I'm the Chief Technology Officer at Oxford Nanopore Technologies, and what that means is, I guess, I'm in charge of all the technology. I've got most of, if all of R&D reporting to me. And I'm one of the senior management team. The story of MinION is quite a long and complicated one. And there is... quite a number of factors went into it. Some of them are technical and some of them are business related, and I'll describe what they are. I looked at our product design, and I thought, well, what's the simplest possible thing that might work? So if you get rid of fluidics, you get rid of pumps, you get rid of this, get rid of...

take out, that that out, da-da-da-da-da. When you put just bare essentials, you end up with an array of holes and some solid state electronics, all right? And some computer, and that's it. All the other stuff, the off the shelf micros... all the other stuff that people put in, and the cogs and wheels, and the pumps, and in particular, fluidics particularly problematic. All that stuff. We can get rid of all of it and really simplify it right down. And then you think about how big it can be. Then what's the smallest possible thing I can make? And if you just dare to think about it, it's actually really, quite small.

This is what we ended up with a few years later, and it's not that different from the product concept. It's probably twice the size of what I imagined. And it's an aluminium case, which is mostly for heat dissipation reasons. The electronics produce quite a large amount of heat. And as a single-board computer in there. Against all custom designs, our circuit boards have our company's name on it, not somebody else's, because it's all custom, designed in house, and there it is. And as the only moving part and there is a fan. Yes, I mean, who would benefit from this technology is an interesting question, and we had that in mind when we designed it. I mean, we are basically targeting everybody.

The sort of company motto we came up with is anybody can sequence anything anywhere. And yes, I mean, they're obviously doctors, and medics, and GPs, and soldiers on battlefields, farmers, people in industrial biological processes, people at home who were just curious or interested. You name it. I still think MinION is an in-between device. it sits in between the lab and the field. All right. It's not quite one thing or the other, but it has got people using it outside of the lab. To make it fully portable, we have to get rid of the sample prep on the input. You have to just be able to touch it to some biology, probably liquid to start with.

And then for it to do everything on board and be exquisitely sensitive, and we're working on that. But eventually, yes, a doctor. You go to a doctor, for example, not a particularly exciting application. But go to a doctor you'll have a cough or something, and he'll just take some spit and touch it, plug it into his computer, and then after a mere 20 minutes, he will know what's in there. And, in fact, my dentist is very keen on this. He keeps mentioning this. I've given him a MinION. He hasn't even used it yet, but I'm getting him warmed up for it. So they want to have a look toward my teeth, for example.

They need to know what the bacteria are that are causing the infection. And it does apparently impact what they do next. And they'd love to, while they've got you there for an hour or so, while they're doing your root canal or whatever, they'd love to be able to just take it and test it, and just get a list of what's growing in there. All right? Apparently it's really quite significant. And they'll easily pay 100 pounds for that with that kind of test, because the overall treatment can be 1,000 or 2,000 pounds. Where is the technology going, and how might it impact digital health in the future? And I think...

so I mentioned the MinION is sort of an in-between device between sort of demonstrator in a way, but it's still quite useful. What people want to do, really, is have something like this. And here's a device they've been designing for a while called SmidgION, and it is basically a small MinION, but it's entirely run by a mobile phone. And we have software already that will answer biological questions, like what is the bacterium, what's the virus, how much is there, have you got this mutation? And it's quite easy to do on a mobile phone. And I've got pretty much the same electronics as the other devices in here, and a much smaller, simpler flow cell.

But for that to work, it has to be something that you can do a liquid biopsy on, by which I mean you can sort of touch the device to a drop of blood, or some spit, or some wound pus, or some of that stuff you get in the bottom of a tray full of prawns. Right. You can touch it to it and then everything happens. So there's zero lab equipment. And the idea there is to democratise liquid biopsy, because at the moment liquid biopsy is very hot. What does that mean? It means that from a drop of blood, it turns out that, or spit, or something else, urine.

It turns out that you can measure a lot of what's going on in the body. So new cancers, viruses, infections. Again, a lot of it can be traced and tracked through your DNA profile, because all these cells, they all share DNA, and the DNA often changes when your diseased. So the idea is you can measure what's in a drop of blood and you know what's going on. Liquid biopsy. That's fine. At the minute, that is still the supercomputer model. It's still large centres and people sending large amounts of blood off in the back of lorries, trucks, vans to places. And they get analysed, and eight weeks later, the report comes back to your GP. It's still not good enough.

So our ambition is really to democratise liquid biopsy so anybody can do it at any time on a very cheap device like this. That's what we need to get to.