

# THE ROLE OF INTERACTIVITY IN VR GAME DEVELOPMENT



Produced by  
**(VR) Intelligence**

Proud to support

**GREAT**

BRITAIN & NORTHERN IRELAND



In Conjunction with

**(VRX)**  
**2017**

December 7–8, San Francisco

# The Role of Interactivity in VR Game Development

## CONTENTS

1.0	Introduction	3
1.1	VR & the future of gaming	3
1.2	Why true interactivity is critical to user experience in VR	3
1.3	UK Department for International Trade	4
2.0	Meet the experts	5
3.0	Expert insights on interactivity	6
3.1	Tell us a little about the current and recent projects you're working on	6
3.2	Creating interactivity is core to immersion in VR gaming. How are you approaching this – and what are the main challenges you're facing?	8
3.3	What can be done to drive increases in character and object interaction in VR? And what's the place for new technology advances like eye and motion tracking?	12
3.4	With the increase in controller capabilities recently, how is this helping to augment the experience for users?	15
3.5	How important is audio in enhancing interactivity and presence?	17
3.6	What are the best examples of techniques to improve interactivity you've seen in games and VR experiences you've come across?	19



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

# The Role of Interactivity in VR Game Development

## 1.0 INTRODUCTION

### 1.1 VR & THE FUTURE OF GAMING

The VR/AR market, while still in its experimental stage, is gaining serious momentum. The global market for VR/AR is projected to increase exponentially over the coming years: from \$3.9bn in 2016 to up to \$108bn by 2021. The games industry, with its expertise in generating engaging worlds and compelling narratives to create ground-breaking, immersive experiences, is a perfect fit to take advantage of VR/AR capabilities.

### 1.2 WHY TRUE INTERACTIVITY IS CRITICAL TO USER EXPERIENCE IN VR

Character and object interactions have long been a crucial element of the video game user experience. But with new advances in virtual reality, interactivity is being taken to a whole new level. In this new breed of gaming, establishing presence is absolutely key and users need to be able to seamlessly interact with the virtual worlds they're immersed in, just as they would in real life, so developers are conjuring up ever more ingenious ways to deliver enhanced interaction into their titles.

In this paper we'll hear from experts producing some of the best content, platforms and technology who are helping to bring incredible VR games and experiences to life. You'll hear from Supermassive Games, Improbable and ARM who are on the front edge of game and platform development in the UK as well Kite & Lightning and Polyarc who are among the developers leading the charge in the US.

With a global view of how interactivity is coming to the fore in VR gaming, you'll get an excellent picture of how to take advantage of the huge opportunities arising. Hear how advances in technology, haptics, audio and controllers are all playing a role in augmenting the immersive experience for users and how our expert contributors see the next few years playing out.



**(VRX)**  
2017

**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**



## The Role of Interactivity in VR Game Development

Proud to support



And if you're looking for more on how VR is changing and enhancing digital experience development in gaming and beyond, make sure you sign up to attend the next VRX conference and expo in San Francisco on December 7-8 – where the real business of immersive tech gets done.

Featuring some of the contributors from this paper, and dozens more of the globe's top visionaries talking about the huge impact of immersive tech on gaming, entertainment, enterprise and more, VRX is the world's most senior level B2B event for VR and immersive technology. Check out full details on [www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)

### 1.3 UK DEPARTMENT FOR INTERNATIONAL TRADE

With more than 450 British companies working in the VR/AR sector, this report has been produced in collaboration between VR Intelligence and the UK Department for International Trade.

The UK's international reputation for creativity and innovation in gaming, film/TV production, and visual effects, as well as its high quality in design and digital, is attracting significant interest from major global businesses looking to generate new IP and products for the VR/AR market.

“The intersection of brilliant creative content and cutting-edge technology will be at the centre of the future economy. Combining creative and digital excellence, a strong R&D base and supportive Government policy, the UK is already established as a global leader in the growing VR/AR sector,” says Matt Hancock, the UK's Minister of State for Digital.

The UK's Department for International Trade (DIT) has responsibility for promoting UK trade globally and attracting international investment into the UK. If you would like support connecting, establishing or expanding your business in the UK VR/AR market please contact Cindy Fabian at DIT: [cindy.fabian@mobile.trade.gov.uk](mailto:cindy.fabian@mobile.trade.gov.uk) / +1 415 617 1372



December 7-8

Marriott Marquis, San Francisco

The world's leading senior-level B2B event  
for VR and immersive tech

Tickets available now at  
[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)

## The Role of Interactivity in VR Game Development

### 2.0 MEET THE EXPERTS

#### PABLO FRAILE, DIRECTOR OF ECOSYSTEMS, ARM

Pablo Fraile is Director of Ecosystems at ARM, a British company who are among the most dominant producers of mobile processors for smartphones and tablets in the market today.



#### TAM ARMSTRONG, STUDIO DIRECTOR, POLYARC

Tam Armstrong is Studio Director at Polyarc. Their latest VR game, Moss, was announced on stage at PlayStation's E3 conference this year.



#### ROB WHITEHEAD, CTO, IMPROBABLE

Rob Whitehead is Co-founder and CTO of Improbable; an innovative UK-based games technology company and creator of SpatialOS - a platform that empowers developers to build, run and operate previously impossible online games.



#### JENNIFER CHAVARRIA, HEAD OF STUDIOS, KITE & LIGHTNING

Jennifer Chavarria is Head of Studio at Kite & Lightning, a cinematic virtual reality company blending gaming, social, and story to create emotionally transformative experiences.



#### SIMON HARRIS, EXECUTIVE PRODUCER, SUPERMASSIVE GAMES

Simon Harris is an Executive Producer at Supermassive Games Ltd., a BAFTA-winning independent UK game developer, with a reputation for innovation in both storytelling and VR.



