Running Headlong into the Future

Communities in Control Conference
Melbourne, 30 May, 2016

Presentation by

Jordan Nguyen
Futurist, biomedical engineer

This is me when I was very young. The idea of what technology can do for us all set in really early for me. So I thought I'd share this with all of you today, and if there's some really burning questions you can throw them out at me otherwise we'll do Q and A at the end.

I want to show what technology can do for humanity and I realise that right from the start, right from the earlier childhood for me, I realised that technology is going to change and advance and we're not going to be able to stop it.

So if we fear it then we let it take hold but if we actually learn to understand it then it's not so scary anymore because we start to figure out what it is out there, what's happening in all of these fields and how they can be applied to benefit humanity.

So this is me when I was young, I clearly had lots of toys. My Dad took some of my toys, the Duplo blocks, you know what these are? Like giant Lego. He took these into his work for this robot to play with.

Now, is anyone scared of robots? Don't worry about it, you can put your hand up if you are a little bit worried about where robotics are going. This is good, okay, I'm not seeing any hands.

Because I had my toys when I was young taken by a robot, I should hate them more than any of you. But what I found was this was a giant pillar, it had a claw out the front and it had a camera above facing down and it had another camera in its claw and so this is what my Dad was working on.

They had a conveyor belt out the front and they put my Duplo blocks on it and as the Duplo blocks moved this claw would follow and then it would go and pick up the block and move it somewhere else.

Now, there's a lot to program into a single robot to do that because unlike us it seems like a simple task but for a robot it has to figure out the size of the block, the shape of it, how far away it is. It's got a perceived size of it which is different to the actual size of it, it's like looking at an object in the distance, you can see a tree and it looks this small that doesn't mean it actually is that small.

Same thing for a robot, it has to figure all that out, then it has to know what sort of velocity it's travelling at, where it's intercept point is going to be, how it's going to move down and pick it up without teleporting because it can't do that so it needs to know how fast it can move, its own real world limitations.

Now instead of programming all of those things into this robot they programmed in artificial intelligence instead, so what it learnt to do was to try and fail and then try again and fail and keep trying and the interesting thing about robots is they're not afraid to fail, that's something

we can all learn from. So it'll just keep trying until it gets it and what it would do is it would update its idea of how this whole system works.

Now it picked up the Duplo blocks reasonably quickly and started moving them around then the threw a bit of a curve ball at it and they put a Duplo block horse on the conveyor belt and the horse moved along and the robot followed it and then it started shaking and then it just shut off, the whole thing shut off, it's kind of like it's way of running and hiding.

But what happened was it actually just couldn't figure out the shape and it was just too much of a load for the system. So it tried again, tried again, it kept shaking, then it had a go and it missed and when it completely missed it went into the bar underneath the conveyor belt and broke its claw, so you can see a good old engineering tape here, fixed it up and they had another go.

Eventually it picked it up and this was really interesting because what I was seeing was a robot that was learning for itself and right from a young age I could appreciate the fact that I was watching this learning process.

Now it's not that scary when we think about it because what we hear about artificial intelligence is a blanket term, it's about as blanket a term as art, there's so many different ways of creating AI and there's so many different types of AI that aren't very scary, they just learn a single thing by repetition over and over and over so that they can make simple repetitive tasks easier or you use Siri on your phone and Siri learns your voice better, learns to service you better.

We have AI all around us all the time and most of the time we just don't realise it. The one that most people are more scared of is called a general artificial intelligence, these are the things that will learn for themselves and become somewhat curious. I'll go into that in a little while.

Now what my Dad was using all of this for was not to make robots that could pick up blocks and move them round, not even to play games, even though that's what this one's doing here. It was playing Chess; all the pieces were printed on the top.

It was really funny actually the way it played Chess, it had a bit of a personality to it. If it took any of my pieces it would pick up my piece and take it to the side and then just dump it and then it would go and pick up its piece and carefully place it in the position that it took.

But it's funny because that had a bit of a personality to it, it wasn't programmed into it, the funny thing is with a lot of robotics we project a personality onto it, it's called anthropomorphism, we will actually see human traits in it which is really strange because if you've never been face-to-face with a robot of any sort you might not realise it but when you are you can actually start to see them having some form of human trait, especially if you name it, don't name it if you don't want to see that.

