



## TRANSCRIPT: Real guardrails in immersive technologies: navigating the metaverse safely

In this conversation with ODPa communications officer Katherine Levy, Dr Louis Rosenberg explains why he feels that advances in immersive technology could benefit society – if safeguards are built in along the way to prevent the exploitation of users.

**Katherine Levy** – Hello! Lovely to meet you Louis, thank you so much for joining me.

**Louis Rosenberg** – Yeah, yeah, it should be fun!

**KL** - When we read it ([Metaverse 2030](#)) in the office, we felt it illustrated perfectly some of the themes, opportunities and challenges with technological innovation and data sharing that we are trying to get people to understand. Why was it so important for you to tell this story?

**LR** – It comes from the fact that I’ve been involved in the development of VR and Augmented Reality for over 30 years. I started out way back as a researcher at Stanford and Nasa working on early VR headsets and then I was funded by the US Air Force to build the first Augmented Reality system and then I founded a number of companies in this space. **I am a true believer that virtual and augmented reality, which is now called the Metaverse can really be positive for society but at the same time, I’ve been at this long enough that I am very concerned about the risks.** The risks that come with immersing ourselves in a technological medium that can be so overwhelming. It will be everywhere in our lives from morning to night, it can be invasive, coercive, manipulative and even if we don’t want it, even if we want to stay out of the metaverse, we don’t really have a choice and that’s why my story is unique in that it’s about Gordon Pines, an older man, who actually doesn’t want to be in the Metaverse but realises that he doesn’t really have a choice and that’s how we experience technology today. There was a time when everybody had a flip phone and nobody thought they would need a smartphone, that they would spend \$1000 on a phone and at some point you don’t have a choice. Everybody has to do that so **in this story, I really try to convey a balanced picture showing that there are good things that comes into Gordon’s life with the technology, but there are significant negatives and these are the things that we as a society need to consider as we enter this unknown. This story is a warning in a very balanced format, it’s not super dark and I do write a lot of dark fiction but it’s deliberately not dark, there are lots of people excited about the Metaverse and I’m excited about the Metaverse but unless we really consider the dangers, very bad things could happen and that’s really the point of telling the story.**

**KL** – that’s certainly one of the things that we loved about the story because as a data protection authority, people hear our title and disengage almost immediately and so one of the things we loved about this story was that it explored these themes that we care deeply about but in a really heartwarming way. But underneath the surface, is this really uncomfortable subtext. It is a story that has a happy ending but it does, as you said, have a warning, it has a very serious message.

**LR** – Again, there’s positive things that will come out of the Metaverse, I really do believe that but there are serious dangers, dangers that I need to consider and when we say Metaverse, I really want people to understand that it’s both virtual worlds and augmented worlds. It’s both. And we should be concerned but it’s not technology that I fear about the metaverse, **it’s the power that this technology will give to the metaverse platforms.** It’s useful to think of social media as an example. Social media 15 years ago was this utopian technology and we were all sure it was going to do these great things and bring the world together, empower and do these great things for people who didn’t have a voice and promote democracy but at the same time it created all these really damaging problems and again it wasn’t the technology of social media that caused these problems, it was the business models that the corporations adopted. When we look at social media we can say, well what’s the business models that they adopted? **We can say that social media platforms are experts at tracking, profiling, and targeting users. That’s their business and the social media part is what**



