



How to bring Virtual Reality to every home

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Abstract

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<p>Virtual Reality (VR) has been around for longer than most would expect and has gone through many development stages, but it has not yet entered the mainstream and it's still not yet fully understood by the masses. This dissertation aims to create a high-level view of the Extended Reality (XR) industry as a whole while focusing on VR, then use that as a frame of reference to explore why is VR currently at the state that it is, and what could be done to bring it to the mainstream.</p> <p>It starts by introducing the few concepts necessary to understand the rest of the study and explains the qualitative nature of it and the why of that. It then uses the theoretical framework to explore the nature of current XR studies and reflects on the necessity to not fully adhere to academic styles. After that it analyses in-depth the interviews to five professionals of the industry about the subject, and then for the empirical part, it summarises the history of VR until now, the perceived current situation, and explores speculations of possible futures. Then finally it lists the gathered reasons and views in the discussion, and wraps it all in the conclusion together with the author's learnings, possible biases, and next steps.</p> <p>Some of the study's findings are as follows: Due to past public experiences, VR is seen as not much else than an interesting experience to have once and never look at it again. Development lessons learned and progress are not properly shared or kept behind closed doors, which hurts anyone interested on entering the industry. AR/MR have higher chances to become mainstream before VR due to them being more accessible and having clearer use cases, some of them that already exist. VR hype is going down, but hope is still strong and progress is still very much happening.</p>
Key words Virtual reality, extended reality, general public, approachability

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1 Introduction

Virtual reality (VR) technology has the potential to revolutionize how we live, work, and play. However, despite significant advancements in the technology, widespread adoption of VR in private homes has yet to be achieved. In this dissertation, I investigate the past, present and possible futures of VR technology and explore ways to make VR accessible to every home. By analysing interviews with five professionals in the XR industry and reviewing existing literature on VR technology adoption, I aim to uncover key challenges and opportunities for bringing VR to the masses. By considering factors such as affordability, accessibility, and user experience, I will theorize potential strategies for overcoming these challenges and achieving widespread VR adoption. Ultimately, this study offers important insights into the future of VR technology and its potential impact on society.

1.1 Glossary

ABBREVIATION	DEFINITION
VR	Virtual Reality
AR	Augmented Reality
MR	Mixed Reality
XR	Extended Reality
HMD	Head-mounted display

1.2 Why of the study

There has been a lot of research and discussion done about VR, the number of articles reached more than 21,000 a few years ago (Cipresso et al. 2018), but the grand majority of them deals with the technology itself or its professional uses, not the application that it could have for the general public. The VR concept and its attempts to make it come to reality have been around since the 1960s, but it was not until Meta (previously known as Facebook) released its Oculus Quest headset in 2019, and later on its Oculus Quest 2 headset in 2020, that the technology truly made a leap to become both affordable and comfortable. It is now that we have a golden opportunity to truly bring the technology down to us common folk and open the possibility for it to become part of our lives and elevate them.

The objective of this research is to understand how to move forward towards the full inclusion of VR into our normal lives and how would that future look like. I will first explain and explore the

interviews that I did to industry professionals which feed into the rest of the study, then I will try to frame the industry in its entirety by looking at its past, its present situation and its possible futures, and finally I will discuss all findings before concluding with a thought about the study itself. All research will be shown from both a hardware and software perspective.

So, to summarise, the research question would be: What can be done to approach Virtual Reality to the general public?

Secondary questions include: Why is VR beneficial to the general public? Why is VR still not a mainstream technology?

1.3 Structure and methodologies

The research method I will use will be entirely qualitative. I will study the existing literature that relates to the non-professional use of VR, extract what they mention about methodologies that ease VR into everyone's lives, and critique them by mirroring them to the rest of the research and by how they fit in the general historical progression of the technology.

Surveys would hardly be able to encompass what I want to understand about the research question, quantity is not as important as quality in this case, so I resorted to doing personal interviews to industry professionals for them to shine a light on what I want to understand with this paper. I explain the interview process, the questions, and generally what the respondents' thoughts were about each in section 6.

2 Theoretical framework

Through the theoretical framework I will help understand where this study falls amongst the rest of them, making sense of the terms used throughout and generally looking at the situation with XR research at the time of writing.

2.1 Definitions

<i>Term</i>	<i>Definition</i>
<i>Virtual Reality</i>	The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. (Oxford Languages)
<i>Augmented Reality</i>	A technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. (Oxford Languages)
<i>Mixed Reality</i>	A medium consisting of immersive computer-generated environments in which elements of a physical and virtual environment are combined. (Oxford Languages)
<i>Extended Reality</i>	The use of different technologies to create immersive digital experiences, and include various combinations of computer-generated content and reality, including virtual reality (VR), augmented reality (AR), and mixed reality (MR). (Casini 2022)

2.2 Current situation of XR studies

XR, like any other modern science or technology, is being actively studied in scholarly environments. However, if we are to believe my comparatively limited research on how many scholarly works are out there, and always considering that I'm coming from a more practical background without access to a scholarly institution, these scholarly articles are generally exploring atomic units of the industry. They tend to decide on a smaller particular problem to solve or a particular industry to find XR use cases for, then go about theorising solutions for that problem or finding applications for companies of that industry. These studies are usually behind closed doors or behind a paywall if you're not part of a scholarly institution, so I personally have access to a small amount

of them. This is a very correct way of going about it and it does move the industry forward, but I can hardly use them to answer my research question, as I want to paint a bigger picture of the industry.

It's worth mentioning that there exists papers that review other existing papers in bulk, and those do give valuable information not only of the state of XR research but also of the themes that the paper is looking for in their review, but they are few and far between.

Then there's the issue of non-scholarly articles, which are generally magazines and blogs. They are generally not peer-reviewed, but they offer a much high-level view of the industry and use less technical terms, as they are geared for non-professional readers. There is plenty of these, and as long as they have reliably proved their trustworthiness in the past, they are the frontline resource to approach XR and VR to the fans of the technology and bring a gateway for the rest of the general public to become such fans and users.

2.3 Customer-focused VR studies

As mentioned in the previous subsection, the customer-focused exploration of VR is mainly found through non-scholarly mediums such as magazines or blogs. Through this study I will strive to gather the proven trustworthy ones to use when trying to solve the research question. Due to their customer centric nature they will be much more valuable than other studies produced by academia, aligning perfectly with this study's objective of approaching the technology to the general public.