So what they were using this for was actually really interesting. My Dad started going into a lot of research into diabetes and I ended up working on this about 12 years ago now.

So he was designing a non-invasive diabetic monitor for Type 1 diabetes and the interesting thing there is the translation of artificial intelligence from this into the medical device was very well linked. There are links between all types of technology that we could basically take two completely different technologies and find links between them.

So what he was doing was he had a strap around the chest, you know, like those bicycle heart trackers, very similar thing, it was taking all the parameters straight off the skin. Now for any diabetic they need to check their blood glucose levels throughout the day to find out whether their blood glucose levels are high or low because we have this happy band that we're supposed to stay in and most of our bodies regulate that if you're diabetic it does not.

So what happens is they take the blood throughout the day and then put it into a system which measures your blood glucose levels.

What he was trying to do was to find a way to get rid of that system completely, put a bicycle strap around the chest and have the parameters sent to a device and the device would be able to calculate the blood glucose levels and it did that through the same type of artificial intelligence, it would look at what those parameters looked like then it would compare it against one that's already been measured, so it would constantly try and find the relationship between those parameters, blood glucose levels.

Eventually what they had was a strap, they could just continuously give you your blood glucose levels without having to take any blood throughout.

And so that's really great for night time use because for certain diabetics it can be very difficult trying to go to sleep at night because if their levels go down and they go into hyperglycaemia, if they go down too far there's been recorded cases of people waking up in the night not being able to move even though they've got jelly beans in reach and that's what they need to bring their levels back up and if it goes on for too long they can fall into a coma.

So it's really interesting seeing that type of relationship from robotics and AI of a robot picking up a block to having a new form of measuring blood glucose levels for diabetics. So there's a lot of links in these things.

For me, I started looking at how I could potentially go into this field.

Now I was really interested in virtual reality from the late '80s early '90s, I was interested in robotics and AI, I didn't actually really have much of a clue what I was doing and what I wanted to go into.

So after high school I took on electrical engineering hoping to get into it, I was suffering in that course, I was barely passing my way through, almost dropped out at the end of my second year because I didn't think I was cut out for it and then because I managed to pass my subjects I decided to give it one more semester and in that semester I went to a backyard pool party.

We were diving off this diving board, it was a little bit smaller and dodgier, we were diving off this diving board into the backyard pool all afternoon. It's the first time and only time I've ever seen a diving board in a backyard pool, probably why. I ended up being a bit creative with my dive, ran and jumped off it and it moved back as I dived off it, I went straight into the water not knowing which direction I was going in until my head hit the bottom of the pool and snapped to the side.

Now I felt this massive crunch in the back of my neck and the first thing I thought was I'm never going to be able to play tennis again which was the only thing I considered myself being good at at the time. And so I came up to the top of the water and started trying to quickly move my arms, they could move, my legs they were okay, my head was kind of bobbing on the water a little bit.

So I had to get out of the pool holding my head, went up to Mum and of course got rushed to hospital because I couldn't hold my head up without my hands. This was the x-ray that came out of it; luckily there were no breakages, no fractures. But when I got taken home and put in bed I had this shock of pain as soon as I lay down, this shock of pain from my neck all the way down my back, it basically froze muscles, I'd torn a few muscles as well and suddenly I was stuck and it was one day, one whole day of not being able to move, not being able to roll over.

I'd wake up from the pain, every time I'd fall asleep I'd wake up from the pain, I remember I kept thinking this is like those days when you're in sick bay at school and you shouldn't be there, it's just all in your mind and I keep telling myself to just get up and roll over and I find I wasn't able to.

So that started to change everything that I thought about the world, I started thinking very differently and what I looked into when I realised I could walk the next day was disability, I had no idea about disability in any form. I had a couple of mates who, when I was thinking about it, I didn't even realise when you know the person for who they are, people aren't defined by their disability, because I actually I didn't think I knew anyone with one.

