure that we can maintain that, you know, give that confidence and give that trust that the product will do what it's supposed to do and it will be safe and it will work well. And, you know, the business is confidence that it will sell well and so on, as well. So you get everyone happy, really drives behaviour it, absolutely does. And it makes it then very difficult to reinvent or change things.

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Kath Wildman
The wonders of human nature. We're coming to the end of our time today Mark. Thank you so much for being here. I know that Steve has one more question we'd like to ask you.

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Dr Steve Welch
Well, so listening to all that, it makes me feel like this is a cruelly hard question then, but as an innovator, what one piece of advice would you give to somebody wanting to incorporate design thinking?

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Mark Price
My one piece of advice, Steve, would be to unpick everything and be prepared to question all of your processes, but just unpick it piece at a time. And when you do that, lots open up. So we we've done out in our research and that unpicking has led us to instead of going from top down, we go bottom up and we're now exploring how to create new products and new processes and systems, you know, using these bio inspired systems, which we're really, if you can imagine, analogy of growing things like a plant. And that's the way we are creating our products and systems now. But it came from exploring everything and just unpicking each piece by piece.

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Kath Wildman
Thank you so much for sharing your time and your insights and advice with us. It's been fascinating to hear from you.

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Mark Price
And thanks very much to both of you. It's lovely to talk about that. I probably could have spent all day, but it's really nice to be involved in the community and to be able to chat with people who are exploring new things. So thank you very much.

00:20:34
Dr Steve Welch
Excellent, thank you again, thanks from me too. This podcast has been produced by the Design in Innovation Network, which is supported by Innovate UK. If you want to find out more about design and innovation and gain access to other interesting people, just sign up to the network and we'll see you next time on Silent Designers.