HOUSE OF COMMONS

Digital, Culture, Media and Sport Committee

Oral evidence: Immersive and addictive technologies, HC 1846

Tuesday 12 February 2019

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Watch the meeting

Members present: Damian Collins (Chair); Clive Efford; Julie Elliott; Simon Hart; Julian Knight; Ian C. Lucas; Brendan O'Hara; Jo Stevens; Giles Watling.

Questions 1 - 54

Witnesses

I: Sarah Jones, Head, School of Media, Birmingham City University, Professor Andrew Przybylski, Director of Research, Oxford Internet Institute, and Michael Veale, Researcher, University College London.

Written evidence from witnesses:

– Professor Andrew Przybylski (et al)

Examination of witnesses

Witnesses: Sarah Jones, Professor Andrew Przybylski and Michael Veale.

Q1 **Chair:** Good morning. Welcome to this first evidence session of the Committee's new inquiry on immersive and addictive technologies. Welcome to the panellists. Apologies for a slightly late start. Unfortunately we can investigate technology, but we cannot guarantee the trains will run on time or that the transport system will get everyone here on time, but thank you all for joining us.

As this is the start of the inquiry, the Committee is quite interested in exploring some of the themes that will be important as we go through the inquiry. The intention as we go through the inquiry is to have specific evidence sessions with companies and practitioners involved with different forms of technologies. Could I start with an opening question to all three of the members of the panel? When we talk about immersive technologies, to what extent do you think it is important that we differentiate between different sorts of technologies and consider that immersion in media can often mean very different things depending on what it is that you are doing, what you are immersed in? Watching a film can be very different from the sort of immersion you face when in a total VR experience. Perhaps, Sarah, you could start us off and we could work down the panel.

Sarah Jones: It is very important to differentiate very early on the difference within the technologies. We bring all immersive technologies together as one as an easy way to define immersion and to understand it from a consumer and general public point of view, but the differences are very intense.

When you are talking about a virtual experience, you are trying to get that moment of presence when you lose all sense of disbelief in the world; you want to feel as if you are somewhere else completely and you get that through a number of different ways of influencing the technology. Most of the time you are in a headset, you are locked out of the real environment and you become part of a different world.

When we are talking about augmented reality, we are looking at overlaying the real environment with digital objects. I might see the paintings on the wall being different; I could put different people in this environment; I could turn on the screen on the wall, if I wanted to. It is about manipulation of those digital objects in a real environment and that is a very different way of using the technology. We are not talking about taking ourselves out of the environment, we are just talking about overlaying that environment with different things.

When we are talking about losing ourselves in a world, losing our sense of self in a world, it is very different. That differentiation is key to the inquiry when you are talking about what might happen.

Q2 **Chair:** Andrew Przybylski, what is your view on the psychological impact of different forms of technology on the people who engage with them?

Professor Przybylski: The basic thing you have to understand is that from a technical perspective there are a lot of differences. Most of what we understand and study is based on phenomenology. It is based on our subjective sense, how it hits us. While many technologies may have topical features that are very similar, such as loot boxes in games or maybe an online gambling site, that does not necessarily mean they are perceived in the same way or that they are structured in the same way.

One of the key things that you will have to grapple with when you are thinking about effects and the level of uncertainty around them is how much of the phenomenology we can study. Unlike games in public or on the playground, these contexts are virtual and in many cases these contexts are proprietary. You cannot just drop a scientist, a sociologist, a psychologist in the classroom because it is owned by the company so there is a fundamental asymmetry here between what effects we can observe and study and the functional surface features of the media.

Q3 **Chair:** By effects, you mean you are looking at the impact on the general behaviour of someone who is engaged with different forms of technology—is that what that would mean?

Professor Przybylski: Yes. Essentially what happens, depending on their disciplines, is that social and medical scientists work backwards from what they know. They work backwards from whatever their epistemic silo is. If you are a psychologist, you care about health and wellbeing. If you are a gambling researcher, you care about excess spending. Those are the lenses through which you study the thing. The siloing is something that you must all be very mindful of because people seem to be experts in their—to be unkind—little cul de sac, but wind up missing the big picture. A lot of this is because of the asymmetry between classic, 20th-century social science and the kinds of technologies we have now.

Q4 **Chair:** This morning I read a comment on social media by Chris Vickery, who was a witness in our previous inquiry on disinformation. He quoted a comment made I think in Russian by one of Putin's advisers, Mr Surkov. What he was saying was that the obsession with interfering in elections by Russia is the small issue. Mr Surkov is quoted as saying, "We meddle with your brains, we change your conscience—and you have no clue what to do about it." Do you think that is right? Do you think that through technology, people can have a psychological impact on other people who engage with that technology and the content within it?

Professor Przybylski: Yes, insofar as language, written and spoken, is a technology, that is true, but a mindset that is critical here is key. On one end we have the people who sell us these things—the design specialists with their Skinner boxes—who just pivot back and forth between different types of extreme claims and they can only have as much power as we assign them. On one end they want to sell us something; on the other end they feel so terrible they have created this Skinner box they have trapped us all in. It does not necessarily have substance, but there is a lot of pomp.

Q5 **Chair:** Michael Veale, can I ask you a question? One of the issues that it seems important to look at in this inquiry is the ethics of the use of technology, what its capabilities are, how it is designed and whether that design is ethical in the sense that it could be something that causes harm. Do you have any thoughts on that in particular?

Michael Veale: Yes, definitely. The nature of immersion can be looked at in a variety of ways; different approaches on it have been outlined by my co-witnesses. One thing I would like to emphasise, which has not been emphasised so far, is that it is very easy to be immersed in a whole infrastructure and series of business models established by one or more actors.

When we see the focus on a particular technology, whether it is virtual reality or apps or games on different platforms, it is easy to miss some of the ways in which immersion can spread. We see this through ambient technologies, particularly in the home and in work and employment environments, and we also see it through the large tracking infrastructures that are built across the internet and link devices together as cross-device tracking technologies.

To get to your question about ethical design, when we think about design, there is a danger that particularly many firms that you might have as witnesses will narrow the question, thinking about a single piece of technology. They will look at this single piece of technology, how it has been studied in isolation, often maybe in a lab context, maybe in a user-centric design context. That is an important field of study, but it often misses that ecosystem dimension, which is where I believe a lot of that power can come from, the power to manipulate. In future it will just be more difficult to escape, as perhaps virtual environments start to link up in ways we did not see before, and we start seeing new economic business models emerge on these virtual environments that create further linkaging and further opportunities for manipulating attention.

Q6 **Chair:** The tracking of people's activities supports massive personalisation of the experience, but also in a way that is difficult for external bodies to monitor, because you are not seeing media that is being widely broadcast or shared in the same format for everyone; it is something that is being designed around the user's personal experiences. Maybe this is also a question for other witnesses. Do you think there is an issue here, from your pursuit as academics looking at these issues, that access to data and information about what is happening is quite hard to come by and that is one of the reasons that companies can sit back and say that there is not very much evidence that suggests any of this is doing any harm?

Michael Veale: That is definitely one of the reasons. You can see it through lots of different lenses. In the UK, since 1998, we have at least had a range of individuals access rights to their data and we have used those rights in a variety of ways. I used mine against Netflix just a few days ago and got a response around the tracking they had done on their "Black Mirror: Bandersnatch" programme, where you can choose different

options and they would send you the data in response to that, so individuals can get their data. However, that is symbolic of what we can think of as a transparency fallacy, asking those who are burdened the most to not only make an active request to see how they are being tracked, but also start to explore what that might mean in the context of the whole political economy.

Furthermore, in most immersive technologies, it is hard to get transparency, even at an individual level, so before we even go to third parties and how third party researchers can go in from the side to get access, you will encounter a range of roadblocks—for example, companies saying, "You cannot verify who you are. We were just tracking you using your IMEI number on your phone" or something like that, "and we do not know if it's really yours, so we are not going to give you your data". If you are not careful, it even fails at that level. That is a failure of individual transparency. Then you will see privacy used as a way to deflect researchers or regulators from examining the practices of the companies.