But I started looking into it and what I found at the time was 1.4 million people living in Australia have severe or profound disability; one in five people have some form of a disability but 1.4 million people with severe or profound disability. I started trying to put that into context for myself because I couldn't even think of that number.

I found out that we meet between 10,000 and 100,000 people in our entire life yet 1.4 million people who are in Australia living with severe or profound disability, it's like where are these people who I'm not meeting or I haven't seen so I started going out and seeking it out.

Now what I found was I looked firstly into spinal cord injuries then I started meeting people who had what was called locked-in syndrome, never heard of it my life and I'm sitting there meeting this lady who is communicating with me through her eyes, through her husband who's watching her eye movements and he's using this system that goes across the vowels because they're quite evenly spaced across the alphabet.

So she'll look up and he'll go one, two, three and then she'll look back so he'll go, okay, so that's, a, e, i, go across the vowels, she'll look up again and then he'll go down the individual letters from i, and so he'd put these letters that would turn into words, that would turn in sentences and it'd take minutes to get out a simple sentence.

So I started thinking, okay, that's communication how about getting yourself around, that was the one that I was thinking of, how could you potentially control a wheelchair.

What I found out at the time was there was the joystick, obvious a joystick on a power wheelchair, if you move that to the chin it's called the chin stick but you still need a good range of movement to your head and then beyond that there was the sip-and-puff method which was a tube that Christopher Reeve used and that was a tube placed in front of the face where you sip from or puff into the tube using two different pressures each way, that supplies four controls to the wheelchair.

Now when I ended up seeing a kid's place for rehabilitation I was finding even children with their high brain plasticity, even children after months of using this system were still crashing, so that's why I started setting myself this new challenge.

I started thinking completely differently about what I would study and I started moving it towards biomedical engineering. I thought I want to find solutions and see if technology could potentially find a new answer and find more ways to do things like control your mobility device.

So this is what I created and I actually drew inspiration from the robotic side, from the artificial intelligence side and then learnt a lot about biomedical, so started learning about how the brain works.

The fact that we are an electrical system is kind of cool, coming from electrical engineering that made it easy for me. So what makes all this magic happen is our brain sending electrical signals down our body through our arm to every strand of muscle fibre within a muscle to make it contract, so we're still an electrical system, we kind of operate almost like electrical appliances except on much smaller voltages and that's why I started going into creating this.

Now this is a smart wheelchair, the wheelchair can see and think for itself, it uses cameras to perceive its environment so that can help with the navigation and it's able to help find its own way round. It also came with what we developed, it's called a brain computer interface, so this was a couple of electrodes, you place it on the head and it closes, it completes the circuit.

So what we do is we pick up on these tiny little electrical brain activities, we amplify them, it's very much like strapping an electric guitar to your head, except smaller. We take that electrical activity we amplify it so it makes it bigger, louder, then we filter it and it makes it sound nice and then we transmit it into the wheelchair.

And then I designed artificial intelligence algorithms which could just learn to figure out when you were thinking controlled thoughts, it doesn't read your mind so before you ask if you're sitting in this chair and you see a cute girl walk past, no, it doesn't just take off and follow, doesn't just read your mind.

It figures out when your brainwaves look like brainwaves that the system has seen before, so you show it I was thinking this thought at this time, when I think of this thought I want it to go to the right. For me I started with very obvious things like obvious mental activity, things like thinking about a Rubik's cube because that stimulates part of the parietal lobe.

Every time you think of a Rubik's cube you imagine it on the right side of you, so every time you think of the Rubik's cube the system goes, oh, I've seen those brainwaves before you're thinking of a Rubik's cube you want me to go to the right, so that's how you were able to steer it.

I think I've got a video in here, yeah, I made friends with it, you know I said don't name it, I named it Tim and me and Tim are good buds. I had this wheelchair everywhere I went and it was heartbreaking when I left it, but anyway.

So this was the idea, I put these two different systems together, the brain computer interface, the robotic wheelchair and that made thought control possible over a smart wheelchair because it allowed you to tell it where you wanted to go through your thoughts but then it also allowed the wheelchair to steer itself and make sure you couldn't crash.