Interviews conducted by Tom Wallis



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

# The Role of Interactivity in VR Game Development

## 3.0 EXPERT INSIGHTS ON INTERACTIVITY

The thoughts, insights and words of wisdom from those on the frontline of the VR industry. To see each interview in full, or to see more of VR Intelligence's reports and insights, visit <http://www.vr-intelligence.com/>

### 3.1 TELL US A LITTLE ABOUT THE CURRENT AND RECENT PROJECTS YOU'RE WORKING ON

**Rob Whitehead** Improbable is primarily a compute platform and client-based environment service. Games studios use our technology to build their games – some of which are VR games.

Perhaps our most well-known project is a game called Worlds Adrift, which we've been working on in partnership with Bossa Studios. Worlds Adrift isn't a VR game, but it is a highly physical, massively multiplayer environment, where thousands of players build ships using physical parts to sail through the sky and explore the remnants of an exploded planet.

Players explore environments together; they're competing with a real, physical ecology that runs 24 hours a day. When players cut down trees, they physically fall into pieces. As their ships fight one another, the panels attached to those ships can fall off and land on the ground.

The world is persistent, so any one of those ship panels, any one of those trees you fell or creatures you kill stick around until something happens to them.

At the core of the game is a meaningful and engaging interactive world. That is something we enable with our platform – these more interactive, more meaningful environments to create believable, immersive worlds.

Worlds Adrift runs across hundreds of servers on the back end; all cooperating together, sharing and organically redistributing the workload on the fly as the world ebbs and flows.

Bossa Studios have been at the heart of defining the aspiration for the game, and they've provided the core of what the game is. We've taken on the heavy lifting when it comes to making that vision happen. Bossa Studios are used to a more traditional game engine like Unity, and we've come along and supercharged that with our technology. Under the hood we're running – at any one time – hundreds of instances of Unity to represent this huge, rich and persistent world.

**Tam Armstrong** Moss is an action/adventure game featuring unique mechanics around player interaction and character interaction. You play the role of The Reader, and you're reading through a book about a heroine named Quill. As you read, you're transported into that world with Quill, and you head off on an adventure together.

You guide Quill at the same time you interact with the environment, and that is the basis for the challenges and puzzles throughout the game.



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**



# The Role of Interactivity in VR Game Development

**Jennifer Chavarria** Over the past 18 months we have been developing a VR tournament-style fighting game called Bebylon Battle Royale. The game takes place in the future, after humanity has discovered a way to extend human life to the point of immortality. After taking an immortality pill, you're effectively frozen in your body, so a baby remains as just that forever: a two-foot-tall, chubby baby. These immortal babies grow tired of living in the world of comparatively tall men, so they build a place for themselves where they can feel normal. That's Bebylon.

Bebylon is this Vegas-style fantastical world where the inhabitants live peacefully with one another. Over time, they begin to overcompensate for what they lack, and fight amongst themselves to rule Bebylon.

There are four power families in Bebylon, which is important in the lore of the game. When you get dropped into the world as a player, you choose which family you want to fight for. In Bebylon, whoever has the most toys, wins. So, combatants fight to level up, to unlock riches, to socially gain fans, to make their family proud and to make their family the most powerful in all of Bebylon.

Beyond the immediate combat-arena gameplay, we are expanding the game into a social world. There will be a lot of lifestyle experiences and events you can attend as your baby avatar. You'll also be able to attend events; to gather with people in the world, and to interact in social environments. The idea is for people to create a community and to join together to enjoy these experiences.

At launch the primary focus will be on the fierce combat of the arena, but shortly after launch we'll be opening up to interactive spectating, and then follow that with different scenes for people to visit and spend time in.

Tentatively we're aiming to launch in February 2018 on Oculus Rift and HTC Vive, with quarterly updates that follow to expand the experience.

**Pablo Fraile** Since we are a tech company, all of the work we do around VR content creation is to showcase the technologies, hardware and techniques we are developing, as well as the key partners we work with.

We also write a lot of software to run on our processors and GPUs. The projects we do are generally intended to demonstrate capability, as opposed to content that people will purchase from their digital store of choice to use on a regular basis.

For GDC this year we created a virtual trip around the inside of a mobile phone: Circuit VR. The experience allowed you to dive into a mobile device using your VR headset to walk around the processors, camera, speakers, memory and printer boards you'd find in your smartphone. It was pretty cool as a showcase of what our mobile processors are capable of when it comes to mobile VR.

**Simon Harris** We first started working on VR with Sony when PlayStation VR was known as 'Project Morpheus'. We actually built a demo called Jurassic Encounter, which Sony used



**December 7-8**

**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)

## The Role of Interactivity in VR Game Development

**“The difficulty with VR is the very thing that makes it so special; the fact that you now have these environments where your hands can be accurately animated and you can move around environments is both a blessing and a curse.”**

*Rob Whitehead,  
Improbable*

to show off their hardware to developers behind closed doors at Gamescom 2013. That demo was also used the next year at E3, when they went public with PSVR for the first time.

We built two products for the launch of PlayStation VR and they both launched on day one alongside the hardware: Until Dawn Rush of Blood, and Tumble VR, which was a remake of game made for the PlayStation Move motion controller back in 2010.

We are the only independent developer to deliver two titles for launch and these were at two very different ends of the spectrum. One, an action-oriented, shooting, rollercoaster horror game, the other, a great physics puzzle game that worked as a sort of calm introduction to VR for people who are unsure about how they are going to react it.

At E3 this year we announced two more PSVR products. The Inpatient, which will launch later this year, is a horror game with psychological elements set over 60 years prior to the events of our 2015 PS4 title Until Dawn. With it we will be bringing branching storytelling to first person VR.

We also have Bravo Team, which is a VR shooter built primarily with two pillars in mind: the PSVR Aim controller and co-operative play. Every part of the game is playable as a co-op online experience, either with a friend or an AI buddy.