One thing that you can look at, though, is that we are seeing a range of transparency measures in new European regulations: the fairness of B2B platforms regulation, which I believe is currently in trialogue, has transparency measures around recommender systems in a B2B context, for example, sellers on Amazon. There are lots of opportunities for providing a more aggregate level of transparency.

Professor Przybylski: I think that there is a larger scale lack of co-ordination. There is a vacuum. In a number of the points of evidence that you asked for in written evidence, this is clear. There is a vacuum here and many of the companies that we have in mind—gaming companies and social media companies—have filled that vacuum with a notion of self-regulation. This has meant that from a policy perspective or a stakeholder perspective, from parents all the way up to lawmakers, fundamentally we are in a reactive mode; it is fundamentally a game of "Whac-a-Mole". We have a problem such as online radicalisation. We haul YouTube/Google in, their policy people promise more moderators, then that problem hopefully goes away, and it is up to us to make sure that it has gone away. If we do not keep spinning the wheel, it will just run itself out.

Because we are not in a proactive space, because we cannot as a society articulate what we want from these companies in terms of data—on one end, Michael is absolutely right that transparency is a necessary condition, but it is certainly not sufficient, and we cannot just ask for transparency without articulating what we mean as a society or what we mean as scientists in terms of what we want to see. In a lot of ways, because of the way that the social and medical sciences work, scientists themselves are reactive. If a Facebook or Google data scientist says to you, "Hey, let's do this study about emotional impact or influencing", they set the rules because they are a giant organisation and you are just a team of four or five. There needs to be a strategic rethink here about how

we want to scale up our own values in terms of asking the important questions of industry and only then will we know what the heck the value of transparency is because we will know how much to ask for.

Sarah Jones: What is really important, if you go back a step, you have already mentioned that it is a very personal technology, a very experiential technology and it is all about that subjective experience and every person that goes into a virtual environment is going to have a different experience. That is very difficult to measure. What we need to do when we are thinking about the ethics is taking that step back and having a look at what is being produced, what that content is. There has been a lot of work done around switching perspectives within virtual environments.

Mel Slater at UCL has produced some phenomenal work in this area about switching genders, switching religion, about understanding other people's perspectives, and there is Jeremy Bailenson at the Stanford Virtual Human Interaction Lab as well. They can do all this powerful research, but we are not seeing that in the work that is being produced, the experiences that are there for everybody to use. For instance, what does it mean to be another gender for the day? What are we seeing about the impact of that; what is the long-lasting impact of that? It is those questions that are not being asked. When it comes to ethics, those are important questions that we need a huge amount of research on.

Q7 **Chair:** In some ways this is a function of the fact that this is a relatively new sector and relatively fast-moving. In other industries there are systems of regulation, oversight and rules in place to try to guide companies down the path of behaving responsibly. For example, if you put too much sugar in a drink, there is an additional tax that you pay for it. There are rules around how you advertise alcoholic drinks or gambling because we know that these things can have addictive engagements that can cause harm. Do we need to start thinking about what the ethics are here? Is it right that a media technology can be run by an algorithm that encourages excessive play by rewarding people the longer they play? I think it is difficult for policymakers and politicians to be able to envisage every scenario. What we can identify are things that we think are bad and have guidelines around stopping people doing bad stuff.

Professor Przybylski: It is a two-part problem. The first part is that unlike something like a sugary beverage or a cigarette or some other kind of qualia that we would be interested in regulating, you can go to the shops and buy that thing, you can drop it in a lab, and you can see at what point it vaporises and so on. However, any given set of experiences that you might talk about changes over time. It is a bit of a trope to say that technology is always moving, but the key aspect here is that when changes happen in the product, we do not, as a society or as users, know that there is a change. There were 34 different versions of the iPhone Facebook app that had subtly different colours and shapes of the notifications. On that end of things there is kind of a curtain and until we have the ability to articulate questions about what is going on behind the

curtain, we cannot use this kind of parallel argument by analogy with these other areas.

The second part of the problem—and I do want to drive this point home—is that while academic science in this area has been somewhat inspirational, it has been pointing at things to be either hopeful about or fearful of, the follow-up has been terrible because it is a shiny object and every time there is a shiny new thing, it is a bit like small children playing football: they chase after the ball. Even on the academic side, it is so easy to write a paper to get in *The Guardian* or your preferred newspaper and job done. You have had impact and good luck with the rest of your career, but you never need to penetrate deeper into a thing in order to receive academic success on the topic.

In a lot of ways, we could have had this exact same meeting 18 years ago and be talking about a game on Dreamcast that was connecting to the internet, or five years before that, talking about the first version of "Grand Theft Auto" if we were worried about its influence on aggression. The problem is that social scientists, and to some extent medical scientists, who are worried about the effects of influence or in the wellbeing of young people, taking advantage of the children, they have not advanced. A lot of what comes from the ethics or philosophy side of things is just, "Hey, let's try this in tech," but even with that, the ball does not move forward. What happens when something new is invented is that everyone just flashes themselves with the "Men in Black" device and everything repeats.

Q8 **Chair:** The final question from me: do you think the answer is that whereas in the physical world you can product test—if someone is making an advertisement about that product, you can see the advertisement and you can assess it against a set of principles, or if someone has designed a product, you can test it to see whether it does harm—in a case like this, we need to have regulators with the power to go in behind the curtain and look at the technology being deployed, how it has been designed, what behaviours it is encouraging, based on analysis of the data held by the technology company?

Michael Veale: To some extent we already have such regulators. They are just not empowered enough in terms of funding to do that now.

One of the things I research quite a lot is data protection law, which is by no means the panacea to a lot of these issues. It is able to be bent into many shapes and to tackle a variety of issues by virtue of the breadth of the definition of personal data. However, we have a regulator with plenty of powers to do that kind of investigation. We have rights at an individual level, which enable people to object to certain types of processing. For example, you would be able to submit an objection to an attempt to predict how likely you are to spend a lot on an app in the next hour, which is something that comes as part of Google's player stats, API. You would be able to submit objections to being used in experiments or AV testing. However, this is just not provided by companies upfront. It is buried, even for the companies that have considered it, in a very deep

part of their website and is not a tick-box option. Most usually it is an e-mail that you have to write, and this is not legal. If we had more empowered regulators, they could highlight that at least with regard to the larger actors and ensure that it is being followed, but it does require them to have more funding.

One thing to do before we start looking at new regulators is to ensure that those that currently have those powers are adequately funded. It is a larger-scale problem than it has been before because the nature of personalisation is very granular. There are many small actors and those are often pretty grievous offenders—in the tracking space at least—and the tendency, with the limited resources available, is to go after the large actors. We have to address that.

Sarah Jones: There is some move from the technology companies to support when there is hysteria in the press, when there is a story about VR that gets lots of headlines. I am thinking specifically now about the gender imbalance within technology and particularly within immersive spaces and the ethics around that, where social spaces have predominantly male users. There have been a lot of stories that received a lot of press attention around women feeling very vulnerable in those spaces. From some research that came out last year, 49% of females felt sexually harassed, and the tech companies did respond to that without regulation and had personal bubbles that you could put on so people could not invade your space. There are some moves without regulations, but there certainly needs to be a lot more work in that area.

Professor Przybylski: The answer to your question is yes, but fundamentally it is not going to be worth anything unless the scale of our commitment matches the scale of the organisation. We cannot trust individual researchers to look at Facebook or Google data or whatever. It is like handing them the ring of power—they get tenure, pats on the back—but the issue here is that these companies need to be made to work for us and the social science teams need to be as large as physics teams. Our papers need to have more authors than words in them before we will be able to get the answers we need.