So kind of a model that on the - it's also wireless so it's kind of cool. And this is a friend of mine Albert, he broke his neck in a motorbike accidents about four years before this and so as soon as he saw it he wanted to have a go so I got him to be our test pilot, he picked it up 10 minutes and started steering it through obstacle courses.

Now the idea is all you have to do is associate those thoughts with directions and then it takes over and makes sure that you don't crash. But here are the things, it really starts to draw -

there's so much I learnt from it all, it draws on all of these big areas that we're kind of scared of without really knowing the details behind it.

So robotics and artificial intelligence, yes, we've seen it all in sci-fi and that's where our reference point is, we know of Terminator, we've all seen I, Robot. I grew up with this guy, does anyone remember him, Johnny Five and Wall-E was actually very much modelled on Johnny Five in case anyone hadn't noticed that.

And that's when I realised you can actually feel emotions, you can somehow feel empathy for a robot even whether it's animated or if it was in a movie like Johnny Five. I went crying to my Mum, I was young, I ran out crying when he got hit with an axe, I mean it was terrible, or when he got blown up, poor thing had so many terrible things happen to him.

But that's what we start to associate, we realise there are differences, if you watch Wall-E you feel human emotions for something that's not only a robot but it's an animated robot and you sit there - did anyone cry in Wall-E, there's five people and me, but that's the interesting thing, this is what drives some of these innovations, a lot of it is centred around people.

I know that we sort of have those ideas because certain people who fear the change will talk about robots coming and taking all our jobs and then that will spread and then the fear of it spreads without finding out the details behind why people are creating these robots.

Yes, certain jobs are going to go to robots, a lot of them did through industrial robots, things that were able to do the same task over and over and over again, 24/7 and wouldn't complain. But what we have coming out soon, we've got robotics that can hold up conversations and these things are going to come along this year. We've got Buddy, we've got Jibo, Jibo's the little guy with the eye, he was created - he very much looks like the thing from Wall-E, it kind of looks like Eva and we've got Pepper, Pepper can, I think it's coming out - probably get this wrong, I think it's coming out of Korea but don't quote me on that.

Pepper can hold up a conversation and Pepper can also tell what sort of emotional state you're in, so if it's telling you a story you're not very interested in it will probably change topics.

And iCub is another project that's trying to work out whether we can put AI that's human, you know, human type of learning into artificial intelligence. I'll tell you what, I won't lie, it's kind of creepy when you see a baby robot looking at its hand and moving it and trying to figure it out, it's learning that that is its hand, is learning environments around it the way that human infants do.

We learn about our difference between us and the environment from a very young age, we pick things up, we hit them, we learn the physics of it, we figure out what is us and what is everything else.

But these things all have purposes to them, they all have purposes and, yes, a bunch of them are going to go into military, we can't stop that, but the more that we know about it and the more we know what can go into the good areas, into the areas for our communities.

The thing is these things are all getting cheaper, faster and smarter and so we can find those gaps. So I personally, obviously like I've said, I personally look for everything that can go into disability, I start looking at how disability can benefit from it and then I decided, well if I'm learning about all these technologies I really need to start sharing that as well because that's a big thing, once you learn about it and you start seeing how it can potentially, positively influence lives you need to share that so that you can find how other communities might benefit from it.

So robotics and AI are two separate things. So artificial intelligence is a system, they're programs that can learn for themselves, they learn in many different ways that have been modelled on nature or modelled on us, so I tend to use neural networks, we learn through repetition, neural networks learn through repetition, that's how I got it to learn the brainwaves.

And robotics tend to just be a physical form for the artificial intelligence to go into. Generally they're only learning specific things over and over and over, a simple task, they're very hard to even get them to do that.

So as we move on, who's heard of virtuality reality? There's quite a few of you. Who's heard of augmented reality, quite a few less? Now we need to know about this, virtually reality/augmented reality, these two things are going to become 150 billion dollar industry by 2020, so we need to know about these things, they're becoming very cheap.

Virtual reality, if you've got a mobile phone you can basically put it into a cardboard box, strap it to your head and suddenly you've got virtual reality because your mobile phone has so many different senses packed into it, it can figure out how it's moving, how it's turning.