**enables their business so if you consider that, and say that social media was this utopian technology and when we developed business models that are focused on tracking, profiling and targeting, we ended up with a world where social media companies can manipulate people, can polarize whole populations, can drive misinformation and disinformation. None of that was expected so now it's considered a metaverse. I can see the same principles of tracking, profiling, and targeting implemented in the metaverse and if it's unregulated will be much, much worse.** So if you think about social media, when you think about tracking, it means where you click and where your friends are. In the metaverse, tracking means knowing where you are, who you are with, what you are doing, where you are looking. In the metaverse if you are walking down the street the way that Gordon Pines does in the story, platforms will be able to track where he is, what windows he's looking in as he walks down the street, how long his gaze lingers, how fast his gait is, whether he slows down or speeds up, in the metaverse and this is also discussed in the story, people will be able to see your emotions by tracking your facial expressions, your vocal inflections, your pupil dilation, blood patterns in your face so in the metaverse, instead of just tracking where you and your friends are, they will know everything you do and everything you feel while you are doing it. At the same time, **the other thing about social media for me is that they don't just use this information to track you, they do this to persuade you and they do this through targeted advertising, and targeted news feeds. The same thing could happen in the metaverse but in the metaverse it isn't going to be just a targeted advertisement, a pop-up ad you'll see, or video that pops up, a targeted ad is an immersive experience, it's a virtual product placement that will be put into the world that you might not even recognize as an advertisement and we see this in Gordon's world in the story.** He's walking down the street and he sees things that just look like they are part of the world, and they are actual advertisements, they are trying to engage him, influence him, persuade him and they even include virtual spokespeople that will engage him in conversation and that's a big part of the story is these promotional conversations and it doesn't get very dark but it could in the real world. A promotional conversation means that you would be engaged with a virtual character, you might not even know that it's promotional, you might not know that you were targeted and it's going to engage you to buy a product or a service or maybe believe a political idea and if at the same time, that promotional conversation, that the AI that is controlling it has access to your facial expressions, your vocal inflection, pupil dilation, it will be able to adjust its tactics in real time to persuade you and again, in the story it doesn't get dark but **these same techniques could be used to create the most powerful form of persuasion and propaganda that we've ever known because you have people who will engage a world and have platforms that can control everything they can see and hear, AI algorithms that are watching and assessing their emotions, and manipulating their tactics so unless there are controls in place, it could become a very, very dangerous technology.**

KL – One of the things that we worry about, well there are two things we worry about. The first is that technology is developing at breakneck speed and these things that you are describing, these things are happening now, they are developing now and regulation cannot keep pace with it so we need perhaps as you said, greater cooperation with the tech companies to develop these technologies together.- We believe as a regulator, that regulation should not be a blocker, it should be part of the conversation, it needs to be part of how technology evolves but it doesn't seem to be happening in this case because it's just evolving too fast. The other thing that we worry about is that people are happily sleepwalking into this almost nightmarish situation that you are describing. Where they are being manipulated, they are not even aware of what they are sharing and it's interesting to hear you as a pioneer in augmented reality to be saying, I love this, I was part of its growth, it needs to carry on growing but in the right way. How do you feel that this should be done?

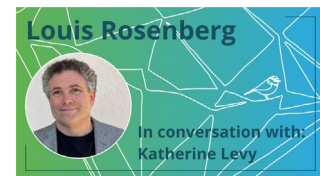
LR - I absolutely agree that regulation is super important. **Without regulation, we will go down the same path as social media went where companies had good intentions, developers had utopian visions but the business models evolved and companies pushed themselves to compete further and further in different directions and you end up with this very negative outcome nobody expected. In the metaverse the same thing will happen unless there is regulation and yet it will be worse because the technology is so much more intimate.** You log into a social media platform, but in the metaverse you are submitting yourself to become an



inhabitant in a metaverse platform – and you are allowing that platform to control everything you see, hear, and feel, and track everything you do. So there's the potential where they can literally change the world around you without you even being able to tell the difference between something that is promotional and something that is authentic, and so when we think about regulation, to me, we also need to take a step up and say, let's think about human rights and immersive rights, do we have the right to know the difference between an authentic experience and a manipulated experience. I think that is the single most important thing because otherwise you can imagine a scenario where I'm walking down the street, I see a parked car, there's some people standing beside the car talking about it, I see the driver telling their friend how good this car is and I hear it and I just think that's part of my world and I just keep walking and that influences me because I think it's authentic but no, it's a targeted advert because it was placed there specifically for me, other people walking down that street saw something else and it was placed there with the type of clothes, the type of the car, the colour of the car, the actual ethnicity of the people, the hair colour, they chose everything to be the most persuasive to me because they've been tracking me morning to night for weeks or months or years and so I could have these experiences that I think are authentic but they are very highly targeted to persuade me and it doesn't have to be to buy a car, it can be to persuade me to believe a political message, to believe a piece of misinformation or disinformation but if there is regulation to protect my basic right to authentic experiences, to me that would mean that if a platform does that, that targeted experience has to look and sound different. **I as a person in this world need to be able to tell the difference between an authentic experience that I just happened to come across and a targeted experience that was placed there to manipulate me.** If I can at least tell the difference then I can draw upon my skepticism, I have the ability to potentially resist this persuasion. **And that's one of the big differences with social media. In social media, even if it is extremely persuasive, at least I know when an advertisement is an advertisement. (13:45) In the metaverse, unless regulation we won't even know what is real or targeted.** And in the metaverse there is also the question, do we even want to allow platforms to be able to track pupil dilation, your blood pressure, your facial blood patterns and expressions to infer your emotions. I think that most people don't want to be engaged in a promotional advertisement and know there is AI looking at your blood pressure readings from your earbuds and adjusting its tactics to maximise persuasion but unless there is regulation, these things will happen. The technology is there and the companies are motivated to do it. And it won't just happen to adults, it will happen to kids.