On the border between the professional and the customer-focused we have the Frontiers portal (Frontiers), which offers professional research that anyone can access, creating a bridge for anyone wanting to easily access good and reliable research or simply learn about these themes more deeply.

Then some of the more customer oriented portals that you will see me use throughout, which have proven their trustworthiness in the past include Newzoo for its insights in gaming, the main use case in VR currently, Ars Technica for its reliable technology industry reports, UploadVR for its passionate, VR focused, and modern investigation of the industry, together with other more sporadically used sources.

2.4 Summary

There haven't been formal studies dealing with exactly the same questions and ideas that I want to explore, most of them explore the uses of XR technologies in one particular field. Despite of that, I want to frame my study on the definition of XR technologies themselves and their current

development status. For that, I will explore each of them and try to understand their relationships, making sense of why I want to focus on VR.

As we've seen previously, XR (eXtended Reality) is used as an umbrella term that encompasses all these technologies that try to give extra layers to our reality by intersecting or replicating it via digital means. The existence of this term by itself demonstrates a tight interwovenness between these technologies and foreshadows the fact that their concepts may be able to leak between one another.

Augmented Reality is the more easily accessible of them all due to its use not requiring any more equipment than the average person already has. This is widely proven by the existence of the most well-known AR game which popularised the technology: Pokémon GO. To enjoy AR, you only need your smartphone and the application that uses its camera and AI to add the digital layers on top of the real world. That being said, high-end AR headsets exist, giving much more fidelity to the experience. These headsets are starting to have the capability of occluding the real world and displaying mainly the digital layer, which leaves you immersed in the digital world, closing the gap between AR and VR.

Virtual Reality is the second most accessible one, being able to be used with lower-end headsets. It is defined as immersing you fully into the digital world, separating your perception from reality. This experience is the most shocking one, the one that pulls you furthest away from what you've known until now, which opens the future to a wider array of possibilities. The other main difference with AR is the ability to interact with the digital layer via controllers, voice, or other means. Headsets are now mainly using inside-out tracking to know their position, requiring cameras that see the exterior of the headset. Using these cameras, you can see the real world and add menus, browser windows and other interfaces on top of it to interact with them while you're still aware of your surroundings, closing the gap between VR and AR further.

And the least accessible one currently is Mixed Reality, headsets with this capability and applications using it being still in active development. MR fully integrates both AR and VR by using high fidelity cameras in inside-out tracking headsets to understand the real world around you and adding fully interactable digital layers on top of it.

3 The past

In this section I want to explore what the industry has gone through to get to the state that it is now. The technology has naturally been advancing from its conception, but I identified a big turning point in regard to consumer headsets in 2012 when the Oculus Kickstarter crowdfunding campaign happened and became incredibly successful. Due to that I decided to divide this section into three parts: one that would look at the period before consumer headsets were even conceptualised or were merely concepts, a second that would see what was there between the first attempts at consumer headsets and the Oculus Kickstarter, and a third that would explore what happened from then until now.

3.1 Before consumer headsets

There was a clear change between the technology being developed for governmental, military or experimental purposes, to entertainment companies starting to try their hands on VR for their customers. Here I'll try to list the major attempts of that period, loosely going by the definition listed at the start of the study.

Designed in the mid-1950s and patented in, 1962 Morton Heilig developed a cabinet not unlike the arcade machines of the time dubbed the Sensorama which, when interacting with it, would allow you to experience one of the six short films he developed for it through a stereoscopic display, fans that would produce wind to stimulate touch, smell emitters, a stereo sound system, and a chair able to move and vibrate.

Right before the construction of the Sensorama, in 1960, Heilig developed the Telesphere Mask, which was a mask that allowed you to watch its content as stereoscopic 3D with stereo sound, all without motion tracking. This is considered the first HMD.

In 1961 the Headsight device from Philco Corporation would allow you to watch multimedia like the Telesphere Mask, but with magnetic motion tracking. It was developed for military use; however this was the first time motion tracking came to this early HMDs.

The first truly computer-generated VR, although with understandably bare bones graphics, came in the form of a machine dubbed the Sword of Damocles, by Bob Sproull in 1968. The HMD being required to be suspended from the ceiling and the user strapped to it, it allowed you to look into the generated virtual scene.

Initial interactions between the computer with the digital environment and the user trying to interact with it came in 1969 as Glowflow, developed by Myron Krueger, which was a light and sound

environment that responded to users. He would then continue to develop progressively more advanced products, like Metaplay or Psychic Space.

Then, during the early to mid 1980s, Scott Fisher with NASA building on top of Eric Howlett's previous developments, managed to give form to the VIEW (Virtual Interactive Environment Workstation) headset, which served as the basis for the developments that would come afterwards.

3.2 VR before Oculus

The concept of Virtual Reality and its first attempts were already there in the 1960s, but it was not until the 1980s that a product became commercially viable with the development and marketing of systems consisting of a head mounted display (HMD) and datasuit or dataglove attached to a computer (Brey 2008). Nintendo tried to make that commercially viable with its "Power Glove", which was the first affordable VR device, but the results left a lot to be desired.

In the early 1990s, Sega developed a VR headset that they dubbed "Sega VR", but the product was not made available to the general public due to early users having bad experiences using it (Horowitz 2004).

During the same years, Virtuality launched a multiplayer VR entertainment system that ended up being mass-produced and sold in many countries, but it was so expensive that only dedicated arcades bought them for their customers to enjoy (Lapetina 2018).

3.3 VR after Oculus

The 2000s did not see any major advancements for the technology. It was not until Oculus VR launched its incredibly successful Kickstarter campaign in 2012, promising to develop the technology for the 21st century, that VR became something truly embraced by the masses. The company known at that time as Facebook bought Oculus for 2 billion dollars in 2014 (Ars Technica 2014) and dedicated one of their divisions exclusively to the development of VR. The Oculus Rift was then commercially released in 2016 for 599.99USD, and it required a powerful enough PC to run its software.