So if you've got it on your face and it's got a display and it's a high-resolution display you put a few lenses in front, as you turn your head it'll turn with you, it'll change the screen with you, so what it makes you feel is like you're in a virtual world, like you're actually there.

I have a demonstration set up outside near the bar for anyone who is interested afterwards, you can come and learn how art is changing and how design is starting to change because these things are going to change the world.

There's so many different ways that creativity can come out and what we've got over there is a system that really isn't that expensive considering it's only just starting to come out, but you'll find yourself holding a paintbrush which is a hologram paintbrush, you'll be holding a hologram pallet, paint pallet and you'll start to paint but you can paint in the sky in three

dimensions and then you can walk around what you've painted, so it'd be pretty interesting to come and have a look at.

Now, these things, of course sci-fi again, many different ideas that will bring up how virtual reality/augmented reality might go, hopefully not towards the death and destruction of the matrix which took into account everything, virtual reality, robotics, artificial intelligence the whole lot and it formed quite a bit of the doom and gloom of it.

But the idea that we can go into the virtual world, that we can basically close that gap between us and the digital world it's really interesting when we start to look at how these things can potentially benefit us. It's a whole new way of storytelling, huge new way of storytelling and this interesting for communities because I've seen it plenty of times where you can't empathise enough for the person unless you put yourself into their shoes.

Try putting yourself into someone's shoes and seeing through their eyes and when I say that I don't mean it's a good idea to, you can actually do it in virtual reality.

So this guy Chris Milk, he tried it in the States where he wanted politicians to see what the life of a refugee looked like. So he set up this camera system so that the politicians could basically put on a mobile phone in a cardboard box onto their face and suddenly they were the refugee and they got to see what the life of a refugee is like as if they were there.

So if they look up they see the sky, if they look around they see everything as if they're there, so it's a video playing out around you and it changed the way that they thought about the whole system because it was no longer a documentary where you've still got that screen between you and the story, it was putting the people right into the story.

So this top left image is exactly addressing that, we've got a guy in a wheelchair, we've got a girl who's walking and both of them are having their eyes switched so they're getting to see what the other person sees, it's a really strange, really strange system and you can't actually describe it, you can't possibly understand it until you try it. We've got the top right; we've got phobias, so people addressing phobias.

If you can ease yourself into it and this is really interesting because my Grandma asked me about this, so I put my Grandma through virtual reality when I first got it and I knew there was this point in the experience where she'd find herself on the top of a building and that terrifies you.

If you're scared of heights you can tell yourself all you want that that's not real and it'll still terrify, so I took the oculars off her head before she got to that point, I didn't want her to have a heart attack. So what I said to her was none of this is real but how did you respond and she said it felt real, she was in these rooms she was looking round, next thing she's in the forest, next

thing she's floating through space and your brain tells you that it was a lot longer because you're not used to just teleporting between all these different places.

Now the funny thing was my Grandma was the one who asked me about it because I got it right at the start, she was the one who asked me about this, she said I am deathly terrified of spiders and I said I know that Grandma, I really know that, there was one poor time where she pulled down the blind, poor thing, a huntsman fell out and landed on her face.

My Mum turned up two hours later for lunch and my Grandma was still there staring up, completely petrified the spider had gone down and run off and she was there stuck in that same position. So I know that sort of fear that my Grandma has of spiders and I used to be arachnophobia too. I talked to her about it and I said, when she asked me could this potentially address my fear for spiders and I said probably not because you know it's real.

And then I tried a virtual experience where I got to watch a spider, which I knew was not real, walking up my arm and when it got here I threw the thing off and shook my hair and it's because your brain makes it real.

So what they started doing was they started looking into this and getting people to address their fear of things like spiders, so in this experiment they take it that little bit further and then the person can feel it as well because they'll put something on their hand where the spider actually is.

Now they can start to ease themselves into the concept so quite often will do things like start with a very animated spider that's very friendly and speaks because suddenly you attach a human emotion to it and it will speak to you and he's very friendly and then it would slowly become more and more like the spiders that we actually live with and eventually you're just no longer scared of it because you can move it round, you know that the threat's not there even though half the time there isn't threat, but you know that it's not there and that it's not real but over time you can ease yourself into it, really interesting what you can do with it.