**One of the scariest things that was announced recently, one of the early metaverse platforms Roblox, they have 50 million kids in their virtual world, and they just announced last month that they are going to start immersive advertising on kids. That's their business model they are going to roll out in 2023 and they are doing that because their revenue was struggling, they missed their numbers for the quarter and in their quarterly meeting, they announced immersive advertising for kids. Now what does that mean? I think that what it means is that a kid will be walking in the metaverse and a giant teddy bear will walk up to them and start talking to them and convincing them of anything, they won't know it's an advertisement, they won't know any different. They will think they made a friend who is a giant teddy bear and that teddy bear says I should buy this or believe that and without regulation, again it's super dangerous.** I believe that there's really positive things that can come out of the metaverse but without regulation it can go dark so you raised this issue of how do we convince the public, how do we convince the industry that regulation is important, I think that **without regulation there will be no trust and if there is no trust these platforms will fail.** They need regulation to put guard rails in place so that this world is trusted by consumers then they can compete with each other making the most magical experiences, rather than competing with each other to see who can make the best use of blood pressure or facial expressions to feed persuasive advertisements so I'm a big proponent of regulation and anyway we can push it I think is super important and I think the industry should also want regulation so that their world is trustworthy.

KL – We agree. I think that trust is such an important factor but as you've mentioned with social media, there isn't a lot of trust for people there. Some people have turned off their social media accounts but there are an



awful lot of people who know that perhaps their good faith in sharing their data has gone to places that they have no intention but they still need these platforms and that's one of the worries, that there are continual harms being done but these platforms are still functioning,

**LR – Yes and that goes back to the fact that sometimes people don't feel like they've got a choice. 20:36 People know that social media is dangerous, these brands have really been tarnished by some of the damage done by these practices but there are people that feel like, unless they are using social media they are at a disadvantage. They are disadvantaged professionally, they are disadvantaged socially and so they have to use it. So now regulators look at social media and say we need to fix it but it's really difficult to fix social media after the fact and it's because the business model is already developed, these companies already rely on targeting and profiling their users and if you put regulation in place then what is their business?** The nice thing about the metaverse is that the business models haven't established themselves yet. It's actually at a time when regulation could guide the industry, could protect the industry and maintain trust. **I talk to policy makers in countries all around the world and one of the things they often say is, well, we can't even regulate social media, how are we going to regulate the metaverse and my answer is, you can't regulate social media because you waited 10 years too long. You can actually regulate the metaverse because the business models aren't fully developed, if you just put simple guardrails in place then those business models will develop in a different way. These companies will compete for customers in different ways. And it will work out well so the time to regulate the metaverse is now, when people feel it is a little too early. Once people feel it's not too early, it's not too early, it's too late.**

**19:09**

**KL – That's why I think this conversation is so important certainly for us and that's why we are so grateful that you were able to talk with us today. One of the things that we believe is that regulation on its own isn't enough. We need to effect cultural change, we need to drive people to want to protect other people and to try and use initiatives, for example this conversation is part of Project Bijou, our social initiative to inspire cultural change and to help people not just be motivated by the law but that this is the right thing to do, to create a better society, where you will be protected, it's a good business model as you said if you have trust. That's what you are doing in talking to us, do you believe that cultural change is important?**