VR quickly evolved from there, with other companies like HTC, Sony and Valve releasing their own headsets with new technologies like sensor-based tracking for free movement of users in a defined space, or cheaper options that were just mounts to use your smartphone as a VR device. From 2016 to 2020 Virtual Reality stayed as a luxury for users that already had a passion for it, as it required you to have an already powerful PC to be able to enjoy it properly. Then, later on in 2020, Oculus released the Oculus Quest 2, a much better and cheaper successor to their Oculus Quest,

which was a headset that did not require a PC to run. This dropped the adoption price for VR dramatically, and during that year the Oculus Quest 2 accounted for 80% of all VR headsets sold (Ochanji 2022).

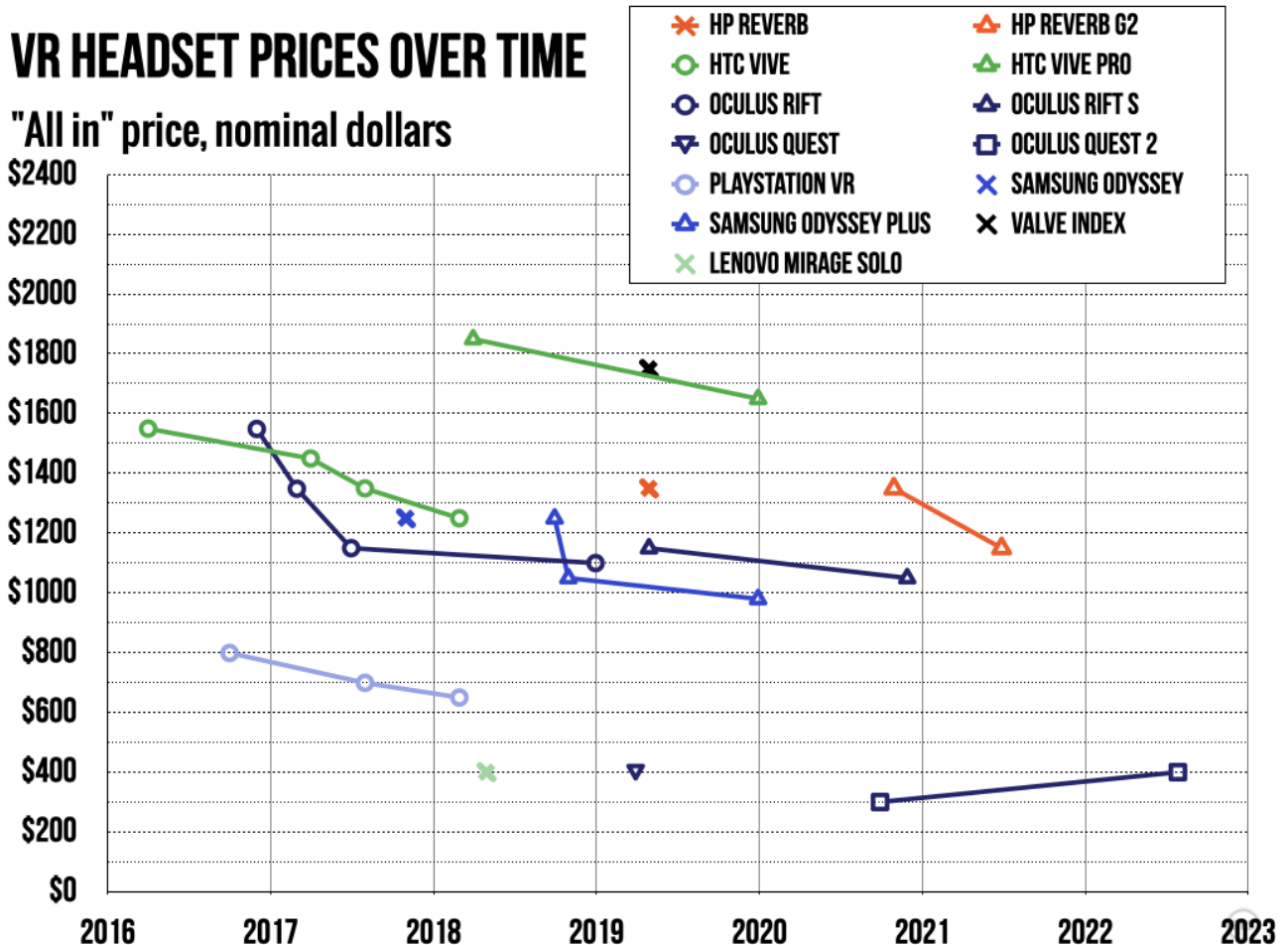


Figure 1: Cost of VR headsets including additional hardware (Ars Technica 2022)

3.4 Advances towards the mainstream

I will now try to summarise what we've seen worked in the past to approach VR to the general public, or in other words, bring it closer to the mainstream. With this I want to frame the big picture so it's easier to see, and by understanding it, give the tools to discuss how the industry should approach the future.

The early years of the technology were nothing but turbulent. It was clear that the dream was there, that engineers and companies saw the glint of a possibility for technology to bring us something born from science fiction. Technological advancements were not there yet, but it was that spark of imagination that later on, when the time was right, led Oculus to kickstart the industry.

3.4.1 Hardware

The biggest fight was on the hardware side. The earlier headsets were bulky, unwieldy, and required an unreasonable amount of setup, so the direction of all advancements was to slim down on everything: size, necessary equipment, price, etc.

As the technology advanced, researchers were able to produce good results with cheaper materials and components, which together with the removal of the need to have a potent PC or sensors around the room as I will discuss next, allowed price ranges to be lowered from around 1000\$ to around 400\$.

The need for difficult setups was completely removed thanks to something called “inside-out tracking”, which changed the requirement of external setups to determine your position for internal cameras which did it more reliably and were obviously already packed with the headset; this also reduced the price as I have mentioned before and paved the way for standalone headsets, which I will now explain.

To combat the need for a computer and cables to connect to it, researchers needed to fit a powerful enough machine into the headset itself. They would never have been able to reach the potency of a gaming computer, but they reached a middle ground by developing something with more or less equivalent power to a modern smartphone. This required VR software developers to adapt their products to these new machines, but the change for the technology was so revolutionary that there was no other option.

And the final major one, which is still in a relatively early development phase, is getting rid of controllers altogether. And don't get me wrong, controllers may always be a possibility due to their precision and fast response time, but we are now making great advancements towards hand tracking, which allow us to use our own hands as controllers to interact with the digital world.