We've got the bottom left; we've got treatment for chronic pain. Has anyone heard of phantom limb pain for amputees? So in the past we used to use mirror box therapy where they'd set up the boxes and mirrors and the person will put the arm that they have out and as soon as they would see from their perspective that they had another arm based on the mirrors, which was of course doing the mirror of what their other one was doing, suddenly this phantom limb pain from the limb that they don't have would go away and so that's why they used to use mirror box therapy for it.

Now we can simply attach some electrodes to, sorry, electrodes to the arm that you don't have to figure out what signals your brain is sending to the hand that you don't have, put a virtual reality device on you and in the virtual world you have an arm and a hand and it's doing

exactly what your brain's trying to tell it to do and again the pain goes away, so very interesting treatment options.

And in the bottom right we have a guy who couldn't make it across Australia to the live birth of his daughter so they put him in this system where he was able to be there and see, look around as if he was there, obviously it's a technological patch, he should have made it but he couldn't.

So it's very interesting how these technologies and what sort of role they can play in our lives and the fact that they're not that expensive, the fact that most people have a Smartphone and any Smartphone will work with a couple of cheap lenses and a cardboard box it's surprising what you can achieve.

Now the future of humanity, what do I mean by this. I'm starting to see how the younger generations coming through are understanding the world around them. More than any other generation before the younger generations today understand what is happening in the world, they see the problems and wonder why there aren't solutions to them.

And so we're finding that through that ability to innovate, we've all heard of innovation obviously it's a hot word, it's something that gets thrown around quite a lot, but really that ability for young people to innovate and to start creating solutions to the problems that they see without that fear of failure, without that fear of things going wrong, of knowing that they're going to learn from those failures, knowing that they can learn and move on and iterate, if they stuff it up you learn something do it again.

Now what I'm seeing is some incredible innovations coming from the young people. I've been judging different technology competitions for a while now.

Now I was judging in Year 9 at this time and I couldn't help but be drawn to the Year 5 category, Year 5 category where these two girls had learnt to understand how those virtual reality devices work, basically what I was talking about, strapping your mobile phone to your face.

Now they understood that they like reading books but a lot of the kids around them don't, so what they decided to do, because they know about heart disease, was they wanted to teach other kids about heart disease as well and they wanted to do it in immersive way, something that other kids would really enjoy.

So what they did was they created a virtual reality experience, they accessed free software online called Unity, it's a game development environment that you can create all sorts of three-dimensional objects.

Then they created all of their 3D assets, so these are basically just 3D models on a computer, in another free piece of software. What they designed was a 3D model of a heart and blood cells and everything that went along with it, then they composited it in Unity, so that means putting it altogether kind of like a jigsaw. And then you can put the Oculus Rift on and what you would find yourself is inside the heart watching all the blood cells going by and you felt like you'd been shrunk down like the movie Inner Space.

Inner Space, where this guy gets shrunk down, put into some little capsule and then he gets injected into a person and he's flying around inside that guy's body, yeah, it was very much like that.

I found myself in one of the heart valves watching all these blood cells flying past, really interesting, and these girls came up with it in Year 5 and they created it. And then they made a whole website to go with it where they gave online tutorials and they were helping other kids to understand the problems about heart disease which is obviously a very important topic, the statistics, what's happening with it and how it can be potentially solved.

Now this is really interesting because it's not just them, what I was finding in these competitions is young people who have been given the option to create, to learn to collaborate and teach each other, it's a whole new world starting and this is very, very interesting because what we were finding was these young people were all going off and finding environmental or social issues even though they've been told you can design whatever you want, if you like skateboards design an App on a skateboard but we're not seeing those.

What we're seeing are kids who are wanting to solve the problems that we have either caused or have not been solved and I think that itself is very inspiring.

I have a start-up called Psykinetic and this is where I take all of these different designs, all of these different ideas of where technology is going and I apply it back to disability.

So further on from the smart wheelchair I decided that there were many, many more links that needed to be brought to the disability sector and I thought it needs to be exciting too, why not make it look futuristic.