**LR – Cultural change is potentially the most important and I say that because it's easy to badmouth the corporations that created these models but the public was part of that decision, if you go back and look at social media, the public didn't want to pay subscriptions for social media but said okay, we're happy to be advertised to and we're happy to allow our data to be tracked because we are getting something for free. Now I don't think the public realised the downside at that time but now they can look at what happened with social media and we don't have that excuse any more. We can look at social media and say okay, the metaverse is going to be worse in terms of privacy problems, also the manipulation problems, what is the culture the public will take from that? Will the culture demand a safe metaverse? Will the culture demand that platforms are not allowed to track your emotions and use it in real time to manipulate you?**

**24:20**

**Will the culture be willing to pay for subscriptions instead of getting things for free, in exchange for the services? Do we culturally realise that when we are advertising it's not free? We become the product that's being sold and do you want to be the product that is sold in the metaverse or do you want to be the customer?** So cultural change in terms of just getting people's awareness is important. The other cultural issue for the metaverse which I think is just as important, in so far as we've talked about the dangers of corporate control of metaverse platforms, one of the other dangers on platforms is user vs. user dangers. On social media we see bullying, we see stalking, hate crimes, all sorts of bad things that happen in social media that are users vs. users and in the metaverse that can be far worse. It can be far more personal because it's immersive, they also be far harder to moderate and mediate because they happen in real time. In social media, if you



were trying to stop hate in social media, it's trying to stop a piece of material from spreading too far. In the metaverse, it means stopping it in real time before it happens, before somebody feels abused and that would be the most difficult thing, it would be a cultural thing where people take personal responsibility in the metaverse when they realise this is like in the real world. Currently people behave in ways on social media in ways that they would never behave in person, they wouldn't, they feel like they have this sense of distance and anonymity and they behave in these terrible ways.

**23:08**

We can't, if that happens in the metaverse we will have these big problems. If instead we have this cultural change, and say, you know what, the metaverse is different, it's direct person to person interactions, people have to take personal responsibility and people have to behave in ways just like they would in the real world. That too would make a very big difference in having a trusted, safe metaverse.

**23:34**

**KL** – Do you think that stories like the Metaverse 2030 have a powerful role to play in shaping our understanding of complex technological changes and what you've just described is very much trying to get people to understand this brave new world.

**LR**– I believe stories are really powerful for getting people to understand technologies that they haven't yet experienced for themselves. **It's hard for people to appreciate the potential dangers, it's hard for people to even know what the potential capabilities are.** For most people, they don't want to read a dull academic paper and I do write some of those dull academic papers about metaverse dangers and regulation but a story is a way to make it real for people and to make people appreciate on a visceral level what this will be so I do think that for any new technology, whether its augmented reality, virtual reality, artificial intelligence, story can be more powerful than almost anything in helping people see the future and realise that that future is not that far away.

**KL** – hopefully far enough away though that we can put some of these controls in place to create something that is positive and not just negative. Do you think though that the legal, technological and cultural changes are undermining our ability to control how much information about ourselves that we share? I know that you were just discussing, that people might not be aware of what they are sharing or who they are sharing it with because they don't realise that they are being targeted or even assessed, you know, their eye movement, that sort of thing.

**25:25**

**LR** – It's a huge problem because people are definitely not aware of these technologies and how they are being rolled out. A good example, **Meta is launching its next generation of head set and that next generation of headset has facial tracking, it can track your facial expressions. Why are they doing that? They are not doing that because they are evil. They are doing it because when they track your facial expression they can then have avatars reflect those expressions so it's actually a humanizing technology, it will make the metaverse more human, it will allow people to interact better, it has these very positive uses. People need to realise, ok, ok it has these positive uses but it also has these really negative uses because when they track your facial expressions, they can monitor your emotions and they can use your emotions to monitor you and target you and do all these things. People aren't culturally ready for that, the legal protections aren't ready for that. There are no regulations in place that protect us from that and the thing is, to be able to enable a world where that technology is used for the positive things but not for the negative things, the only way to do that is with regulation.** The culture demanding that protections be put in place would help as well, if people are asking for regulation and the only way they ask is if they know "hey there's this cool new technology in the latest headset but I should be worried that they can now read my emotions and they could



know my reaction to everything that happens so throughout my entire day they could know exactly not only what I did but how I feel about that every moment of my day". So if people realise that's possible they should say you know what, that should be regulated. They shouldn't be allowed to store that information.