Sony remain an important partner for us, but we are a cross-platform studio and our VR ambitions stretch across multiple platforms

### 3.2 CREATING INTERACTIVITY IS CORE TO IMMERSION IN VR GAMING. HOW ARE YOU APPROACHING THIS – AND WHAT ARE THE MAIN CHALLENGES YOU’RE FACING?

**Rob Whitehead** With VR, a lot of games are built in a way where everything is bolted down. You can really consider the game to be more of a theatre set than a truly realistic simulation of the real world.

The difficulty with VR is the very thing that makes it so special; the fact that you now have these environments where your hands can be accurately animated and you can move around environments is both a blessing and a curse. It totally breaks the immersion if, for example, you’re in a library and the moment you try to interact with the books it becomes apparent that they aren’t physical objects, but a wall with some texture on it.

From our perspective, we see a requirement for a huge amount of computation to create all of these physical elements. Within VR you have to allow the freedom to interact with everything; to pick stuff up and toss things around the room. You’re going to need a huge amount of compute power to do that, and that’s where our platform really can help.

**Tam Armstrong** We believe the best way to create interactivity in a game is to ensure that at a fundamental level, interaction is required to succeed as a player. Anything less than that raises the question as to why the game is in VR in the first place.



**December 7-8**  
**Marriott Marquis, San Francisco**

The world’s leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**



## The Role of Interactivity in VR Game Development

In the design of Moss, The Reader's interaction with the world to assist Quill on her adventure is fundamental. As easy as it may be to say a simple statement like that, we faced a lot of challenges to figure that out.

Early on, the challenges included communicating to the player the states of interaction and constraint of motion. When we began the project, we were used to creating games where interaction meant pressing a button on a gamepad to make something happen. To perform physical movements to interact with objects means you need to communicate with the player in an entirely different way. For example, real life provides physical constraints to motion that communicate how an object should operate that just don't exist in VR. VR has alternative feedback channels such as texture, sound and additional user interface – but the early problem we needed to overcome was learning how to encourage that interaction and communicate using these channels effectively.

Once we had a suite of interactions including sliding and turning objects that felt right, it wasn't necessarily obvious how they would be integrated into the core mechanics of the game. There's not a lot of prior art for a game where you need to physically move pieces with your hand. How you reach into the space and how you lay out spaces to make them interesting in three dimensions – these were things we had to figure out through trial and error. You then have to work out how to use these tools to create good gameplay.

I would say the biggest recent challenge has been a technical resource one: how to build these interactions into the game in any kind of quantity. An object that is interactive usually takes more work than something static. With background elements, you can build them and tweak aspects to make them look better, but generally they don't have as many dependencies with other gameplay elements. As soon as an object has multiple states, you have to do a lot of work to represent each state effectively, make transitions between states feel good, and handle interactions with other objects.



**(VRX)**  
2017

**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

**“There are still only a limited number of people in the market who own headsets and are familiar with hand controllers.”**

*Jennifer Chavarria,  
Kite & Lightning*

Working in VR has brought a new dimension of industrial design to game development for us. We didn't have that expertise before, but we are certainly learning through the creation of this project.

**Jennifer Chavarria** We're approaching interactivity from two different angles: gameplay and lifestyle.

When you are playing Bebylon, you're immersed visually in your avatar body. When you look down you will feel what it is like to be inside your customized, chubby-baby body. For some of our gameplay mechanics we are taking advantage of utilizing tools such as Oculus Touch controllers to accentuate the experience during combat. For example, when you're sitting in your avatar body inside the battle ring, you're controlling or puppeteering a mini-me version of yourself that is actually doing the fighting, similar to Battlebots. The idea is that if you wave your hands to taunt somebody in the ring, or dance around, or punch, you're able to do that freely, with the full range of motion through the Touch controllers – you aren't confined like with a gamepad.

Another way that we're implementing immersion during gameplay is through specialized items called “Humiliation Bombs.” For example, if your opponent throws a smoke bomb into the ring, when the bomb hits the floor and explodes the smoke will go off and rise up; impairing your avatar's vision and affecting your gameplay by not being able to see well through the smoke – it will affect your avatar directly in 1st person.

In regard to the lifestyle aspect of the game, we have completely designed the experience to be from a 1st person perspective to fully immerse you emotionally within the world. You're able to customize your home environment – your crib – as well as changing the outfit you might like to wear for a night out in Bebylon. You will travel around in your own hover vehicles, which are also customizable, to further express your personal style however you see fit.

Spectator interaction also comes into play, and kind of acts as a crossover point between the gameplay and lifestyle aspects of the game. You'll have the opportunity to dress up and head out to watch a tournament with your friends, interact with each other and even throw things into the ring that could affect the outcome of the tournament itself. This creates a sense of belonging and culture within the environment.

In terms of the challenges we are currently facing, with our launch being in early 2018, there are still only a limited number of people in the market who own headsets and are familiar with hand controllers. Gamers are used to traditional game pads so when we have tested the game at events with a 'gamer' heavy demographic, surprisingly this is a challenge for them to pick up and the majority of people have still never been in a headset. With that being said, we want to ensure there are a lot of people online to play each other and create community to get the most from the experience. Gaining fans during gameplay is a big deal in Bebylon, so if you are fighting in the ring you want to have people watching to react to your showboating and fighting antics, which helps create a more realistic experience of what we see in real life sporting events like the WWE, which is similar in nature to our design.



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

**“For a developer, it is less about creative freedom and more about the technical challenges; how you allow users to express their interactivity personally.”**

*Pablo Fraile, ARM*

**Pablo Fraile** In traditional gaming, you think of increasing interactivity by creating bigger landscapes, more characters or allowing more freedom for the user to be able to explore.

Within VR, interactivity is less about the environment and more about you as a player. How can you move? Where can you go? What objects can you interact with? For a developer, it is less about creative freedom and more about the technical challenges; how you allow users to express their interactivity personally.