So we've been looking into eye tracking devices that are external that can go onto your laptop and track your eyes externally, they're now so much cheaper than they used to be, they're now retailing at about $200 but they can completely change lives.

This family have a kid who's 2-years-old, Isaac, they found out that he had high level cerebral palsy and might never walk, might never speak but we found out he was really bright by getting him to solve problems through his eyes.

And so we found out not only could he solve all these problems really quickly but he could understand us, we said look at the horse, he immediately looks at the horse and so the parents suddenly had a measure on how bright their kid was.

They always knew intuitively that he was smart but because he couldn't communicate with them in your conventional methods they had to find a different way.

And this is young Riley, I think a few of you will recognise him; this is when I first met him two years ago. He came in, he loved technology, he wanted to have a go at virtual reality and see what the other side of the world looked like so we gave him a virtual tourism experience and, like I said, when you look around it's almost like you're there because travelling for people in Riley's position very difficult so they have to really plan out every bit of their trip.

Getting to see what Greenland looked like was great for him, getting to see what different places in the world was like, he loved it and you can see it all at the drop of a hat very quickly, very cheap.

So this is where technology's taking us. I of course thought of Riley as soon as I came up with this project and thought people need to be taken on this journey of the creation in technology, of the technology for development because there's so many highs and so many lows, so many things that we don't understand and that we go into and we just go into it without the fear, we just say we're going to take it on, we'll figure out the rest on the way.

So when I was given the opportunity to have my own TV documentary by the ABC I put a different documentary forward to them which you'll see at some point later in the future and they loved it but they said first we'll give you two half hour episodes what would you do with it, we want you to show what you do day-to-day and said, well, I'm creating this new device but haven't actually got that far with it yet, haven't really done that much with it, why don't I do that on TV.

So I grabbed Riley, he was the first person I thought of and went he's going to be great for this, brought him in we interviewed him and his family and what Riley's Mum told us was really interesting.

Riley's Mum, Casey, she told us that Riley used to stare at objects, at lights, he used to stare at TVs and he'd try and make them turn on or change because these are the things that we take for granted.

Riley has severe cerebral palsy so his movements are affected, he can't speak but he shares everything and communicates with the world through his eyes and so I went that's what we're going to harness, we're going to harness that strong ability that he has through his really expressive eyes to see what he can do to reach those ideas.

His Mum said one day he was looking at the TV when he was trying to will it turn on, he was staring at the TV and tried to make it change channel and she said the channel just suddenly changed and no-one knew what happened and suddenly Riley was saying that he has a super power.

So that's what brought up becoming superhuman, I went alright that's what we're going to create, we're going to create your own version of what we're calling telekinesis, that's your super power.

And Riley was telling us he's got this communication device kind of like what I was showing you, an external device that tracks his eyes but it's very difficult to have a conversation with someone when that thing's in the way, it's hard to watch the TV if you turn it on and you've got this big device in-between you and the TV. So we said we want it to be nice and portable, something that you can wear and I said to him what would you like it to look like if I was to put something on your head that would basically pick up on the electrical activity of your eyes and he said I love cyborgs, I want to look like a cyborg and I went alright.

I said do you want lights in it, he goes yeah, blue, I went I think anything I create now that I'm excited by you're going to love. So we created this headband for him and this is what you get taken through, the first episode focuses on what he wants for just general day-to-day independence, being able to control the lights, turn on the TV, change the channel.

We designed a headband because every time you move your eyes you've got such a direct connection between your eyes and your brain, so your eyes all the vision that comes through crosses over goes to the back of your head, that's where it gets processed but at the same time to move our eyes it's moved by muscles.

So our brain sends electrical signals to those muscles to push and pull them, so we just put a couple of electrodes on his head, no surgery required, a couple of electrodes on his head in this awesome looking headband and it picks up on the electrical activity of his eyes, again like strapping an electric guitar to your head, it amplifies the signal, it filters it and then it transmits it and gets him to control whatever he wants.