3.4.2 Software

On the software side there were less urgent problems, but there were a few major ones that needed to be addressed. The one that stood out the most was the fight against motion sickness, which happens mainly when the visual system detects apparent motion, whereas the vestibular system informs the brain that no movement is occurring (Patrão et al. 2020). Many very innovative solutions were developed, but the most successful technique for now has been moving by teleporting from one point to another instantly instead of moving smoothly, which does not register as movement in the brain.

A less urgent one that we are still fighting with is the advancement of developer tools to create VR applications and creating a context in which developers actually want to develop those applications. For VR to truly enter the mainstream there needs to be enough things to do with it, and the industry needs to grow so there's enough money flowing for developers to want to move forward. However, as we have learned from the interviews that I analysed in section 6, the game engines Unity and Unreal currently bring more than enough capabilities to develop VR applications, especially paired with plugins and SDKs like the one developed by Virtual Dawn, always keeping in mind that they will need to keep up as technology advances and, like Saarinen exemplified, keep bringing solutions to problems that are currently inconveniencing us.

4 The present

In this section I want to explore the current state of matters after having the knowledge of what came before, frame the current situation so it's possible to get a bird's eye view of the industry. I will start by exploring what is VR being used for to understand better the state of the industry, then look at said state, and finally try to understand some of the problems and see what solutions are being presented to combat them.

4.1 Non-professional uses of VR

First of all I want to explore what do people use VR for currently to use it as a frame of reference and as insight for the rest of the section.

As we can see in Figure 2, taken from a recently conducted study, the first use case for VR is currently gaming. This doesn't only include traditional games, but also social experiences (like Rec Room or VR Chat) and gamified fitness (like Supernatural or Fit XR). This is influenced by the Oculus Quest 2 being marketed mainly for gaming but is also strongly helped by the existence of the PlayStation VR headset that is able to be used with the PlayStation 4 and 5. This use case experienced a boom thanks to the COVID-19 pandemic not allowing people to continue with their normal activities and trying to find a viable substitute in the digital world. Activities to be substituted may include social meetings (casual through social experiences or professional through workspaces),

Most Preferred Use Cases of VR Headsets

Use cases that are ranked among top 3 by VR headset owners

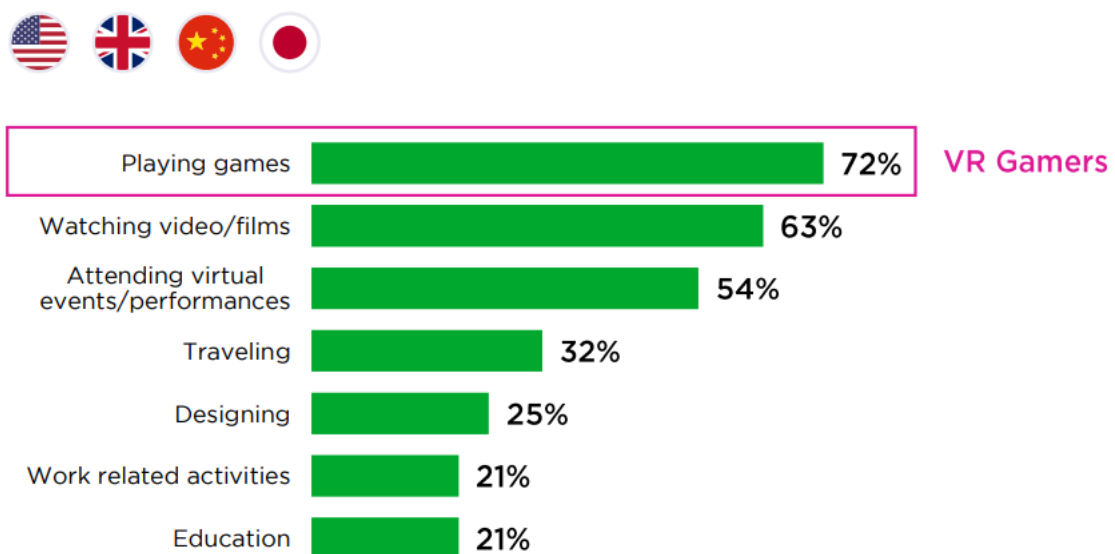


Figure 2. Most preferred use cases of VR headsets (Newzoo 2022)

fitness routines that were made impossible due to lockdowns and gyms closing, or simply escapism from a dire situation via traditional gaming.

The second use case is watching video content. This may come in two forms: watching stereoscopic video, usually playing 180° or 360° around you, or watching traditional 2D content in simulated virtual environments, usually featuring big screens. Stereoscopic video is way more accessible even with lower end headsets that use your phone, like Google Cardboard or Gear VR, which is a major factor in favour of this use case. Big platforms like Netflix or YouTube have mainly adapted the second form of watching content in simulated digital environments through their native VR apps.

And the third use case is attending virtual events, which may be one of the most exclusive VR features, as it's hardly accessible without a headset. One example of an application incentivising this use case is Horizon Venues, from Meta.

It is worth mentioning that repeated non-professional sources on the internet and multiple reports of personal experiences in forums and the like, agree that the consumption of adult content is one of the main driving factors why many people decide to try VR. This fact is hard to prove and cannot be used publicly to advertise the technology, but some try to explore it, like VR Selector in their 2020 statistics.

4.2 State of the industry

I want to start this section explaining the Gartner hype cycle theory so I can mirror it afterwards with the opinions we got from the professionals in their interviews and with other collected data, the reasoning being that it mirrors quite well the events that the VR industry went through in the past, and makes good sense of the supposed current state. As a disclaimer, I will be utilising this theory in isolation, without taking into consideration the Gartner firm, brand, their commercial use of the theory, nor the applications that they choose to use it for.