Michael Veale: Very briefly, we also have an interesting mechanism in UK law, the super-complaint, which exists, and which is unique to the UK in areas like consumer law, financial law and payment processing law. The Government refused to put such a thing in the data protection law. It was article 82 and it was not triggered. There is to be a review carried out to see if it will be triggered. Such mechanisms would allow organisations to complain to regulators on behalf of an affected group. That is a good first step, because it does not require them to have a complainant and it does not require them to go through particular identification of individual harm. Often we are not looking at individual harm; we are looking at a broader, societal level effect.

What that misses, however, is the empowered investigation function of the super-complaint organisations. For example, under the Enterprise Act, the organisations are Citizens Advice and Which? but these

organisations do not come with powers to examine the data. Giving those same organisations that have the power to raise issues also the power to co-ordinate efforts to understand those things would be useful.

Q9 **Ian C. Lucas:** It seems to me that the action we take is reactive. We read about something, we find out about something we did not know about previously and then we do something about it. It casts my mind back to when we were speaking to Facebook in the previous inquiry. Facebook has all the information and asks us, "What do you want to know?" but we do not know what Facebook has. We need to have a much more proactive approach in the public space, in the democratic space. You were talking about some very interesting innovations—seeing things from another gender's perspective, for example—and that could be a powerful educational tool.

As legislators, we never have that conversation or discuss that far ahead and set the agenda. Are you aware of any countries or governmental or public bodies that do have that sort of conversation? Is anywhere being proactive in trying to reach ahead in the public space, ahead of what the gaming companies are doing?

Professor Przybylski: The best positive example is probably groups in the United States that are drafting what I think is called CAMRA or something very similar. It is a style of legislation that is meant to relate to access and to answering some of these fundamental questions, but unfortunately, no, we cannot just copy Germany's homework on this.

What we have instead is a series of outstanding negative examples. In China, we now have face recognition technology that is meant to turn off online games after three hours. In South Korea, we have technology that turns off online settings from midnight to 6 am for those people under 18. This was in place as a law for seven years before anyone bothered to check if it worked.

Definitely there are negative examples where, in the absence of a thoughtful proaction, of being able to articulate clear questions such as might come from exploratory research and science, people have adopted a precautionary principle approach that just shuts it all down. Speaking as someone who encountered the American abstinence-only sex education, I can say that that will not work.

Michael Veale: In the UK, we do have—or used to have—a Government office for foresight, which is now sort of inside the Government Office for Science, and you can look at their reports from nearly 20 years ago, 15 years ago talking about this very issue, talking about immersion, connected objects and the effect that would have on society. We should give ourselves a bit more credit for having those institutions and we should make sure they are still empowered—the area of foresight—and linking that to regulation, adaptive regulation, regulation that can change over time, that even has sunset clauses, other bodies involved in changing it and building on some very principle-based approaches. In Europe we are very lucky to have come across the principle of data

protection law, which is now being exported around the world and has been for some time. It is a principle-based approach. The details are not important, but thinking about how those principles can be adapted over time and about organisations that can do that is useful.

Sarah Jones: There are some interesting conversations, particularly with Digital Catapult, Immerse UK and Innovate UK. Those organisations are getting those conversations going and bringing academics together. You are talking about a multi-disciplinary subject. You are talking about bringing in psychology, philosophy, ethics, computer science, design, immersive theatre, all these different elements coming together. That is what makes it very exciting. They are holding those conversations, but then we have the technology companies desperate for content because as much as we predict that this industry will be worth X amount of billions by 2021, we still need content and there is a complete lack of content, so there is a drive to push that forward while also trying to have those conversations. Those things are not always joined up and that is potentially where some of the work needs to be done.

Q10 **Julie Elliott:** Michael, you have mentioned more funding for some of this regulatory stuff. Data protection is something in which the Committee has had quite a long-running interest in previous inquiries. Do you think that the legal and regulatory framework we have is prepared for the vast amounts of data that the immersive technologies are going to collect?

Michael Veale: Yes and no. The structure of the regulation is well prepared for that and we can fiddle around with it at the edges, but the principle-based core structure is well prepared.

What is not well prepared for is the very decentralised nature of where we are going. It is decentralised in a particularly interesting way. That does not mean that there are no big actors, but in immersive technologies, you are dealing with a large ecosystem. Maybe there is a gatekeeper platform, an app store, for example, but you still have lots of actors, lots of different trackers behind the scenes. Data protection law in the UK, because of its origins in Hessen in Germany in the 1970s and OECD guidelines in Sweden and so on, has this idea of a data controller. It has this assumption that there is someone you go to, you knock on a door and say, "Hello, can I please have access to this data, and can you also take these actions to make the system better?"

We have seen, even in some trivial cases around social networks—I say trivial because they are trivial compared with where we are going—that that approach does not work. People say, "We are just co-ordinating. We are absolved of responsibility, it is the whole environment". We need to work out how to deal with these ecosystem problems and that involves working with or taking action against co-ordinating actors, those setting standards—in the pervasive online advertising space that is Google and the Interactive Advertising Bureau, for example—taking action against those who are gatekeepers, such as platforms, app stores, which make a huge amount of revenue from this, encouraging them to audit apps that go on further, encouraging them to run automated audits, but also

encouraging them to put in their own transparency requirements, which can filter forward towards consumers or NGOs to check their legality. It is at that point that we lack provisions. The metaphor of a single actor, which comes from an employer—"Can I have my employment record, please?"—does not work in this world. The problem is not the amount of data; it is the number of actors.

Q11 **Julie Elliott:** Sarah, do you think there are guidelines and guidance for people designing immersive technologies on how to handle the unique types of data they collect? I am thinking of things like eye recognition, quite unusual data.

Sarah Jones: No.

Q12 **Julie Elliott:** What guidelines do you think there need to be?

Sarah Jones: I first started creating experiences—I research and I make—about four or five years ago, with no guidelines whatsoever. I just made and that was it. There certainly is nothing at the moment that talks about what you can do or should not do. You are talking about a technology that is driving an experience and you want to replicate that experience. You are looking for different ways to trick the mind into feeling a different way. There was a great, but slightly horrific, experience a few years ago called "Catatonic", where you were in a mental asylum in a wheelchair, you were being pushed through this mental asylum, and it was a most horrific experience. I remember it still, the power of that experience and the ways it made you feel as if you were there, that you were a character. It is still in my mind very clearly.

That was a powerful experience. You can say, "Well done," to the creators. They did get what they wanted. It was great, but also terrifying, and you don't think about what those long-term effects are, what the effects are on the mind. People might respond to it in different ways. We don't understand that. In the same way that you might go and watch a horror film, you do not know how you are going to respond. Everyone will respond differently, but when you are a character in that experience, when you are in there, inside it, that tricks the mind.

There is very little guidance. We do not have guidelines on the length of experience, how long you should be in a VR headset. Some films are 18 minutes long. Is that too long? Is that too long on the eyes? Is that too long to be immersed? Should it be shorter? There are no guidelines at all.

Q13 **Julie Elliott:** Do you think there should be guidelines?

Sarah Jones: Without restricting creativity, yes. As a creative, I do not want those restrictions, but I do not think we have enough data now to understand how it can impact people and what kind of length of experience there should be. It does very much depend on the type of experience too. Some things can be a couple of minutes and awful, you do not want to spend any longer in them. There are other things where 18 minutes is okay. It all depends on the type of experience.

Professor Przybylski: I have a three-part answer. The first is thinking in terms of funding or degrees of freedom for action, built into the Digital Economy Act 2017. In the Green Paper, there is some potential statutory authority to have financial and data levies, so there is a way in.

In terms of effects, we did an analysis of the pre-existing virtual reality literature in the social and medical sciences and we found that these studies were very low quality. Therefore when we talk about an effect or an amount of time that we would scientifically say should be a limit, we find that the studies are what are called statistically underpowered, which means if there is a VAR there, the chance that the study will detect it is quite low, so there are a lot of both false positives and false negatives. I would caution you very hard against looking to science for an answer there. Again, if there is a bunch of low-hanging fruit that academics and scientists have picked before they get hired by the VR companies, there is a real paucity there.