With early versions of Circuit VR, it wasn't very interactive at all. You could look around and move to different places, but there wasn't much actual interaction. That's mainly down to the technical challenges of mobile VR, which is one of the main areas we're looking to develop today.

When you have a mobile headset with 360 degrees of freedom, you can only look around or teleport; that's about it. Because we don't have a remote control, you don't have the option of interacting with two hands, and that can be a little weird for users if it isn't handled correctly.

Technology, rather than creativity, is what will enable interaction, particularly in mobile VR. Mobile VR will match – and eventually surpass – tethered VR in this respect. When you are not tethered to a PC or to a console, the ability to interact; to move; to explore; it all becomes that much greater.

**Simon Harris** The main challenge with creating interactivity is actually managing expectation. The second you start giving the consumer the expectation of interactivity, you then have to manage that expectation. A great example is in a traditional TV-based game. We present the 3D environment to move around, usually with UI elements to highlight the objects you can interact with. Once you are trying to convince the player in VR that it is totally immersive, interactivity has to work everywhere.

With The Inpatient we ensure that you, as a player, are represented completely. So when you look down you will see a representation of your whole body – arms, hands, legs – and your arms react depending on your actions with the controller. When you start interacting with the environment – picking things up, knocking things around – everything works to enhance that feeling of presence. Surfaces are tagged correctly so it sounds different when you knock on metal, wood, concrete or anything like that.

That suddenly increases the amount of work involved in producing the game. However, it's essential because you move closer to that point where the player starts to believe they are physically in an environment, rather than viewing through a screen.

There are tricks you can employ, however. In Bravo Team we focus everything around the gun you're given, and your interaction with the environment through that. Because you're holding the gun, we don't need to use up resources to provide the same fidelity as when you pick up objects. But you still have to convince the player that the environment is real; making sure all the aural and visual cues they would expect in the real world are present



**December 7-8**

**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

and correct. When you bump into things it has to make the right noise, and the audio needs to be positioned all around you to understand where things are coming from and where things are happening. So it can become quite a challenge, but something which truly elevates VR above the traditional TV experience.

### 3.3 WHAT CAN BE DONE TO DRIVE INCREASES IN CHARACTER AND OBJECT INTERACTION IN VR? AND WHAT'S THE PLACE FOR NEW TECHNOLOGY ADVANCES LIKE EYE AND MOTION TRACKING?

**Rob Whitehead** Traditionally, a lot of games effectively led the user through scripts to craft a narrative and move them through an environment. When you can manipulate every single object in the environment, as you should be able to with VR, then you've effectively created an explosion of different avenues and pathways that proactively need to be written in.

User expectation is that the system is already there; it has been designed. So with VR, rather than thinking about the exact narrative and paths you choose, developers need to instead think more about the different parts of the world and how they interact with each other.

The idea of physics; the idea of farmability; of social interactions in that space... modelling the rules, how those different objects interact and the level of play is the most important aspect of increasing interactivity. You don't want to put the brakes on your users or curb their interest by forcing them too far down a particular route, because that defeats the purpose of VR in the first place to a certain extent.

Just like with any media, you can do some fantastic narrative-led things with VR. Virtual reality represents an opportunity for incredibly rich sandboxes, the likes of which have never been seen before. The fidelity of interaction you can have in VR is so much higher than many other kinds of visualisation. There's a sense of presence as well that immediately makes your interactions more meaningful.

**Tam Armstrong** When we're thinking about gameplay and how we can increase character and object interaction, we think about the moment-to-moment experience of playing. Throughout development we kept coming back to this refrain: it's not enough that you can interact, if this is going to be a game, the game needs to have rules that *require* these interactions.

Once the game has the requirement for interaction at the core, we found that we needed to build ambience into the systems around the main mechanics to encourage that interaction. If you're going to reach into the game to interact with objects, the entire rest of the game – even from an ambience point of view – needs to support the fact that your physical interaction in the world matters. That means the player should be getting feedback from every object, not just those that require you to interact with them. Reaching through the grass should cause the grass to move, and dust motes should float

**“Throughout development we kept coming back to this refrain: it's not enough that you can interact, if this is going to be a game, the game needs to have rules that require these interactions.”**

*Tam Armstrong, Polyarc*



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

**“Eye tracking is a hugely beneficial technology for VR because you can eliminate some of the things that take you out of the experience. You’re able to react and get reactions in real time.”**

*Jennifer Chavarria,  
Kite & Lightning*

away in reaction to your movements. Ambient interactions outside of the core gameplay teach the player that their actions will be rewarded.

We see this as a rule in game design and it’s simply being reframed for 3D interaction: you need confirmation, rejection, and feedback with every input. Every wave of your hand or pull of the trigger to grab something is an input that needs to provide the user with feedback all of the time. When you achieve that, the whole experience is incredibly rich.

The ability to motion-track the head and the hands – that’s the thing that makes you feel immersed in the environment beyond the presence afforded by stereo rendering. Your hands causing an effect makes you feel grounded and present within the world. One interesting thing that comes out of this is the emotional effect of physically interacting with characters within a virtual world; it’s much more impactful than we thought it would be. People form bonds with the characters much more quickly than they would in a more traditional game. You could take the same characters and put them on a flat screen television, and I don’t think players – although they’d find them very charming – would have the same emotional reaction. It’s hard to describe what happens when a character appears to be standing right in front of you, reacting to you, and has a heartbeat you can feel. We had no idea it was going to have such an impact.

**Jennifer Chavarria** Eye tracking is a hugely beneficial technology for VR because you can eliminate some of the things that take you out of the experience. You’re able to react and get reactions in real time. If you’re interacting with a character or an AI and it’s giving a performance that you’re watching, and you look away, or maybe even look beyond the person talking to you, if the AI has a deadpan look, doesn’t react to you or change its expression based on your interaction, you are immediately pulled out of the experience. Your brain recognizes this moment is not real. Our eyes lead our bodies to where they need to go. By being able to follow that and interact with that in real time – that’s going to improve the experience tremendously, creating a feeling closer to what we know in our everyday life.