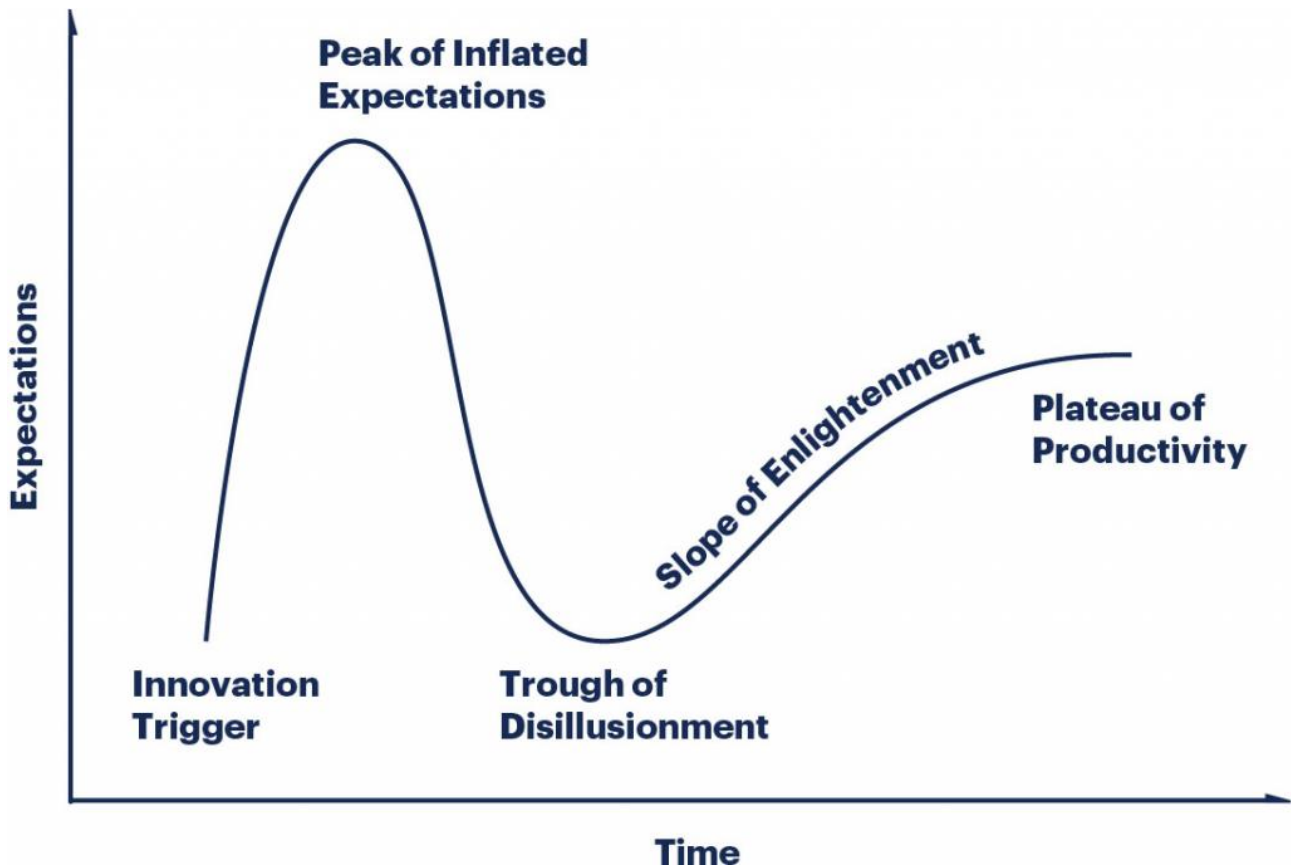


Figure 3. Gartner hype cycle graph (bmc 2020)

Hype is defined as a situation in which something is advertised and discussed in newspapers, on television, etc. a lot in order to attract everyone's interest (Cambridge Dictionary), which has been seen as a common effect for new and innovative technologies through the years.

The Gartner hype cycle theory identifies different phases on the lifetime of an emerging technology, trying to make sense of a generalised feeling towards it. The time scale varies but is usually constrained in a period of 2 to 10 years. I will first paraphrase the description of each phase from the description given by Gartner on their official website (Gartner) with as little mention of VR as possible, then explore the different moments of its history where VR may have gone through the different phases and theorise in which phase the industry is right now considering the information gathered.

Innovation Trigger: This refers to the moment when a technology is conceptualised, its viability may be proven, a breakthrough may have happened, but no usable products exist. Hype starts being clearly visible in this moment, usually through media exposure.

Peak of Inflated Expectations: Through early publicity and a lot of hype there is a very positive perception of the technology, but many prototypes fail to deliver and the majority of investors start moving away from it.

Trough of Disillusionment: Interest and hype seems to disappear or is severely reduced, producers of the technology fail if they don't make severe changes or are very successful, and investors disappear except in the rare cases where early adopters are satisfied.

Slope of Enlightenment: New use cases for the technology start to steadily come up, it becomes better understood, its evolution becomes apparent, and companies and investors start appearing. Conservative companies remain cautious, however.

Plateau of Productivity: This is when mainstream adoption starts being visible, where one or more use cases have been proven and have taken off to bring clear benefits to companies and investors.

One noteworthy thing to note is that this theory identifies the eventual occurrence of the emerging technology fading out before they reach the plateau of productivity. This failure of the technology seems to generally occur during the trough of disillusionment by it not managing to get enough interested people, companies, and investors to get to the slope of enlightenment.

I will now attempt to identify moments in the VR industry's history where the technology may have gone through each of the mentioned phases and see what the general thought is as to where we are now.

In their blog (TechViz Nov 10 2020), TechViz mentions that in 1995 VR was placed in the Trough of Disillusionment, and that it was later identified in 2017 to be in the Slope of Enlightenment. It then mentions that it disappeared from the graph before reaching the Plateau of Productivity, and that Gartner explained that fact by saying that "VR technologies were almost mature, and didn't need to be evaluated as a new technology". They also criticise those ideas by saying that there has been peaks of hype throughout the years, and that we are currently still seeing plenty of beneficial advancements that getting the technology closer to being truly productive for enterprises.

The YouTube channel ThrillSeeker, in a video of their popular series "Tuesday newscast" (ThrillSeeker 21 Dec 2022, min. 1-5), explains the theory and lists the possible multiple hype cycles that VR has gone through. They list the Oculus kickstarter in 2012 as an Innovation Trigger, followed by the HTC Vive and Oculus Rift headsets creating a Peak of Inflated Expectations, that ending in a Trough of Disillusionment when all headsets of the time were exceedingly expensive and required powerful PCs to run, together with having a limited amount of software available for them. They then identify another Innovation Trigger in 2020 with the release of Oculus Quest, Oculus Quest 2 and Meta becoming the market leader, all thanks to the headsets being standalone and affordable and the COVID-19 pandemic making them highly attractive options. After that phase they see Meta popularising and strongly leaning into the concept of "metaverse" as the Peak

of Inflated Expectations, together with the presented false idea that the Quest 2 was more powerful than it was in reality, then followed by a current Trough of Disillusionment when major tech companies investing in VR are losing money and popularity, including Meta. He finally places a lot of hope and belief that we are starting to see a Slope of Enlightenment coming.