For a promising direction in developmental articulation of what should be in the media, I would look to the work of Baroness Beeban Kidron—her work on the 5Rights framework is not directly drawing evidence of studies that have been done, but consults developmental researchers, relationship researchers, child researchers, baby researchers, trying to articulate what meaningful, cautious design looks like—if we are going to move past the 2008 Byron review, because not a lot has happened in the last decade in terms of what you are talking about.

Q14 **Jo Stevens:** I want to go back to what all three of you have said about ethics and regulation. I am thinking about what kind of framework you might have. The obvious example that springs to my mind is the pharmaceutical sector: if you produce a medicine, you know what is in it, that if you have certain medical conditions you should not take it, you know what the side effects are going to be. Why would something like that not work—or would it work—if you applied something like it to this sector? I am interested to know if we can learn something for this sector from other areas of regulation.

Sarah Jones: For me, it is very difficult because you are talking about a subjective experience and the experiences will be unique. In a virtual experience, I might watch something, you might watch the same thing and we take completely different experiences from it. It is very difficult therefore to apply something like the pharmaceutical model to understand what that impact will be. There is a lot of research on body-swapping, mind-swapping, those kinds of areas, where there does need to be regulation. Other industries could inform how that is done, but I am not entirely sure in what way, given the subjective nature of those experiences.

Professor Przybylski: The amazing thing that has happened is that these kinds of trials are already out in the wild. Your pharmaceutical analogy is well-chosen because we have a situation where because we have failed to articulate what we, as a society, want from these companies in terms of young people or older users, what has happened is

that the news of the day or the push-pull of charities has forced companies to reposition themselves. Facebook may—and this is not hypothetical—work with a suicide prevention charity and they will build a tool to identify or flag some aspect of self-harm that a machine learning algorithm might link in some way to an indicator of suicidal ideation, but that never goes through drug and regulatory authorities. It is already working. It is already out there, and it is seen as a social good. The charity does not care because it thinks it is doing good. Facebook does not care because it does not have a drug; it has a tool, because they are engineers and there is an element of self-induced naivety.

But these things are starting to be stacked upon one another. You only need to think about the discourse around self-harm images currently in the UK where you now have another aspect of this, where the intervention somehow precedes the fundamental understanding. It is like a pharmaceutical company giving out blue pills, purple pills and green pills, but having no sense of what the active ingredients could possibly be.

Michael Veale: There are lots of good things about an analogy with the pharmaceutical sector and I want to point out some of the inverse, some of the tensions and what we might be able to learn from that sector as well. One thing we can learn is the way that there is a lot of regulatory arbitrage in the financial testing sector. There is a lot of financial testing that gets moved effectively on to more vulnerable or poorer communities abroad, areas that have fewer regulations, areas where it is cheaper to run pharmaceutical trials and they are used in turn as evidence in richer markets. We see a lot of the same thing happening, particularly in digital technologies at scale. We can look at the way that content moderation is being outsourced by large platforms into areas of precarious employment and how that is reinforced there. We have to be very careful that if you put in testing requirements, the burden does not disproportionately fall on vulnerable people because that is a risk.

Secondly, one thing that pharmaceutical trials are notoriously bad at measuring—and I think it links in Andrew's point—is synergy effects. It is very expensive to measure synergy effects in complex systems because you have to place everything in synergy with everything else to understand if there is an unexpected synergy effect. As in the case with many pharmaceutical products, there is no good theory around why something does work or does not work. It is hard to anticipate synergy effects without doing empirical studies. When we are talking about a single small actor, a small business or a platform making an experimental product, placing it into a system where it is effectively interacting with many other components—for example, in providing new data flows, in receiving data flows from other products, or even just being integrated into the social fabric of somebody's life—it is very hard to test for synergy. Anticipatory testing of that kind only gets you so far.

What you could do instead as well—and we do have analogies from the pharmaceutical industry—are follow-up studies. You have to say if it is an

experimental drug, "We are going to have an understanding of how it is deployed and used in the wild and the effects that it has". In that situation, you might want to engage in that kind of approach, but that would require transparency over the results of such studies and their methodologies.

Q15 **Jo Stevens:** I want to move on to something else now, which is the Centre for Data Ethics. Andrew or Michael, you might have mentioned there not being sufficient funding for current regulators, that they have powers, but they do not have the funding to be able to do what they need to do. Do you think that people have sufficient understanding of their data rights? Do we have sufficient understanding when we interact with immersive or gaming technologies and are we equipped to enforce them? I will be perfectly honest, I would not have a clue about how to enforce my data rights if I was on one of these games. How widespread is the knowledge about what people can and cannot do?

Michael Veale: No, but the answer is not necessarily increasing literacy. On one hand, I do not think people are informed of their data rights. In theory, they can e-mail, and they have been able to do it since 1998. We have not had a big step change in the nature of data rights in the UK since then. However, data protection comes from an individual rights framework; that is at its heart. It does not have the collective dimension that we might need. We are still burdening the individual. There is a lot of talk about whether we can get transparency, notice and consent, can we get explanations of how systems work, and this all burdens the user and just replicates the same problems. What you can do is encourage companies to design these options to be more upfront, to be more obvious, but even that does not take you far.

It was completely destroyed by lobbyists in the data protection regulation in Europe—the GDPR—and it is also being destroyed by lobbyists right now in debates happening now about the ePrivacy Regulation. Electronic signals, automatic signals, that can be sent by consumers from their browsers or devices to signal their preferences across a wide range of products—in the ePrivacy Regulations they are called do-not-track signals—in the GDPR, they were almost totally removed, except for the right to object. You have to do this because that means that individuals can just simply subscribe to a set of preferences that somewhere—Citizens Advice—might provide to them, and that can be updated at a central point and those are automatically applied across all their products and services, without burdening them. If you do not do that, I think this very individualistic idea fails very quickly.

Professor Przybylski: I want to push back on the idea that we have a perception of political will to regulate the approach to this. There are these mechanisms whereby we could extract money and data from the companies in statute and there is a lack of co-ordinated action. It is important to be mindful that with this kind of argument, by analogy to things like cigarettes in the case of addiction or pharmaceuticals in the case of intervention, there is an easy out for the entrenched interests. In some ways the companies have slapped on a mature content sticker or

they can do the kinds of things like the stickers that are put on the outside of a gambling establishment and then we are not in any way learning about what is going on, we are not learning about how the algorithms change or how the enticements change over time. We have just labelled it and considered it done and dusted and walked away.

The issue here is that because there are these entrenched interests that have some lobbying, financial and data power, they can be let off the hook with something that sounds good, such as a limit, but they are playing for time because it is revenue under the curve.

Jo Stevens: Sarah, did you want to add anything?

Sarah Jones: No.

Q16 **Clive Efford:** Sarah, you were talking about the virtual reality experience, where you were immersed in it and felt that you were actually there. Is there any research that says that what you are experiencing is any different from when people are immersed in watching a film, for example, the impact that the "Blair Witch Project" had? I suspect that had a lot of similar emotional impacts on people when they were immersed in watching that film. Is there a difference?

Sarah Jones: Absolutely, there is a huge difference. This is what is exciting about the technology and the opportunity that you have for it is immense. I always liken it to a circle where you have a story and you have this frame. If you are reading a book, you have this barrier. If you are watching a film, you have a barrier. When you are talking about an immersive experience, when you are talking about virtual reality, you are talking about jumping into that frame, you are actually part of the environment. You might not have active agency so much in the world, but you are really part of it. That means that the whole experience is intensified massively.

Within VR the ultimate goal—this goes back to the second wave of VR in the 1980s and 1990s—is to get that moment of presence. Presence is very distinct from immersion. We get immersion when we are lost in a painting, when we are lost in art, when we are lost in the theatre. We get that moment of presence when we lose all sense of disbelief in the world and feel we are there. That is why the intensity of the experience is much more powerful, in a way that you do not get elsewhere.