Improved motion tracking – that you can perform in real time and imitate your actual movement – grants the user more freedom to express themselves, creating an emotional bond with the character or avatar body they are inhabiting within the environment. This will help eliminate a lot of delayed or static movements during interaction in VR, which create barriers between us and the environment. This once again causes your brain to recognize the experience as not real, and forces you out of being present in the moment. For example, when you’re working with a gamepad, you’re restricted to touching buttons. Those buttons cue interactions, rather than actually triggering activations by physically gesturing. With a gamepad in VR, you aren’t participating in 1st person through interaction in the same way that you can with motion controllers.

The faster we can improve these technologies in VR, the faster we are going to completely sell through the realism. Right now there’s a slight delay to everything, and that produces a disconnect between the user and the experience. Let’s break down those walls and pull people in!



**December 7-8**

**Marriott Marquis, San Francisco**

The world’s leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

**“You have to plan effectively, and consider exactly what experiences you want the player to have. The more developers do this, the more it will stand out when a title does not have that level of interaction.”**

*Simon Harris,  
Supermassive Games*

**Pablo Fraile** For mobile VR, eye tracking is mostly about efficiency. The idea is that as a creator I can seamlessly remove any detail that isn't necessary, which frees up resource. Eye tracking allows us to extract the most from the hardware we have at hand.

One of the problems of mobile VR, as opposed to desktop, is that you have all of your processing power effectively strapped to you. These mobile devices are extremely powerful, but the single biggest problem they have is power dissipation: heat. How do you manage heat in a mobile device? Anything you can do to reduce power consumption is extremely important.

We demonstrated eye tracking at GDC this year. The ability to render the minimum amount of the virtual world, without the user perceiving the resource cost saving is going to be very important. However, it isn't going to significantly transform the experiences you can have with VR.

Motion tracking is really fascinating, and it's incredibly complex. To motion track effectively you need a very detailed map of the environment. Because of that, we will see things like simultaneous localization and mapping (SLAM) tracking become very common in mobile. We'll probably see this technology included within prototypes this year, and I wouldn't be surprised if SLAM, or something very similar, begins to be included within devices on the market as early as next year.

**Simon Harris** Developers have to plan for this from the beginning. The challenge is this: if you don't think about the world you're creating; the interactions the player is going to have; and what that means with everything you create from there onwards, then that will continually throw up unexpected challenges as you develop.

You have to plan effectively, and consider exactly what experiences you want the player to have. The more developers do this, the more it will stand out when a title does not have that level of interaction. Once consumers have seen something, they tend to expect it in everything. In the games industry generally, we are always raising the bar, then setting that as the requirement for everything we do in future. New tech will always do that.

You asked about eye tracking. Right now we know where users are pointing their head based on the headset, and we can target specific scares and events based on that information. In our cinematic games we can lead the player and tell the story using framing and camerawork. In VR it's a bit more difficult to get the player to look in specific places, because they are in complete control of where they are looking. Implementing eye tracking would enable us to deliver that to a much higher fidelity.

As new tracking technology and techniques come in it will allow us to increase that level of immersion; that representation of the player in all our VR games. We have already sort of moved on from the disembodied floating hands that were common in the very early VR games because the technology has moved on, even in these early days of VR.



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**



## The Role of Interactivity in VR Game Development

### 3.4 WITH THE INCREASE IN CONTROLLER CAPABILITIES RECENTLY, HOW IS THIS HELPING TO AUGMENT THE EXPERIENCE FOR USERS?

**Rob Whitehead** Using a keyboard and mouse or a controller, there is a finite bandwidth of interactivity that you're able to deliver, if you're building a game around 3D construction or manipulation of 3D objects.

I recently saw a virtual world project where it had a fully physical chess set. You played chess in the game by picking each piece up and moving it as you would a real chess set. There's an important distinction here because any chess game you may have played outside of VR in the past, where what you're effectively doing is sending instructions for an animation to play and for your pieces to be moved. In VR however, you should be able to grab a piece and throw it across the room if you so choose.

Seeing someone who has never used VR or played video games before kneeling down to pick up a chess piece to place it back on the table – that's quite a phenomenon to behold. If you tried to implement that kind of 3D manipulation using a keyboard and mouse, it would be incredibly complex.

Simply because of the nature of VR however, you have this intuition as a person as to how you can manipulate objects within the three-dimensional space.

Tapping into that intuition increases the opportunity to have these new kinds of interactions. If you can leverage that intuition – of how things are done in the real world – the need to construct game mechanics that are, by necessity, of a lower fidelity, disappears.

**Tam Armstrong** Full tracking and haptic feedback are the things that make physical interaction possible. This new technology is exactly what has allowed us to move away from treating controllers like laser pointers, or in cases where there are no controllers, treating the head direction like a laser pointer.

**“Full tracking and haptic feedback are the things that make physical interaction possible”**

*Tam Armstrong, Polyarc*

**(VRX)**  
2017

December 7-8

Marriott Marquis, San Francisco

The world's leading senior-level B2B event  
for VR and immersive tech

Tickets available now at  
[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)



## The Role of Interactivity in VR Game Development

**“The introduction of new controllers, like the Oculus Touch, has been huge”**

*Jennifer Chavarria,  
Kite & Lightning*

There are implementations of this laser-pointer-as-input-mechanic analogy that have worked well, but if we want to augment the immersive experience, we need to eliminate some of those abstractions. Pointing your head at something to do a thing is not a natural input mechanism for a person. They can certainly learn that interaction, but it elevates the experience when you can make more of it intuitive.