**27:18**

**KL** – You beautifully illustrated that in the story with the halos. I thought it was a really visual but clear way to explain exactly that, to make people think twice, do you want people to see this information about you.

**LR** – Yes and that's voluntary, we voluntarily give this information without thinking about it and again, partly it's people just choose to do it but a lot of people feel pressured to do it. They feel pressured to share information on social media because if they don't they feel at a disadvantage and the same thing will happen in the metaverse and that will take cultural change more than regulation to realise hey, maybe we should all stop doing things quite like that.

**KL** – And you've talked about meaningful regulation, you've said that you are not only involved in writing stories but also these big documents and in your recent paper, "Regulating the metaverse, a blueprint for the future", can you explain a little bit about what that means to you and do you think this is just a question of law and regulation or are there wider issues to consider?

**LR** – I think it will be to affect cultures. People want to be protected from abuses. If people are aware and there are multiple companies competing and one company launches a safe metaverse that doesn't do these practices, people could choose that path and even without regulation that would help. I personally think that regulation is needed in parallel with that because we, just like I mentioned with Roblox, a platform for kids, they do lots of good stuff to protect kids from abuses, yet they are already going towards immersive advertising so it shows that most of these platforms will go in that direction. So in terms of regulation it's really about regulating the two sides of it, which is the tracking and profiling and the targeting with persuasion. On the tracking and profiling, the thing that's a little bit tricky is that these platforms need to be able to track in real time all of these things about you. They need to know where you are and what direction you are looking and how you are standing. They need to potentially know your facial expressions to make your avatar look right. They just don't need to store this information over time and they definitely don't need to profile you by running machine learning on this information over time so there's this big difference between tracking information at the moment they are simulating the world and storing it and profiling you and using artificial intelligence on it because if they are allowed to track and use artificial intelligence on it, they will not only know everything you do all day, they will then be able to predict everything you are going to do at every single moment. They will use this information to make these predictive models to say, oh, the way to influence that particular person is to do this and this and this, because our AI that looked at their entire life for the past six months knows how to influence that person and that's really, really dangerous and we've never seen anything like that before and so regulating how that data is stored and used and whether it even *can* be stored over time would be helpful, and then on the other side, it's looking at what are they actually allowed to do to influence you. There's going to be advertising, it's going to be immersive meaning it's going to be virtual product placement, it's going to be virtual spokespeople like the story, it's going to be little flying creatures that are going to whisper in your ear. The question is, are you the user, do you have the right to know what is promotional, what is targeted information and what is an actual part of the world. If at the base level can clearly tell the difference, if somebody walks up to me on the street and starts talking to me, if they look different so I can think, oh, that's an advertisement and it's not just another user, that's the first big step in protecting, and really protecting people from this boundary between advertising and manipulation. Without regulation it will very quickly cross from traditional advertising to manipulation because people will be deceived. They won't know even what is an advertisement so regulation has a big role to play. The public should also demand it so culture has a big role to play.



**KL** – What role do you think regulation can play or should play in specifically keeping children and young people safe in the metaverse?

**32.42**

**LR** – In the metaverse, all these dangers – tracking, profiling and also targeting are going to be more dangerous for kids. Even with traditional advertising, kids have a harder time telling the difference between an advertisement and just an authentic experience. In the metaverse, we are all going to have a harder time telling the difference unless there’s regulation and so the level of protections for kids is even more important than for adults. The protections for kids could potentially or should potentially come first vs. adults but honestly, I think we all need the protection so I would opt for let’s put these protections in place for everybody and let’s play special attention to kids because we know they are even more impressionable and even less aware about data privacy than adults.

**33.35**

**KL** – One of the questions that my colleagues were asking, is should children be excluded altogether from the metaverse but as we have seen with Meta, that hasn’t worked with trying to exclude the under-13s so that’s possibly just not practical.