Q17 **Clive Efford:** The experience still goes in through the eyes and the ears, and possibly even touch, so those experiences are exactly the same in the sense of how the brain processes it. Has there been any research that says there is anything different going on in the mind as a result of virtual reality when compared with other experiences like football?

Sarah Jones: Absolutely. A lot of the scientific studies around body-swapping, mind-swapping and being part of a different environment signify that a lot.

You mentioned touch. I have done work with smells before, to enhance an experience by adding in different sensory stimuli that increases that

amount of presence. You can liken that to 4D cinemas and the old Sensorama chambers in years gone by. However, the power of the experience is so much more profound when you are inside it, you are actually inside an experience. That does not have to rely on high graphic processing. There is a lot of data that shows it is not about having the highest graphics, it is not about having the best-quality camera. It is a whole range of things that contribute to you feeling that sense of presence. That is the ultimate quest. When you are creating an experience, that is what you want.

Q18 **Clive Efford:** Has anyone done any research that shows that there are different senses in the brain that are being activated here or are we talking about something different?

Professor Przybylski: Dovetailing on that in terms of the science, one of the problems with these studies—besides having a very small number of observations, which creates false positives—statistically is that there is a very high degree of novelty. Because the studies do not have a lot of follow-up you can observe things that look different, but besides the fact that somebody is wearing 2 lbs of kit on their head you do not know that this is an enduring change.

The class of evidence that is best to structure your thinking on this point in terms of broader sociological or psychological impact is how we viewed other immersive technologies over time. We have a reaction to "The Great Train Robbery", we have a reaction to comic books or to rap music where we have a lot of hopes, fears or anxieties and it is bound in novelty that is linked to a generation or to a trajectory. Only when the hype has blown off do we all reflect on the fact that we all played "D&D" when we were 10 and that was part of storytelling. That was the active ingredient that was behind all of the excitement. I think that this again requires a longer period of sustained scientific interest than just, "Gee whiz, this is different".

Q19 **Clive Efford:** Are the people we are worried about who may be influenced by this immersive technology the same people who may be sucked into gambling too much? Is there a crossover?

Professor Przybylski: From a broader perspective we have to be very careful here. If we think about "The Great Train Robbery", a classic black and white film, in the United States the fears were that women, minorities and immigrants would adopt criminal inclinations. When the "Death Race" arcade game came out—a very silly game where you run over goblins and they turn into little crosses—we were worried this would lead to a rise in traffic fatalities. Therefore when we try to identify these groups that we think of as "the vulnerable other", we need to be very mindful of the intersectional characteristics of this. It is never the white 36-year-old Oxford professor who will be vulnerable to this; it is always someone else.

Q20 **Clive Efford:** In terms of addiction, we would all end up addicted if we exposed ourselves to excessive amounts of nicotine, cocaine or heroin

and we would all have the same physiological response. However, we will not all have the same psychological response to being exposed to immersive technology?

Professor Przybylski: If you have 1,000 people who are nicotine dependent and they have decided to quit smoking, a year later half of them will have returned to smoking because they have a basic behavioural and substance-based dependency.

When we do the same thing and look at online games using American Psychiatric Association proposed indicators, we did a study where we followed 5,700 people. Of the 0.5% who met the draft criteria, none of them were addicted six months later. Therefore there is a specific kind of pitfall, when you do the science right, of assuming digital technology has a qualia that is equivalent, fungible or interchangeable with other kinds of behavioural or substance-based dependencies.

Q21 **Clive Efford:** Is it possible for a tech company designing a game, or some other immersive form of technology that I might expose myself to, to design the algorithm so it will get me addicted?

Professor Przybylski: Not addicted, but they are targeting specific behaviour. This is not to say there are not bad actors. If we turn the cameras off, I will give you a list.

The problem is that it is not like there is a magic algorithm or there is a magic Skinner box here where someone has cracked it. What happens is that it is a co-ordinated effort where they look to the gambling industry and do not optimise for addiction; they optimise for return on investment. They found that half of the revenue comes from 0.5% of players. You know what they do? They assign secretaries to manage the whales, so when you do not play for a little while the algorithm says, "Check in on this person" and then they have a human being e-mail and say, "You have not advanced to the next level". It is less that there is a magic equation; it is more that there is a cyborg enterprise.

Clive Efford: It is operating in the same way as the gambling industry did, because that is exactly what they did.

Professor Przybylski: When they are proud of themselves you have to listen very closely for the right words.

Michael Veale: I will add briefly to that. If you look at some of the larger and arguably more transparent actors, not to mention the smaller ones, you see this in the services they provide. For example, in the App Store Google operates something called its Firebase analytics product. This comes with PlayerStats API. As a service it will provide you with predictions for, "What is the probability this person is in the highest 95th percentile of spenders? What is the probability this person is going to spend on your app within 24 hours?" They buy an add-on or something within your app, "What is the likelihood this person is going to spend this amount over a longer period of time?" This is being provided as a service

by platforms, which are the co-ordinating platforms, to individual companies designing apps to market on these platforms.

Q22 **Clive Efford:** Should we step back from this and try to find a simple solution to it? Trying to play "Whac-a-Mole" with all the technology is virtually impossible because new stuff is going to pop up all over the place.

Shouldn't the enforcement agencies confidentially, to protect confidential information, have access to all tech companies? Should they have to open up their databases and everything else so what is being done with that data and how they are designing their algorithms can be seen, so they are not, for instance, targeting vulnerable young people to buy more loot boxes and things like that? Do you think that is a solution?

Professor Przybylski: A bit, but you need to know what to look for. Again, it is a necessary but not sufficient condition for getting a hold of this problem. That style of access, absolutely. However, like a lot of the things Sarah was saying, there is an aspect of art to this as well. There are loops in games and rewards, cycles that are relatively benign. They are the exact same loops that are in board games, in "Apples to Apples" or whatever, so they are part of what brings joy.

It is a two-part problem, being able to articulate the question and also being able to get the answer. You bring up loot boxes, but loot boxes are a concept like screen time. It is easy to say, "This is my kid looking at a screen" or, "This is an event that is happening that has a random element to it". The most recently published academic paper on loot boxes was meant to categorise them—it was in "Nature Human Behaviour"—but there were 20 errors in it. Therefore even when someone tries to do it, it is a moving target.

Q23 **Clive Efford:** Are they not the basic ingredients from which people make money? A bit like baking a cake, the basic ingredients are the same, but the question is what are people doing with those ingredients?

Professor Przybylski: I do not know. There is an aspect here where there is intrinsic motivation, human play and the thing that motivates us to learn and to grow. Then there are those who would co-opt that process.

Sarah Jones: Going back to your original question around immersion and presence, it has moved on to addiction. I find it quite curious that it is an inquiry into immersive and addictive behaviours. By the very nature of the technology at the moment, immersive technologies—particularly wearing headsets—are not comfortable enough or light enough to be able to generate that kind of addictive quality that sitting down and gaming might. There is certainly a huge study that needs to be done on the psychological effects. As we have mentioned, there is not enough long-term evidence at all. We are not understanding how long lasting empathy-generating content is.

Say something that was made in 2014 had a profound effect on lots of people—lots of decision-makers at the UN, for example. Do we still feel the same degree of empathy as we did two years ago? Those kinds of questions are not being asked. Research is not being done in those areas whatsoever. However, there is enough research that will talk about immersion and presence in a virtual environment as having a much more profound impact than a traditional flat-screen viewing, so there is enough data on that.

Q24 **Simon Hart:** It is a similar thing, but is there not a legal liable issue here? We talked about tobacco and drink. To some extent if you buy tobacco and drink you are given sufficient warning of what the health consequences might be, I suspect to prevent any future action being taken against the providers of that material in the first place.

However, what you were just saying, Sarah, suggests to me that we do not know what the long-term effects are. I suppose my question is this: if in 10 years it is by then demonstrable there is severe psychological damage that is a direct consequence of these particular games, where does the liability lie?