As for the interviews it was Takala and Participant A who talked about the hype cycle, and they both agreed that we are going down the curve of the Trough of Disillusionment.

So taking all this into account together with the front news found in magazines and other news sources, we can see that there is worry, but there is also hope. There is worry stemming from the huge layoffs that the big tech companies like Meta are suffering, from past promises and dreams not coming to be realised, and from the difficulty of making as much people as possible understand the technology, amongst other reasons. But there is also hope from the many startups working hard to bring new and innovative solutions to the table, from the VR aficionados that are feeding the hype, and from big players jumping in and putting their resources into this upcoming industry.

4.3 Problems and solutions

In this subsection I'll list different problems that the technology is facing in a literal sense (problematic hardware, unreliable software, the effects of that, etc), and explain one example of what is being done to solve them. There is too many to list all of them, and new startups are surely surfacing every day, so I'll list some of the most blatant examples with the objective of exemplifying the progress of the industry towards different matters.

As much as people may say otherwise, size does matter. The bulkiness of HMDs has always been a problem, and although the current most popular headsets are definitely easily wearable and you can have them on your face for some amount of hours, you need a good strap to even be able to wear them comfortably and you eventually have to remove them to let your face rest. A big front-running solution to this problem came not too long ago in the form of a headset dubbed Bigscreen Beyond (Bigscreen), a PCVR headset with never-seen-before lightness, small size, and comfort. The company builds the face cushion specifically for your face, assuring that it fits perfectly, and the device itself has great image quality.

Obviously there has to be drawbacks to such promising features. The price as it currently stands is 1369€, which is considered a "prosumer" price, referring to "pro consumers" that can afford more expensive and high-quality modern products that have a higher price. It is just the headset with the displays, so it is not standalone, and it has no controllers of its own. By default it is not wireless, although there are many solutions out there to make it so. The face cushion is designed for your own face, so only you would be able to use the headset comfortably.

All being said this is a huge step forward for the form factor, and other products are sure to follow suit.

Haptics, full body tracking, expensive room setups... Many companies are trying to crack the enigma of how to bring your full body into the virtual reality, full body trackers like the VIVE Trackers or SlimeVR, haptics like the Tactsuit, treadmills to use your legs to move like the Virtuix Omni, many that you can just google and they will appear in the top results. So I instead decided to exemplify these developments with a little known project that's trying to tackle many of those issues while also making something that you can even build yourself at home, the EXIT Suit (EXIT Suit Patreon). This invention consists of a wooden exoskeleton that you strap yourself to, which tracks your movements and maps them to your VR avatar, and is capable of giving you force feedback, with which you can feel all resistances happening in the virtual world, from the weight of your backpack to the water resistance of a stream.

Of course this is still in development, but its existence proves a few things. It shows that it may not just be interested companies releasing expensive products that push forward these developments, there is and will also be smaller passionate people and groups that will push to have more accessible solutions for everyone. It shows how inventive people can be with not necessarily that much funding, and it brings the feeling that one of the big limiting factors is just our imagination, not only the technology.

And the last one I want to point out is not VR, but AR, although some would say it's MR due to its interactive capabilities. I'm talking about the Tilt Five project (Tilt Five), an already released set of AR glasses which, for a price that could be considered consumer friendly and that varies depending on the number of included devices, allows you to play games in AR. It's accompanied by a mat that serves as a game board, but some apps can also be used without it, and connects to a PC or an Android device to execute the games.

This is a clear example of a technology geared for consumers, using an innovative technology, and that is focused on form factor for being lightweight and comfortable to use.

5 The future

In this section I will look at the future of VR and XR, what we have to look forward to in a shorter and longer span of time, starting by the near future looking at what's likely coming this year and what should we look forward to past the next decade.

5.1 Near future

First of all I'll briefly look at a couple of advancements that are announced to be coming soon and are confirmed in some way or another. I will do my best to focus on the advancements that are thought to bring VR closer to the end customers and briefly explain why.

It's impossible to talk about the near future of VR without talking about the upcoming headset of the line that brought it so strongly in the past, the Meta Quest line, with its upcoming Meta Quest 3 that is supposed to come out this year 2023. As CEO of Meta Mark Zuckerberg mentioned in an interview this past year (Stratechery 12 Oct 2022), the Quest 3 would be "in the price range of \$300, \$400, or \$500", aimed for it to be by all accounts a consumer headset and reserving their enterprise-focused efforts for their Quest Pro line.

To this day there hasn't been too much confirmed about the headset, just leaks and some speculations, but I will list the general thoughts that have the most backing. It's thought that it will have colour passthrough like the Quest Pro, which will make users more aware of the surroundings, will give it more fidelity and will help greatly with Mixed Reality capabilities. It's supposed to come with way more powerful MR capabilities than its predecessor, helped by the colour passthrough, which we know they are highly capable of as we've seen with the Quest Pro. It will probably be lighter, have similar controllers than the Quest 2, and it's very unlikely for it to come with face and eye tracking.

If history serves, it is likely for the Quest 3 to be the first thing that people consider when buying a VR headset. However, it is always good to consider the differences that the industry has between when the Quest 2 was released and when the Quest 3 is supposed to release. There are now more competitors, Meta as a company has suffered many setbacks, and the Quest 2 itself will continue to have a grip on the market as a safer option than its successor, so the future is never certain.

Then we have the issue of the upcoming Apple XR headset. It is of the general opinion that Apple putting his foot in the industry will mark a turning point for it as they have done for other industries in the past, also explained by Arikök in his interview and mentioned by others. The release of this headset has been delayed (purposefully, to some accounts) many times in the past, maybe to wait for the technology to advance to a more lightweight and stylish form, maybe to solve problems that

kept appearing, but seems like current CEO of Apple, Tim Cook, is pushing for the headset to be delayed no longer (Axon 13 Mar 2023). Nothing is known about the headset and what's out there is just speculation, but it will leave no-one indifferent.

Apart from the ones developed by the big western players, many other devices are being developed, not only HMDs but haptic devices and other advancements that strive to push the industry forward. Many of those fizzle out before reaching any success, but marks on the world and the industry are being left slowly but surely.