**LR** – So, it doesn’t work to prevent kids and in a lot of ways, kids are actually the largest group of users of the metaverse. Roblox and Minecraft are the closest to a metaverse in terms of a large scale, general purpose metaverse than anything and of course those are for kids, well mostly for kids and in some sense, that’s preparing them for their future and there’s a positive side to that. Because this technology is only going to become more and more significant and they are becoming skilled in that world but that’s all the more reason why they need protections and specifically protection because again, kids are impressionable, kids are not aware of protecting their own privacy, and kids have to worry even more not just about corporations and advertising but other bad actors. One of the biggest dangers in the metaverse for kids is that adults can pretend to be kids in the metaverse. Bad actors can pretend to be other people. There will be new forms of fraud and deception where people will hijack avatars that look like a friend or a family member or look like a co-worker and so there are these other dangers which will require really strict identity verification and that should be a requirement on the platforms that they really take identity protection seriously because in the metaverse if you don’t know that the person you are talking to is actually that person, even if they look and sound like that person, that’s a really dangerous situation for everybody, even more so for kids.

**KL** – What for you is the main potential for harm and what sort of advice would you give to parents?

**LR** – At the present time, the main potential for harm is predators who in the virtual world, in the metaverse, can hide behind avatars. In traditional social media people can hide behind text and that’s dangerous and all those problems exist and bad things can happen. In the metaverse, they can hide behind an avatar, that avatar could look like a big friendly teddy bear or that avatar could look like someone they think is their friend, their sibling, their family member so the potential for being confused about the identity of the person you are talking to and actually think that it’s somebody you know is really significant in the metaverse and parents should make their kids aware that just because somebody looks like a kid doesn’t mean that they are a kid, just because somebody looks like someone they know, it might not be the person they know and at this point awareness is the best you can do but regulation would go a long way to helping put real guardrails in place and to require identity validation and authenticity. It needs to be taken to a much stricter level than traditional social media platforms.

**KL** - Until I met you and until I started researching this subject, I really had no idea what the metaverse was, it’s such a mind-blowing concept. You are absolutely right, we need regulation and it’s brilliant to get in at the start but it’s so hard to engage people with something that is so out there.



**LR** – It is and for a lot of people, it feels like it's far in the future but for the largest companies in the world, it's not far in the future. For the largest companies in the world, they are investing billions and it's not just Meta, it's every large tech company. Apple and Google and Samsung and Sony, every big company you can think of has a metaverse strategy and development programme, working on products. So for me, I got involved in 1991 working on metaverse and I really thought, within ten years this would be everywhere because there is a positive part to this. What the metaverse is really doing is, it's presenting information to people in the form we were meant to perceive it. We were not meant to look through little windows at flat documents, we were meant to interact with information all around us, that's how we understand our world and so 30 years ago, I was sure that when these technologies allowed us it would be all around us but it's taken 30 years but now we're at a point where it's really different that it's been in previous decades where it's not just technologists that are excited, it's not just small companies that are excited, it's the largest companies in the world, they are investing billions of dollars and they are convinced it's going to happen and if they are convinced it becomes a self-fulfilling prophesy.

**39:38**

**KL** - Within Metaverse 2030, you suggest that like every technology, it's normal that augmented reality will experience growing pains and hopefully these will be ironed out if we take steps now but what do you think about more generally about the sort of data harms on a broader scale, that we are already seeing, that you are describing in some of the developing gaming technology for children and essentially, the potential if this proceeds without the right intervention.

**40:08**

**LR** – Like you said, there's a lot of dangers that already exist with current technologies, current social media technologies, current gaming technologies these risks get amplified as we move into these immersive worlds where everything is far more intimate. The public needs to be aware of the risks at all levels, including current technologies and the public needs to demand a safe digital life and that involves regulation and it involves customers choosing which products, which companies they go with on these issues. If companies start competing with each other on these issues of protecting privacy and not sharing data and not selling your data to brokers, then consumers can choose the companies that are acting better but if the public isn't even aware, then it won't become a competitive playing field so it's about awareness, it's about regulation and it's about the public realizing they need to demand the platforms they want and not just accept what's out there and it's hard, you don't really get a choice, nobody reads the data protection documents that come up – the whole system is designed to assume that the public is just going to agree to anything.