Sarah Jones: It is a very good question. I have a background in philosophy, and I like to ask those questions around the value of experiences. We were having a conversation earlier around the value of a virtual experience as opposed to a non-virtual experience. There are some questions around virtual torture and whether VR could be used to torture people and then whether that would be an equivalent: would there be an equivalence to virtual torture as opposed to non-virtual torture? We do not understand the mind. We do not understand what that impact is. There is not enough data. Who would be liable? Is it all of its creators? Is it the industry in putting out content without those long-term effects being studied? When do you do those studies?

Q25 **Simon Hart:** Quite. If it was a medical instrument or pharmaceutical company, there would be all sorts of warnings of possibilities rather than definites. They would try to second-guess what the potential side effects might be in order to mitigate that liability. However, none of the people we have spoken to or listened to this morning are in any way suggesting anything. In fact, when we saw a panel of gaming people last week the suggestion was, "No, there is absolutely nothing to see, no problem at all".

All I am asking is if in 10 years' time it transpires that one of my kids has a psychological disorder that is exactly attributable to it—by then the science may have caught up—can I go after these people?

Professor Przybylski: From an accountability perspective, I think the people on your side of the table, the people on our side of the table and the gaming companies would be 100% responsible, if that was shown in 10 years' time.

I think we should be very mindful that entrenched interests in industry will interpret an absence of evidence with evidence of absence. That

understood, when we get science right and when we remove the bias of the researchers, when we register our studies and we share our data and look at how data can be sliced and diced to create fears or hopes, we do not see the trace that presupposed this decade-long ossification. We find the pre-existing biases of researchers paint dramatically different pictures. How you analyse data, what variables you pick can lead to a result being terrifying or to the chief medical officer saying, "We cannot give good advice". There are billions of different ways of analysing data.

Q26 **Simon Hart:** Isn't the fact we are having this conversation at all, and the fact that I think there was a Science and Technology Committee report last week hinting at time limits that people should adhere to, be sufficient warning to the companies trading in this that at least they ought to be undertaking research and attaching warnings, even quite broad warnings, alongside the sale of their product?

Professor Przybylski: It should suggest that we do not take our eye off the ball. It suggests that they should be subject to continued scrutiny until we get the right answers. The thing you need to understand is that from a human rights perspective international frameworks are very clear about young people having rights to play and having rights to information. If we begin a process of restricting users without knowing what we are up to, we can run afoul in the other direction.

Q27 **Simon Hart:** I am not talking about restricting it; I am talking about alerting users to the potential consequences of their actions. The absence of that strikes me as being arguably irresponsible.

Professor Przybylski: I am thinking of a situation where there is a game like "Fortnite" that has come out, which teenagers use for socialisation more than running around and killing. We slap a new kind of advisory on it because we observe that there is a correlation between the number of hours and self-reports of depression or something and what we wind up doing is taking away their digital watercooler because we scare parents unduly.

Simon Hart: Or duly.

Professor Przybylski: Or duly, but we do not know. That is the thing, we are not parameterising our own certainty here, we are just taking the gaming companies' word for it.

Q28 **Brendan O'Hara:** There are moves, are there not, particularly around gaming disorder that the WHO introduced last year as a classification of disease? We have heard lots of anecdotal evidence and certainly lots of unscientific evidence from newspapers and concerned parents. Why do you think the WHO has classified this as a disease?

Professor Przybylski: I think that in psychiatry there is always a fundamental tension between flagging things that are of social or health concern and not pathologising regular everyday aspects of life. The key debate you can cue into when you think about the idea of behavioural addictions is the debate around nicotine versus caffeine dependence in the late 1980s. The evidence is that caffeine is probably just as addictive

as nicotine, but there are countervailing forces that prevent everything from being labelled as addiction.

The thing you need to zoom in on here is the fact that there is no curiosity about what gaming actually is. What is the bright side of the coin? It is only focused on the dark side. There is also no careful definition provided of what a game is, what it is not and what it is meant to encompass. In the United States the proposed category is "internet gaming disorder" but no one can tell me what an internet game is. I think all games involve the internet now.

Q29 **Brendan O'Hara:** What evidence did the WHO use to determine that this was a disease?

Professor Przybylski: It has not determined it is a disease. It has included the category in its draft guidance for ICD-11. It took the NHS 23 years to get ICD-10 into practice so it is going to be a little while before this comes around for us on this island.

Basically there are two classes of evidence. The first class of evidence is expert opinions and the second class of evidence is surveys. Researchers take a gambling questionnaire or a smoking dependence questionnaire, take out the words "gambling", "nicotine" or whatever and put in "World of Warcraft", "Fortnite" or whatever the scary thing is at the time. They go to an online forum and have people fill out a survey. There are a thousand studies like this. When they look at them they say, "There is a phenomenon here". However, if you do it carefully what you see is statistical noise.

Q30 **Brendan O'Hara:** If that was its evidence base, what was its motivation so to do?

Professor Przybylski: I think it wants to do good. I think the WHO wants to make sure young people have access to care. However, fundamentally there is a problem because it is not clear that gaming is the thing that is the cause of the problem. When you listen to psychiatrists talk about it—I would highly suggest, if you have not already, hearing from the Royal College of Psychiatrists' "Gaming the Mind" group—often gaming is part of a dynamic: it is a crutch, it is a social support, something is going wrong in the family. It is true that games can fill that vacuum, but you can see on both sides it is very cynically used by those who have again entrenched interests. If you have a clinic that charges $10,000 or £10,000 a month, you still get in *The Guardian* to talk about how gaming addiction is a problem. On the other side of it, you can point at research by my group if you are a video game developer and say, "Look, there is no 'there' there". In the interest of short-term gain that forestalls the deeper conversations, which I can sense your deep dissatisfaction with, I am very dissatisfied with it too.

Q31 **Brendan O'Hara:** Is the work being done, in your opinion?

Professor Przybylski: One of the basic ideas is that everyone has to show their work. What has happened in the last 30 years of addiction

research around technology is that academics say, "The industry needs transparency—yada, yada, yada". However, what happens is that academics are not transparent. They do not share their data. They do not say whether or not they have their hypotheses before they collect their data. This ridiculous cycle creates more flotsam that you have to navigate through. From my perspective the answer is open and transparent large-scale science, but that is kind of expensive.

Q32 **Brendan O'Hara:** Given that this Committee is right at the start of this process, what are the most urgent questions that we should be asking when we look at things like gaming disorder and what are the traps for us to avoid?

Professor Przybylski: I think there needs to be a data-clearing house between the amazing investments the United Kingdom has made in tracking household panels. There is the British Household Panel Survey, the Understanding Society project and the Millennium Cohort Study. We collect all of this granular data about kids, their families and their households. That needs to be somehow linked—preserving ethics and accountability—to the functional data of what these young people are doing as they play. The gaming companies do not have information about the kids and their wellbeing. The kids and the wellbeing people, which we support with our tax pounds, do not know anything about their digital lives. We have to ask survey questions, which are noisy. Therefore any way of proposing and testing these questions requires a synergy or a combining of sources of information. Does that make sense?

Sarah Jones: It is easy as well to get caught up—we have all mentioned it—in the headlines and the "sexy talk" around the technology, "VR will ruin your life", "Getting virtually groped in virtual reality" and all those big headlines. They do generate a lot of conversation. We have all, I am sure, had our work spoken about in lots of different forums because it is new, because it is exciting. However, it is not new, and it is not exciting. It has been around for years. NASA has been using it for education since the 1980s. We are talking about quite established technology. It is important to cut through all of that noise, because there is a lot of noise out there, and try to pull back to those real issues. Issues around data protection, ethics, the safety of users and what things might be doing to the mind—subliminal advertising, brain hacking and those kinds of questions—are the important ones to focus on that you can get real results on.

Q33 **Julian Knight:** Sarah, how did living in a virtual reality world—sometimes I feel I live in a virtual reality world in this place—for 48 hours affect you?