So we thought, okay, it's going to be a challenge to get it go through lights and TV and everything but I asked him, I said if you can control anything what would you like to control and he said my dream is to drive a car, so I went, okay, I went maybe a toy car, we'll see what we can do, I was saying maybe we'll try and get you a remote control car would that be good, and he was ecstatic because it's just thinking that way, I mean when you can access it you sort of don't think of it like that so I thought that would be great, he's going to be excited by a toy car,

I'm going to get him a real car. I won't give it away because this is coming up this Tuesday but here's the vehicle that we've got him and you can find out how difficult it was on that journey and whether he learns to drive it or not.

But one of the things that I want to show you within this is that idea of getting rid of that fear because we do fear the unknown. I didn't know if this was going to work, I thought my TV career would end as soon as it started.

I said within one month we're going to film the whole thing and we're going to create the technology through that one month and there are so many things in this that we don't even know if it's going to work.

t was about a week in, I'm not spiritual really but I kind of jinxed this one, I said to the producers, I went you know what, usually in my technology development a lot more goes wrong than this, this has just been way too smooth and I said touch wood but, no, seriously it's just way too smooth.

I think the table I touched was plastic.

The next day everything went wrong absolutely everything, all the technology stopped working, we started taking backward steps, the only thing that worked all the way through we lost on the plane back from Coffs Harbour, $1100 worth of equipment that only came from Germany and so we had to make all the calls we could to make that speed through and with everything going wrong and all these problems this vehicle for - here's a little bit of behind the scenes for this next episode.

This vehicle that turned up I asked my friend in Perth to get this vehicle to us, to allow us to control it through a computer and see what would happen and when it turned up we couldn't control it with a computer at all, they just didn't speak the same language, they didn't want to speak the language for some reason.

But I still posted it up on my social media for people to see that we were trying to fix all the problems and this is something that my Mum always worries about, she said what happens if it - why do you tell everyone what you're going to do before you do it, what happens if it doesn't happen, well the world will fall apart won't it, everything will go to hell, that doesn't happen.

So I realise that what happens when I tell people what I'm going to go and do next it's almost like a commitment and so I would say that for yourselves, it actually really helps.

If you're ever wanting to go and do something, that if there are any major challenges that you're about to face and you want to do it, tell someone, tell even one person, write it to yourself, you know, write it to yourself, tell a person around you, doesn't matter because

suddenly you're making that little bit of an extra commitment and you'll find that that helps a lot.

That's how I've gone and made a lot of things that I've done which I thought were impossible. It was about five hours after this at about 1:30, 2 o'clock in the morning that we got some form of control and that was just with the computer we still need to form that bridge between Riley and the vehicle.

Here's just a little bit of a preview to it, makes it all look exciting, it is exciting. What we find is a lot of these technologies that we use because technology today is becoming smaller, cheaper, faster we're actually buying devices that are $30 and under.

We're connecting lots of small, cheap devices together and innovating with it because we can see how that's going to form a single solution, in some cases it's a bridge, in this case it was a bridge between Riley, and you can see him having a go, between Riley and the vehicle and that's what we were looking at.

And so this was incredibly challenging but we also didn't have a big budget for it, so sometimes you just need to know what's out there, what we're capable of achieving and have a go. So there's a few things here that I want to leave you with; make the unknown known because if you do that there's nothing to fear.

We fear the unknown so just learn about it because in a lot of cases these things really aren't that bad.

Communities are built around common visions and values; and I think all of you would understand that and know that, so if you can share those visions, if you can share those values with the people around you, you never know when people are going to get on-board.

When I put that post up on Facebook I suddenly had three helpers that night just turn up at our warehouse, people who saw it knew what we were trying to achieve, knew that we were struggling and just turned up to help us in any way that they could and that sometimes happens, you never know who's going to get on-board with your visions and your values unless you share that.

Find the opportunities in change; we can't stop change, I would just basically say try and embrace it, embrace the change, find out how these things could potentially help your communities, potentially help your causes and share those around, share those with each other, help empower others.

I realise that the most inspiring thing that I find about Riley is that Riley wants to create technology in the future. He wants to create technology to help other people with disabilities.

And I thought if I can empower him then I'm going to have much more reach through the flow-on effects of people being able to help each other than I will if I do it all myself, and that's what inspires me every day. Thank you.