**42:33**

**KL** – Yes, I mean. It's interesting isn't it trying to avoid the pitfalls, to avoid these data harms but to hope that there is a way forward, that we can appreciate and benefit from the advantages of the metaverse without coming a cropper with all the obstacles. You wrote a paper recently (['Protecting Privacy in the Metaverse'](#) – 30/09/2022) where you describe the system's ability to discover your location, your height, the length of your arms, your gender, your age etc. For someone listening to this who may be thinking "so what?" **can you articulate what the problem is** with these online environments being able to derive this sort of information about their users? 47:22

**LR** – At UC Berkley they did a really interesting study where they created this virtual escape room and it felt like a game, you go into the game, put on a headset, today's technology that you could go out and buy, you put it on and go through this set of tests and they show at the end, look at all the information they can get from you and they are getting that information because when you put on this headset, they are tracking your head motion, they are tracking your hand motion, they can tell how tall you are, how you are physically





walking and stepping and moving. They can derive medical information about you, there are able to see whether this person has certain medical conditions, they are able to tell if someone is colour blind, if someone has had some medical decline, you as the user have no idea that this type of information could be derived from this simple experience and so they built this system to show that the type of data being collected is so extensive that you combine it over even just a short period during this experience which felt like a game, and we do some AI processing to it, we can know all sorts of things about you that you would never guess that we would know so it's a wakeup call. Even data that seems innocent can be quite invasive. A great example is tracking gait [the way you walk], augmented reality will be able to track your walking. Just from tracking gait, people can tell all kinds of medical information about physical problems and even mental disabilities just by how somebody walks, how quickly they walk, so it is... **the privacy we need to protect is not just the data you see on the surface, it's what can be inferred from that data and so this whole category of inferred data, people need to be aware that there is a lot, especially with use of AI, there is a lot people can find out about you even if it seems like they are not getting that much information.**

**KL** – It's incredible because on the one hand this technology has the ability to prolong your life, to detect medical conditions but on the other, it could expose people to the weaponization of data if it falls into the hands of bad actors. Do you think that most people have an understanding of how they are tracked, profiled and persuaded? Essentially you've pretty much covered this and said no, they don't but I guess this is an example of how the technology is constantly evolving and the example of this escape room shows just how quickly it's evolving.

**LR** – **People are more aware now than they were because of a lot of negatives that came out of social media, but I think they still don't appreciate the significance and that's partly because of how powerful artificial intelligence has become recently.** There is data that is tracked then there is data that is stored then when you have a store of data about a person over a period of time, AI, machine learning can be run on that data and can infer all kinds of things about a person's likely behaviour, likely preferences, likely interests, likely reactions to different things, how people react to different advertisements, how people react to different news information, and so people should be aware that it's not just the simple data that's collected in the moment, it's how over time that data can characterize you at a really, really deep level and how AI is making those characterizations more and more accurate and more and more predictive which they can actually predict how you will be influenced if we feed you a certain piece of news, how you will be influenced if we feed you a certain advertisement, and awareness hopefully will make people demand change.

**KL** – It's such a fascinating subject and I was just thinking, in whose hands that technology rests as well, and it's lovely, you are speaking from the US, I'm in Guernsey and we generally live in fairly safe, democratic societies so we can talk about these things for starters, we can talk about it because in some jurisdictions you can't, they don't want people to know that these sort of technologies exist. Essentially, if you had just one insight to share for people listening to this, our data protection community. We are trying to bring about cultural change, if you had one insight you would like to share or for people to take away with them, what would that be?

**LR** – With respect to the metaverse, the key thing for people to realise is that **for 30 years the technology has been developing to be the most effective tool for fooling the senses that we could create, that's the entire purpose of virtual reality, augmented reality, that's to blur the boundaries between what's real, and what's not real. To create a suspension of disbelief around completely fabricated things and so when we think about the dangers of the metaverse, we need to realise that those things can be used against you, that the metaverse could become the most powerful tool of persuasion that we've ever created because it has the ability to fabricate anything and it has the ability to track and profile you at levels we've never seen before.** That said, regulation and guardrails could prevent that and could make the metaverse a safe and magical place that can do really amazing things for medicine and education and entertainment but we need the guardrails.