Sarah Jones: Not as much as I thought it was going to. That is probably more problematic—the fact that it did not impact me. You are referencing a time around 18 months ago where I lived in virtual reality. The whole idea was to try to see whether we could live in a virtual world and what the impact of that is. I wanted to get that moment of presence where I would wake up and not know that I was in a virtual world. I wanted the

technology to be that great that I would have lost all sense of disbelief, which did not happen. Headsets are heavy and we are talking 18 months ago when it was even worse. However, it was an interesting experience to understand how much of our lives can exist in VR—how we can use virtual reality for education, for learning, for eating, for meetings, for meditation, for exercise, all those areas where the technology has the opportunity to transform people's lives—and to get that data. Unfortunately, it did not impact me as much as it should have.

I think what was quite interesting was that we reached out to all of the major tech companies and none of them would support living in VR for 48 hours.

Q34 **Julian Knight:** Why?

Sarah Jones: Strapping a headset to your head and not knowing what is going to happen for 48 hours may have something to do with it, which comes down to the lack of research.

Q35 **Julian Knight:** They were worried that something would go wrong?

Sarah Jones: Yes.

Q36 **Julian Knight:** What else did your research more widely reveal about the potential for VR to impact people's thoughts, behaviours and interactions?

Sarah Jones: There is a lot of work that came out of it. The question around presence is important—it is something that concerns me a lot—and the understanding you do not need the highest processing or anything like that to feel involved in an environment. I put my phone down on a ledge and dropped my phone because I thought that ledge was there; my phone just fell to the ground. That was a cartoon kind of environment. I know I am not there, but I had that moment where I did believe that the environment around me was true.

In terms of interaction, there was a lot of work we did around social spaces in VR. It was at the time that Facebook Spaces had just launched and was its first step in virtual social spaces. I am quite uneasy about those spaces; I do fear them slightly. It was an interesting way to interact. It was an interesting way to understand how we can use this tool for huge good in terms of education. For example, situating yourself on the moon and being able to share that experience with lots of different people is learning in a really incredible way. We did all those kinds of things within 48 hours as well.

Q37 **Julian Knight:** Given your unease that you have just expressed, what do you think of the need for more robust industry standards to guide the development of VR technology as we go forwards?

Sarah Jones: I think there is certainly a lot of need and we have moved on from the, "Let's just make everything and put everything out there". We are starting to see more stringent processes maybe or the work is not reaching as many people, which is good, because there has been some poor work. I have made things where I have thought, "I want people to

feel uneasy. That is the environment that I want to create so how can I make someone feel uneasy? What can I do in post-production in terms of creating those experiences that people are going to feel on edge?" I am a responsible creator so I will take that seriously and test and check all of my work, but you do worry that there are a lot of platforms where there is a lot of work that has not been regulated, has not been checked and has not been made in the right way.

Q38 **Julian Knight:** When you say "checked", who by?

Sarah Jones: That is where the need is. It is easy to get work out there now, particularly with YouTube having a virtual reality platform. Vimeo the same; you can stream in 360. I could get out a camera now, I could film this whole environment and I could put it online and anybody else could be in this room. That is fine for this kind of environment. I could create anything and then put it out there and it could get an audience.

Q39 **Julian Knight:** Do you think it is too laissez faire? Loan sharks probably have industry standards. Does it need something more robust, do you think? I would also like to bring you in on this in a second, Michael, as well. Does it need something: more clarity, more robustness and just basically, as you say, someone looking over someone's shoulder when they are creating something? Do we need some role for Government, some role for a regulator? What are your thoughts on that?

Sarah Jones: Yes. I think there is definitely a need for some regulation, and I think what is interesting about the technology is that it does not fall in one particular area. It does not necessarily fall to Ofcom. It does not refer to competing. Where does it sit?

Q40 **Julian Knight:** Everything falls to Ofcom these days.

Professor Przybylski: That was what I was thinking. I was like, "Who at Ofcom will be stuck with this?"

Sarah Jones: Where does it sit? In what industry does it sit? We have such a big area around education, you have around training. Where do you put it? I guess that is one of those big questions for you to try to figure out, but wherever it does sit then, yes, there does need to be more regulation. Simply around children using VR, Samsung always have their guidelines with their Gear VR, which was one of the most prominent mobile VR headsets a couple of years ago, where children under the age of 13 should not be using them. You had that one-line guidance, but that is it. Definitely there has to—

Q41 **Julian Knight:** Where do we put it? Michael.

Michael Veale: Insofar as it is a product—and I think a lot of the time what we are talking about now is a product or a very delineated service like video, being here in a 360 environment or so on—it is quite easy to think of it within the product or service liability regimes and in terms of consumer protection and so on. However, that does not scale to the future because I think what we see there and what we see in a variety of technologies, and while we cannot predict with certainty, it does seem to

be likely in VR and similar technologies, is that there will be a platform and infrastructure where other things will be built. You will be entering a virtual world where there are other service providers; there are other business models operating within this virtual world and it is unclear who is governing these. One thing that you lack there is the right to examine the infrastructure and I think that is the key word here, to look at who has the rights to information, to govern this infrastructure, to oversee it, to oversee what services can or cannot be provided.

At the moment when we look at say the ICO's powers, being the most developed in terms of data, we do see that they have a right to go in and request information and they have quite extensive rights in that regard if they suspect there is a breach of data protection law. Unfortunately they are bound by the regulator's code, which is odd because they are an ombudsman. They have to consider even individual complaints, whether it is going to affect UK business. It is very bizarre from their point of view.

Those powers exist. However, this is not all about data protection. This is going to be a case of consumer agencies. We are thinking about Ofcom. We are thinking about lots of different agencies who may be interested in accessing this infrastructure to analyse whether products and services using it are or are not in breach. Thinking about what powers are necessary across sectors of it will be interesting and whether there could be a regulatory clearing house for this. We see the European Data Protection Supervisor has set up a digital economy clearing house, I think it is, to bring together different regulators across Europe to talk about these issues. I am not sure if the UK is a member of that.

Q42 **Julian Knight:** Probably not for long.

Michael Veale: No, but a member of that group, UK regulators. It would be worthwhile thinking about a clearing house around digital infrastructure.

Professor Przybylski: I would briefly add that thinking about what the minimum viable product is from a regulatory perspective or what an 80:20 role would look like here without placing undue burden on Ofcom, I think the initial guidance, given the vacuum that we are dealing with here, health and safety for things like epilepsy, the necessary conditions here, so that on a basic physiological level there is guidance about brightness and strobing and things like that, so things that we already know in other forms of broadcast media that we regulate.

The second bit is whatever our values are, so maybe something around accessibility guidelines, ensuring that people who are older, people who have issues with sightedness, do not get left behind. Steps in both of those directions can be taken in a relatively light-touch fashion to make sure that if indeed these platforms hold all of this promise and potentially all this monetisible data that we want to control that we are not leaving a vulnerable group behind.

Q43 **Julian Knight:** Sarah, do you have concerns over women's experience in virtual reality?

Sarah Jones: Massively. There is quite a big piece of work being done at the moment around gender in virtual reality. There is a huge imbalance in terms of users, and it is concerning, not in terms of what is being produced or anything like that, but is concerning when it comes to social spaces. I always liken it to the old 1990s chatrooms where you would go inside a chatroom and it would be awkward and feel horrible and a little bit seedy and it is like that—

Q44 **Julian Knight:** A bit like Twitter?

Sarah Jones: Yes, just like that. It is that kind of environment where if you put on a headset and you go into a social space your avatar might be you as a woman, but the male gaze is straight towards you and it can be uncomfortable. There have been a lot of reports, as I mentioned earlier, around sexual harassment in VR. Then it comes to that value of experience: is it equivalent? If you feel like you have been harassed within virtual reality, is that the same as being harassed in a non-virtual world? Then we have that equivalent of experience to consider. The tech companies have responded well. They have a safety bubble feature.