5.2 Far future

As a disclaimer, in this subsection I will be highly speculative due to the nature of the question being posed. I will try to generally list some ideas of what professionals and the community thinks will happen in a decade or more.

I want to start off clarifying that, when it comes to VR, immersion is the name of the game. I will also mention possible transformations of AR and MR because, in the far future, they may be intertwined, but I will do my best to focus on VR. Because of that, perfect states of the industry that may come in these futures focus on bringing next-to-perfect immersion and will likely be defined by that fact.

To put forth the further future ones, I want to talk about the two ideas presented in the interviews by Participant A and Takala. Participant A mentioned the possible existence of the holodeck in a perfect future, which would consist of a room that becomes anything that's needed in the moment. That would likely require the ability to manipulate infinitely configurable organic matter, which is currently hard to imagine how would we break the laws of physics to accomplish that (Caddy 2021), and that would allow us to have perfect immersion as reality would become what the virtual reality would be, not requiring any body-mounted devices. To this point I also want to point out that the technology to accomplish this would very likely be cumbersome and require a dedicated space to function, which puts it far from the possibility of personal use and limits it to professional uses. So, considering that, the next best thing is to try to recreate what the holodeck would bring us but in fully immersive Virtual Reality. To that end, Takala imagined a device that, much like in the movie Matrix, would put you right into a virtual reality, and your brain would fully believe that you are there. You would have all senses inside that reality, being experienced by your avatar. The barriers to reach that point would be creating a fully functional brain-to-computer link like the one that Neuralink is already developing (Neuralink), to the point that there would be a two-way communication between human and machine, and one would be able to affect the other seamlessly.

I also wanted to mention the much talked about metaverse, specifically Meta's metaverse as they have been the frontrunners of the term's popularity. Like Wired says in one of their blog posts (Ravenscraft 25 Apr 2022) the concept of metaverse is very vague and largely misunderstood, but one of the most popular meanings behind it is an interconnected digital world within which you'd be able to carry your digital assets (avatar, wardrobe, etc) from one app to the other. As it is pointed out in the blog, "such a world requires companies to cooperate in a way that simply isn't profitable or desirable", and that fact, arguably even more than the technology itself, makes the metaverse very hard to come to existence. Also on the technology side, as Martikainen points out on their interview, software to develop VR applications (currently mainly Unity and Unreal) would need to enforce plugins and solutions that allow this interconnectivity between apps developed in their platforms. So to summarise it is possible but a lot of things need to fall into place before it is plausible.

Finally we have the issue of the perfect HMD, the perfect glasses that would make XR technologies truly attractive. Those glasses would be light, wireless, stylish, they would have enough battery life to last a usable amount of time, they would bring you a good enough use case so you can't imagine living without them, and perhaps they would allow you to change between using them for VR or MR/AR. At this moment nobody can imagine how to advance the current technologies to a point where that would be a reality, but despite of that it is one of the most grounded ideas there is thanks to its less revolutionary nature, as at that point it would merely replace smartphones, laptops and other VR headsets.

6 Interview analysis

In this section I will list the questions present in the interview, explain why I chose each of the questions, and summarise what the interviewees thought of the matter. With this I aim to present the results in an understandable and referenceable way, which tries to unravel what did the professionals think, tries to find bridges between their opinions and paints a bigger picture of each subject.

6.1 What is it you / your company do / does in the XR market?

This was an introductory question, mainly to get to know them and understand how close they were to the VR market. This would also help me weigh the next questions depending on their familiarity with them and how much they had to say about them.

Arikkök's background is in tech sales and is now working as an AR/VR account manager in MeKiwi. Martikainen's background is in HR and B2B, then made a career shift to VR after seeing the solutions it could bring, and is now the CEO of Virtual Dawn. Saarinen is the R&D lead in Helsinki XR Center, which does a lot of research projects, helps startups and supports the Finnish / European XR environment. Takala is a long standing XR researcher both in Finland and Japan and has worked in prominent universities. And the final professional who I will refer to as Participant A is the CEO of a company which acts as a bridge between XR companies and startups, and brands that would have projects with them.

6.2 What is your personal relationship with VR? Do you use it in your everyday life?

This was to understand how much first-hand relationship they had concretely with VR, not only with XR in general, and seeing if they were an active consumer.

A secondary part of this question was asking them if they introduced people to VR and how was that experience. The difficulty of professionals to introduce VR to normal people will mirror how hard it is in general, as they should be the most capable, so with this question I wanted to ascertain that difficulty.

As for using VR in their personal life, Arikkök and Saarinen do use it actively, mainly for entertainment, but the rest do not. Martikainen doesn't for lack of time and not having a good enough use case for it, Takala uses it sporadically but is very hard to surprise him anymore, and Participant A quickly suffers from cybersickness when he tries to use it.

As for the introduction of VR to people, they were mainly done by showing the most popular games (like Beat Sabre), or experiences made specifically to display VR's capabilities (like Richie's Plank

Experience). They were generally successful primarily thanks to the “wow factor”, the realisation that VR is completely different from any other type of media, but that did not necessarily translate to the ones introduced to it wanting to buy a headset themselves.

Martikainen commented that even people that do not like computer or console games liked VR due to it being a completely different experience, and Saarinen that advancements in the technology are making it easier to be introduced by reducing the possibility of motion sickness and unavailability.

6.3 In your experience, what is VR mainly used for?

In this study I explore the current uses of VR to see what its selling points are, so I wanted to gather as much ideas as possible from professionals.

I did not ask this question to all, just when the opportunity presented itself. One thing to note however, is that a big theme that came throughout the interviews is the current lack of use cases for VR, which I will explore deeper in the other questions but that may affect the lack of uses for the private customer. All respondents pointed to gaming and entertainment being the main use, with Takala adding adult entertainment as a primary use within the entertainment category, and Saarinen mentioning a secondary group that uses it for work.

6.4 What’s your opinion on the state of the VR industry right now?

This was the main question of the interview, moving from the previous more personal questions to bigger overarching themes, which would feed into the next questions.

All of them agreed that the technology is not yet fully realised, which is something that quickly becomes obvious after you start understanding the industry more than just having tried VR once, but it’s also something that needs to be mentioned. Through the interviews we commented on the myriad of advances in hardware that are happening, the many startups joining the fray and big firms joining in, and we also mentioned many current software solutions and their capabilities taking into account the sometimes limited power of the devices they need to run in; the fact that these advances exist is ample proof that the technology is in its development stages.