**Jennifer Chavarria** For us in particular, the introduction of new controllers, like the Oculus Touch, has been huge. These controllers allow you to be free and to physically interact. I can't express enough what a difference these controllers have made in our game mechanics. When we first designed the game, we were restricted because of the gamepad: your hands were stationary, very close together, and pressing buttons would trigger an action. That was not the experience we had envisioned.

Within our game, fighting with your own style is a massive part of the emotional buy-in for the consumer. When you activate beast mode in the game, you are bestowed with a flashy weapon such as a diamond-studded selfie stick. Because of the new controllers, you can physically take your arms in real life and whack your opponent in an up and down motion with the selfie stick in real time. You can punch and fight with your body in real life while the controllers track your every move, and it feels like you're actually participating in the game. That gives the player a much bigger rush than if you were one step removed all the time and had to use a traditional gamepad buttons. The controllers allow you to physically connect with your character as an extension of yourself.

**Pablo Fraile** Controllers make all the difference. Going from a mobile VR headset, where your interactions are limited to tapping on your head to move around, to a VR headset where you can point and shoot – it makes a massive difference.

Some companies are doing really cool stuff with things like hand and gesture tracking, but for me, the lack of grip in hand tracking technologies is something of a deal breaker.

Controllers are definitely the way to go, and some of those controllers – like for the HTC Vive and Oculus Rift – they are pretty realistic in terms of the gestures they allow you to do in the virtual world.

There are still issues around the detection of virtual objects, and how to stop users from moving their hands through an object in the virtual world – and as those issues are resolved, that's only going to improve interactivity within the VR environment.

**Simon Harris** It's all about fidelity. The new controllers give us more and more information about what the player is doing with their hands. Initially we only knew where your head and hands were within a 3D space, with simple button presses permitting rudimentary interactions like making a fist or picking up an item.

The more detailed data we receive from the new controllers means we start to understand what you are doing with individual fingers. Valve are moving in an exciting direction with their knuckles controller, which will provide incredible detail and enable the complete animation of a whole hand. Our ability to make the player believe that they are actually in a virtual world is only getting stronger as the technology grows.



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

### 3.5 HOW IMPORTANT IS AUDIO IN ENHANCING INTERACTIVITY AND PRESENCE?

**Rob Whitehead** Along with the massive leaps in visual fidelity and visual presence, you absolutely have to match that on the audio side. I can't profess to be an expert in audio, but I've seen a number of interesting techniques around server-side processing. You can effectively work it so that when you're in a room in a game, the game knows exactly what audio properties need to be delivered to make you feel like you're in a small space as opposed to a large space or vice versa. Audio is undoubtedly super important, but as it's not my specific area of expertise it's not something I can really comment further on.

**Tam Armstrong** Audio is critical to enhancing interactivity and presence in VR. Audio communicates a sense of place. From the noises in the background, to the reverb you perceive from the objects you interact with, every aural cue suggests the content and geometry of the place you're in. That feedback gets combined with what you see to build a more complete picture of your surroundings.

Audio has a very important role in communicating the physical properties of things like weight, texture, and power. Objects you drop that make a louder, deeper crash will sound heavier to you. Scraping noises when you drag an object suggest friction. Every piece of audio can help give you a sense of what a material is.

In an environment where you can interact with everything in a more natural way – whether you consciously perceive it or not – the expectation is that the simulation and audio will work together to realize the world. Sound is a very important feedback channel right along with visuals. When the whole experience of the interaction is cohesive and responsive, it makes the world more real.

**Jennifer Chavarria** Audio is hugely important – arguably as important as the visuals. Audio can make or break an experience. Let's even forget about VR for a second; in film or any other media in 2D, if the audio is bad, it can really throw you out of the experience. It's extremely important that we pay attention to audio because it will help to sell the visual realism.

In VR, audio also helps to create depth perception within the environment. If you have a stadium arena – as we have in our game – that massive environment will have a very different aural feeling to being in a closet, for example. It's very important that you're able to use audio to differentiate and accentuate the environment that you're putting people into.

If you're developing more of a narrative story in VR, it's important not to underestimate the importance of audio cues. Your audience has the freedom of movement and can look wherever they want, so you have to guide them through the experience, and audio is perfect for helping them subtly guide them where you want them to go next. You want them to keep that sense of self-discovery while directing them through using their auditory senses.



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

**“Audio is a key ingredient in creating virtual atmospheres. VR is so immersive that a poor audio experience, even if it’s only perceived subconsciously, can devastate an experience.”**

*Pablo Fraile, ARM*

In tournament arena style game like Bebylon, when you go to a sporting event, you go to be a part of the action. The energy of the powerful sounds of being amongst thousands of people is infectious – it emotionally pulls you in. That’s exactly why people still attend live events in the age of the high-definition screen. When you can create that visually and accentuate it with the audio, the two work hand-in-hand to truly create a real-world immersive experience.

**Pablo Fraile** Audio is actually a key ingredient in creating virtual atmospheres. VR is so immersive that a poor audio experience, even if it’s only perceived subconsciously, can devastate an experience. Audio makes up a significant amount of our perceived world.

I still remember when I was a kid playing doom – hearing the monsters around the corner in the corridor freaked me out. That remains a powerful memory to this day simply because of the sound.

Audio is going to become increasingly important in VR. Having accurate audio location and audio effects that interact with the virtual world will be paramount to delivering a great VR experience. Factors like refraction – off the walls and ceiling, as well as how different materials reflect sound in different ways – these things will be get more and more attention from creators.

Audio is a very compute intensive technology. Creating good audio is also a very dedicated creative process.

Content creators have decided, at least so far, to dedicate their valuable processor bandwidth to enhancing visuals. Because of that, audio has been neglected to some extent.