Q45 **Julian Knight:** That is a personal bubble, is it?

Sarah Jones: The personal bubble, yes.

Q46 **Julian Knight:** I was going to ask you what that meant.

Sarah Jones: Yes, absolutely. You can have a personal bubble, you can determine how big that bubble is around you and it would stop people coming within that space. You can mute them fairly easily. There has been lots of research. There was a great study done last year around it where they spoke to quite a large number of users of social spaces where they spoke about women feeling like they needed to go around the edge in environments to move through different rooms. The virtual rooms are set up in social VR. You can teleport yourself to different areas and some tech companies have organised women-only rooms. I am not sure if that is the answer, but certainly the purple bubbles—you can make them whatever colour you like—or the personal bubbles have been a welcome addition.

Q47 **Julian Knight:** Yes, but is that enough to counter intimidation and harassment, do you think?

Sarah Jones: No, but it is a start and it is the same as harassment that you would feel in everyday life. It is the same. You are replicating a world. You have another world out there, so you have those same issues that people feel.

Q48 **Julian Knight:** It is anonymous though. That is the thing. I can intimidate someone or harass on a virtual reality and have an anonymity there, but if I intimate or harass people in the street, for example, then I am witnessed, I am subject potentially to prosecution for that. Does that

not make it more difficult, more difficult to trap and also more difficult in terms of restraining behaviour of the individual concerned who was doing the harassment or the intimidation?

Sarah Jones: Absolutely, and you see that with social networks, with trolling on social networks. People feel that because things are anonymous, it is okay to say it, it is okay to harass somebody in a virtual space because you are not really there, but you are. You are present in that environment, so the personal bubbles are helping, but you are talking about a male-dominated space.

Q49 **Julian Knight:** Can I just open this up as well? Do you think we are basically just going to repeat what we have just been going through for the last 10 years in the virtual reality space as we have done with the social media space in that respect, in the fact that this anonymity of the ability to harass, intimidate, to be vile to your fellow human being? Are we just going to have that again now, but this time it is going to be in a virtual reality space?

Professor Przybylski: Yes.

Q50 **Julian Knight:** It is pretty depressing.

Professor Przybylski: I am lucky enough not to be a woman in virtual reality around social media. But there is a very peculiar intersection here between social challenges and social givens and the technological. There are certainly technologies that if they are properly grounded in experience, like a bubble, they may have a good functional advantage, but it is very tempting when a system has levers or off switches to just assume that we can rest on our laurels with respect to culture.

Sarah Jones: I would say as well it is not just women. In the survey that was done last year there were 600 users surveyed and 36% of men also felt that they were harassed within a virtual space. It is more prevalent.

Q51 **Julian Knight:** Do you think it would help, Sarah, if there were more women creating these spaces to just have a different mindset, effectively to be more aware of the challenges that can be faced?

Sarah Jones: Yes. I guess I am in a very privileged position because I know that the women in the VR industry within the UK are huge and also globally there are some incredible creators. I think that is helping massively. They are mostly coming from the storytelling traditions rather than the gaming traditions. You still see it, because it is the culmination of loads of different industries, a lot of the female creators are coming with that narrative, arts background rather than in the programming developing stage, but there is a huge growing passion.

Q52 **Julian Knight:** Is there that cultural conversation going on in this space between women in order basically to say, "How do we effectively create something that does not just mirror everything that has gone on in the past"?

Sarah Jones: Yes, there is, and there is some great work being done at UAL within it. There is a lot of work being done there. Catherine Allen as well—you should speak to her at some point—she has been doing some great work within diversity in VR. There is a lot of work and a lot of conversations happening around diversity within the broader tech industry as well. It is not just a VR issue; it is more tech.

Q53 **Chair:** Just to follow up with a question from me. A lot of what we discussed this morning reminds me somewhat of the inquiry we have done on looking at social media and disinformation, where at the start the inquiry considered this as a form of bad content that goes viral because it is sensational and what can you do about it. Virtually recognising that there is a form of intelligent design behind this information going viral and how it has targeted the people and targeted the people who are vulnerable with it, with this as well we are trying to get insights as to what are the right questions we should be pushing, what are the issues we should be looking at. The makers of these technologies are not. They are acting on data. They are designing games—I would not say deliberately—to be played or targeted to certain people.

From what you said, Michael, earlier on they are acquiring data from big tech companies in order to help target probably games at vulnerable people or people who are going to spend the most money on them and designing them in that intelligent way. Do you feel there needs to be more scrutiny of the sort of data that creators of these technologies can have access to and therefore how they can then use that? Because it seems that if they chose to, they could easily use that data to exploit audiences.

Michael Veale: When we talk about a lot of these future-facing technologies, not that the technologies themselves have not existed, but I think the business models around them are emerging. We can learn a lot by looking at current practices and the one that we can learn a lot from in this space is real-time bidding online for advertising, where we see that there are a lot of actors involved in that. It is effectively when you load any website the adverts are generated on the fly. There is a marketplace bidding for your eyes. It is linking your identifiers that, in these kinds of technologies, will be on your device. Lots of identifiers are sent off, permanent ones too, and you are being cross-matched against databases that are accumulated about you by data management platforms, like Cambridge Analytica was a data management platform—among other things—but Google also runs one.

This kind of cross-matching is incentivised by this whole structure so the ecosystem that has been set up incentivises certain actors to exist and we can say intelligent design to some degree. It is not like somebody already laid out a blueprint of how they wanted this to work. A lot of actors emerged, a lot of incentives emerged, and you ended up with undesirable structures. Taking a close eye on the infrastructures that have emerged, especially as these new technologies emerge, getting ahead of that and just being aware of who is in the space, what they are

doing and the legality of what they are doing from the beginning is key. To begin with it is just the legality. We can try to think proactively and regulate in anticipation of many harms that may result from replicating a world, but what we did not do in other spaces is ensure the legality as these things were emerging. I think we can learn a lot and do that in the future.

Q54 **Chair:** The data you mentioned that Google supplies, is that linked to individual users or to devices or is it—

Michael Veale: Google run—it is not Ad Exchange, it is different—the AdX platform. They have a lot of different products within the real-time bidding space and they have a data management platform product, which I have forgotten the name of, and that is about matching users to find out more information about them. They are one of many providers of this, Salesforce and so on, but lots of other smaller providers. Companies that are bidding for your eyes, they will need to know how much to bid for you. They need to know if you are valuable or not and so they use intelligence externally and that intelligence externally takes the information your device sends—which could be quite difficult to figure out who you are from—and then uses another service to work out exactly who you are and to work out a lot of other information. It is these other services that run the trackers across all devices. It is in this context that there are incentives to create these structures: the bidding context, the context of attention seeking and the context of this being the way that these products make money and the creatives are funded in this way.

Professor Przybylski: Yes. I would say that it probably is a category error to assume that all of the data that the companies collect and store is of equal value. Depending on whatever the monetisation challenge or design challenge is, if you are a game company or if you are selling ads or whatever, there are monetisation models that involve real-time transactions and maximising those or subscriptions or single point of sale or DLCs, all of these different modes and models. You are right to say that the way that certain kinds of data are eventually deployed or monetised, there is an aspect of design to it, but companies do not always know. It is a bit like advertising. They do not know what 50% they are wasting. They have to collect it all and then they store it all and then depending on how disorganised they are as a group within an organisation, they then have teams that alternatively say, "This is signal, this is noise," and then that gets project managed.

A gaming company could be sitting on loads of data that they do not know what to do with until they realise that there is a toxic dynamic and they need to fix their matchmaking with gender or something like that. Then only when that happens do they scoop up the data and lots of stuff is just left on the cutting-room floor because the idea is that the data is their oil. They need to monetise it, so they cannot share it. There is like this dragon on top of a pile of gold thing that is happening.

Chair: Thank you very much. I think we have to draw it to a close at that point, but thank you very much for your evidence this morning.