Audio is an area that ARM has been investing heavily in. We’ve been working with our partners to integrate new audio technologies into mobile devices, granting greater audio fidelity whilst reducing computing overheads. We believe this will give artists a lot more freedom to include more feature-rich content.



**(VRX)**  
2017

**December 7-8**

**Marriott Marquis, San Francisco**

The world’s leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)

## The Role of Interactivity in VR Game Development

**“Audio is possibly  
the most important  
factor in enhancing  
presence.”**

*Simon Harris,  
Supermassive Games*

Unfortunately, because often you won't realise the impact of poor audio overtly, the only way to show the impact is with an A/B comparison. You can try the same experience with audio that is somewhat lacking, then repeat that experience with effective audio – the difference it makes is unbelievable.

**Simon Harris** Audio is possibly the most important factor in enhancing presence. Obviously, you have to create the visuals of the world for the player to be in – without that you aren't anywhere – but incredibly, the subconscious understanding of audio is there in all of us. You really have to experience a VR game that hasn't implemented positional 3D audio, or one that has done it poorly: it's just wrong. It immediately screams at you subconsciously, “this is not correct”. It very quickly becomes incredibly important to get it right, just because it is so jarring when it's wrong.

Beyond sight, hearing is the next sense you rely on when navigating spaces. There are some great VR experiences which use audio only to demonstrate that as well.

So whilst audio and visuals are the primary concerns with VR today, the next thing will be touch. We have a bit of that with haptic feedback on some controllers, but in the future we'll see a gradual replacement of every single one of your senses – fully implanting each of them in VR. We're already working very hard on touch, when we can deliver smell and taste, then you are well and truly in a virtual world.

### 3.6 WHAT ARE THE BEST EXAMPLES OF TECHNIQUES TO IMPROVE INTERACTIVITY YOU'VE SEEN IN GAMES AND VR EXPERIENCES YOU'VE COME ACROSS?

**Rob Whitehead** Within our platform we have one technique in particular that is relatively unique. When you have large, multiplayer experiences, you want to be able to manipulate the world and have everything feel natural. You want to be able to pick up an object, shake it about in your hand very fast, and for that movement to animate as it would in the real world – almost as if the object is attached to your hand.

If that object was being simulated on a server somewhere, latency and lag would impact the responsiveness of that interaction. Within our platform, we have a technique whereby developers can change the owner of objects on the fly with regards to compute responsibility.

This is just an example, but if you pick up a barrel, your local compute power becomes responsible for the physical simulation of that barrel. What that means is you immediately have a very high-fidelity, interactive experience with that object. Ungrappling from the barrel then moves the responsibility back to the server, so the object goes back to being simulated on the server side.

By coming up with this very interesting simulation technique, where we can move the simulation between the server and the client's machine seamlessly, we basically eliminate the problem of interaction latency that you often find with other multiplayer online games.



**December 7-8  
Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at  
[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**

## The Role of Interactivity in VR Game Development

**“When you construct something in VR, the sense of how it feels to have your creation right there with you – it’s incredible.”**

*Rob Whitehead,  
Improbable*

This technology came about because we realised latency is a problem that probably isn’t going away – the speed of light isn’t going to change anytime soon! On the server side, for some time now we have used a number of different game engines that constantly overlap with one another. We had to become expert at moving objects between game engines on the fly, and we simply extended these techniques to include the client’s local compute power.

In terms of external techniques that have impressed me – there is so much I could talk about here! Construction – or rather creative-oriented experiences – those are the ones that have really blown me away. When you construct something in VR, the sense of how it feels to have your creation right there with you – it’s incredible. In terms of application; when applied to industrial design, things get very interesting because you could draw a picture of a car in TiltBrush, walk around it and feel what it’s like to actually be around that car. That has potentially huge implications for product development across the board.

**Tam Armstrong** We are big fans of the hand model in Lone Echo. Our solution is different due to own unique goals and constraints, but the high-fidelity nature of their work is so impressive and inspiring. The physical response to movement and the interactivity of the hand model are done so well.

What I love about VR is that everyone has a different set of techniques. When you see someone tackle a problem in an entirely different way than you, it is still so inspiring. For example, take content creation tools like Tilt Brush or Medium; they visualize tools instead of hands and have such a great use of haptics. There is texture to everything you do and it’s a very physical act to create models and paint. It’s truly inspiring to see what the possibilities are.

**Jennifer Chavarria** One game I recently played is Lone Echo from Ready at Dawn. The feeling of weightlessness while tracking your avatar robot arms and hands, utilizing the hand controllers, really pulled me into the experience. I love that they did not stop at just showing hands but simulated the feeling of imitating your full arm movements: your elbows bend and forearms twist and turning as you grab and pull yourself through the zero-gravity environment. They also did a wonderful job with AI tracking; responding via dialogue, and interacting with you as you move around and toy with different objects.

Another experience I have a lot of fun with and provides great interactivity is The Climb from Crytek. Having the ability to grip using controllers as you climb, your arms free to pull yourself up to climb higher and higher, experiencing visual rewards along the way – it’s exhilarating. As you grip to hold on, you feel like a rock climber with your arms going up and down. This creates physical immersion: tapping into your motor skills. If I was doing that same experience with a gamepad and just tapping buttons, I would feel so far removed, even though the visuals might still be great. When you’re in The Climb and you look down, you don’t want to fall off that mountain. You find yourself gripping tight and, utilizing the Oculus Touch controllers, it allows you to interact heavily within a relatively simple game design.



**December 7-8**  
**Marriott Marquis, San Francisco**

The world’s leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
**[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)**



## The Role of Interactivity in VR Game Development

**“I love the experiences that give me feelings I can’t have in the real world... One that stands out for me in Lone Echo on Oculus Rift.”**

*Simon Harris,  
Supermassive Games*

**Pablo Fraile** I saw one piece created by the BBC that I thought was really interesting, it’s called Easter Rising: Voice of a Rebel. The experience focused on a conflict between the Irish and British in the early 20th century. Whilst that doesn’t immediately sound like a great topic for a VR experience, it was incredibly well executed.

The creative industries in the UK generally are world class. However, organisations like the BBC, partly because they don’t have the same commercial drivers as other companies, they seem to be less afraid to experiment with different media. They are able to bring together some of the best technicians in the world with some of the best content creators, and they instil a great culture by being unafraid to experimentation. They are doing some truly amazing stuff.

In general, the British content creators are up there with the best in the world right now. We deal with quite a few companies out there that want to create content for a variety of reasons – to showcase some of the stuff they are doing – and they tend to gravitate towards British content creators because they are absolutely world class.

**Simon Harris** When I was asked this a year ago, it was easy. The technology was so early and the market so small that I had played practically everything. Today there are so many great teams building VR experiences that it’s impossible to see them all. I love the experiences that give me feelings I can’t have in the real world. A lot of what we do as game developers is delivering a fantasy. We create games for people to go and do things and take on roles; to be people and have experiences that they cannot in the real world.

One that stands out for me is Lone Echo on Oculus Rift. They’ve created an incredible experience where you feel like you’re interacting with a space station in zero gravity. They’ve done some fantastic work in a similar area to us; when I look down I can see my arms, I can reach out and grab pieces of the space station and using discrete motions to propel myself around. Lone Echo delivers something that I have no experience of whatsoever; I don’t know what it really feels like to be weightless in space. When I’m playing it though, boy, am I convinced I do.



**December 7-8**

**Marriott Marquis, San Francisco**

The world’s leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)

## The Role of Interactivity in VR Game Development



### Driving the Business of VR and Immersive Tech San Francisco, December 7-8

With so much opportunity on the horizon for VR in gaming and way beyond, now is the time you need to hear from those building the future of VR and immersive tech and network with the true industry leaders in the field.

VRX 2017 in San Francisco is just the opportunity. Established as the globe's leading senior level cross-industry event, the agenda features the brightest and best minds from across gaming, media, enterprise, brand marketing and immersive technology.

With speakers representing everyone from Oculus, Ubisoft, Epic, Google, Survios, Intel, HTC, The VOID, Unity, Resolution, Kite & Lightning, Cloudhead, Polyarc, ARM and more, there's no better place for you to learn from and network with the top tier companies leading the charge.

Head to the dedicated event website to see more: [www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)



**December 7-8**  
**Marriott Marquis, San Francisco**

The world's leading senior-level B2B event  
for VR and immersive tech

**Tickets available now at**  
[www.vr-intelligence.com/vrx](http://www.vr-intelligence.com/vrx)



**(VRX)**  
2017

December 7-8 | San Francisco

Register  
early,  
Save \$\$\$

# The world's leading senior level VR industry event

## Where the real business of immersive tech gets done

**GAMING • CINEMATIC • BRAND MARKETING • ENTERPRISE • HEALTHCARE • EDUCATION**

- ➔ **GET INSIGHTS ON TRUE MARKET OPPORTUNITIES:** Hear perspectives from the world's most active and respected analysts and investors on where the best opportunities in the immersive tech space are right now...and where they'll be coming over the next few years
- ➔ **UNDERSTAND THE REAL COMMERCIALS OF VR/AR/MR:** Explore in depth the various technologies, applications and business models that are emerging. And find out what will drive huge market growth in 2018
- ➔ **MEET THE VISIONARIES BUILDING THE FUTURE OF VR AND IMMERSIVE CONTENT:** This is the only event to have c-suite representation from the top-tier VR/AR/MR hardware, software and content studios showcasing the best immersive experiences. We hand pick the real visionaries and innovators to speak so you'll get cutting edge insight from the best in the industry
- ➔ **THE CHANGING FACE OF ENTERTAINMENT:** Gaming, film, sports – you name it, every form of entertainment is being transformed by rise of immersive tech and content. Hear where the biggest shifts are taking place, and how to take advantage
- ➔ **DISCOVER WHICH INDUSTRIES ARE EMBRACING IMMERSIVE TECH MOST... AND WHY:** Hear about real-world enterprise applications in industries from AEC and automotive to retail, education & healthcare... find out what works and what doesn't to create compelling, immersive and intuitive experiences
- ➔ **FIND OUT HOW IMMERSIVE TECH IS HAVING A MASSIVE IMPACT ON ENTERPRISE:** From training & simulation, to collaborative product development and sales & marketing, the applications for VR and immersive tech across industry are huge. Get deep dive insights on the best use cases from a whole host of verticals

**REGISTER NOW @ [WWW.VR-INTELLIGENCE.COM/VRX](http://WWW.VR-INTELLIGENCE.COM/VRX)**

**A world class speaker line-up from across industry...**

**htc**

**Rikard Steiber**  
President,  
Viveport & SVP  
Virtual Reality  
**HTC**

**oculus**

**Yelena Rachitsky**  
Executive  
Producer of  
Experiences  
**Oculus**

**THE VOID**

**James Jensen**  
Chief Visionary  
Officer  
**The VOID**

**Walmart**

**Brock McKeel**  
Senior Director  
of Operations  
**Walmart**

**Discovery<sup>VR</sup>**

**Rebecca Howard**  
SVP Emerging  
Platforms and  
Partnerships  
**Discovery  
Communications**

**Paramount Pictures**

**Ted Schilowitz**  
Futurist in  
Residence  
**Paramount  
Pictures**

**AECOM**

**Morgan Garrard**  
Director  
of Systems  
Innovation  
**AECOM**

**Ubisoft**

**Vicki Ferguson**  
Programming  
Team Lead,  
Virtual Reality  
**Ubisoft**

### SPONSORS AND EXHIBITORS INCLUDE

**Diamond Sponsor**



**Gold Sponsor**



**Bronze Sponsors**



**Exhibitors**