The initial reactions to the question were perfectly varied. Arikök and Saarinen saw it in a positive light, saying that the technology is breaking through, Takala and Participant A were a bit more sceptical mentioning that the industry is stalled, and Martikainen took a more neutral stance saying that it’s still immature and hasn’t taken off yet. The message is the same, as already mentioned, that the technology is still in development, but if these reactions proof anything is that there is not a

singular mindset shared amongst the industry professionals, and that hope is not lost by any means.

Both Takala and Participant A talked about the hype cycle theory, where widespread opinion quickly peaks, then quickly declines, and then plateaus, saying that we are currently in the downturn of the curve. I will explore this theory later in the study.

Arikkök defended that the numbers that are being published (like headset users in Steam) clearly show an increase in popularity, and that Quest 2 sold really well, especially on Christmas. He also mentions that the big firms jumping in will help a lot, and has hopes for the headset being developed by Apple, saying that they create trends and popularity.

Martikainen said that we're still figuring out how can this technology bring added value to companies, how can it improve processes and bring benefits. He also mentioned that it would be more beneficial to look for something that only XR can bring instead of trying to replicate the real world with it, like creating virtual offices. He also makes a big point of the need to decentralise the access to apps, saying that right now it is incredibly hard to take off if you are not in the Meta store, and that it is inevitable that at some point there will be easier to access platforms that will offer more apps outside of these centralised spheres.

Saarinen mentions that the Finnish / European XR environment is getting more support from the European Commission, making more players start to understand what they can do with this technology; that it's not too big in Finland yet but that steps are being taken. Also that Helsinki XR Center keeps receiving startups and projects but they would have space for more, showing that there is advancement but not fast.

Takala celebrates that devices are now usable, that it is no longer as easy to make users sick as it was before, but that use cases are still not fully found and there is no killer app yet.

Participant A talks deeply about the hype cycle, and points how useful VR is for training in professional environments. That the training use case is the one that is pushing the technology forward in that area.

6.5 What's the perfect future of the VR industry? Do you think it is achievable?

This was the natural continuation of question four, forming utopic scenarios and then seeing if those scenarios were truly utopic or if there was a possibility to get there. With this, I planned to get possible roads that would answer the research question. There were points where this question got

slightly mixed with question eight, but I'm going to try to keep the ideas in the questions they'd belong to.

Two utopic ideas came out for which we can't imagine the necessary technology quite yet. Takala imagined the endpoint for virtual reality technologies to be akin to the digital world presented in the movie *Matrix*, where you could be inside the digital world, for example connected by a neural link, and you wouldn't even realise it necessarily; he mentions that there is many difficult questions to ask before this future is even surmountable, giving the example of mapping movement inputs from an anthropomorphic real body to a not necessarily anthropomorphic avatar.

Participant A went a different direction imagining the culmination of the technology being similar to the "holodeck" presented in the science fiction series *Star Trek*, where you would enter with your real body into a room that would change to fit your needs.

As for the achievable ideas presented for VR, Saarinen said that VR technologies would replace laptops, Arikök that VR will very likely be led by gaming, and Martikainen that VR will inevitably stay one way or another because for some use cases it is simply better than any other alternatives. Participant A briefly mentioned the idea of a perfect headset that would have different layers of immersion, being able to change between VR, MR, AR and normal glasses.

In this question, related to question eight, I also asked what would be an ultimate state for AR and MR, and the generally shared answer was glasses that would replace smartphones, and that teenagers would want to wear without reservations.

6.6 What do you think it would take for VR to become mainstream?

The last three questions went quite hand-in-hand. The primary objective of this one was to gather as much ideas as possible for the second half of this study, but it also served as a bridge for questions seven and eight.

The consensus was that we must reach a point where headsets are cheap enough, light enough and powerful enough for people to want to buy it and wear it, but there were some more concrete ideas thrown around.

Most of them mentioned that we would need to find the appropriate use cases, Martikainen adding that to reach that point, access to apps would need to be decentralised as answered in question four. Saarinen pointed out that we need to find a way to make it cheaper to create content, as right now, having to work with a third dimension is increasing the cost for 3D modelling and other requirements, forcing the need to make shorter experiences, and that a solution for that may lay on

Al. Takala listed some batches that need to be surmounted, like being able to focus on different distances in the digital world.

6.7 Is trying to get VR to as many private customers as possible worth it, or would the industry be better off focusing on professional uses?

This was to critique the preconceived idea of this study that VR should be in every home, and play with the thought of the VR industry getting more benefits from dealing with professional customers than from private ones.

Answers to this question were surprisingly varied, proving that the best answer is not yet known.

Arikkök, Martikainen and Takala thought that it would be more worth it to focus on private customers, saying that the market is bigger there. Arikkök exemplified it by comparing the selling of 5000 headsets to individual users who would then buy one or more apps for it, to the selling of maybe 40 headsets to a company with 5000 personnel, who would use the headset for just one particular app. Martikainen defended that if you don't get individual people into VR, then you can't get anyone into VR because the professionals also need to be open and able to use the technology; he further exemplified it by noting that many of the private customers that we introduce to VR today will be the decision makers of the future.

Saarinen and Participant A instead thought that it would be better to focus on the professional environment. Participant A made a point that training is one of the biggest use cases right now and there would be a lot of use for it. Saarinen elaborated that there's not many devices cheap enough to get to a lot of costumers, and the ones that can get to a lot of costumers are not powerful, which makes it risky to make apps for them: you don't have the device resources to make something powerful, so you have to make something that's less powerful, with less quality, and try to break even; he compared that fact to making apps for the professional sector where you have devices that are more powerful and can make better products for them, which becomes more profitable.

6.8 Between VR, AR and MR, which do you think has the most potential to become something that the majority of people use in their everyday lives? Why?

This served as a clear follow-up from the previous question, because ideas have been brought and history has shown that, especially AR, may end up being what becomes mainstream before or instead of VR, and I wanted opinions on that. In addition, this would help with the differentiation of the three technologies. It's also worth noting that, during the conversations, AR and MR were usually being bundled together, maybe painting MR as a deeper and more interactive version of AR.

The unanimous answer was between AR and MR, the reason being that it can more easily fit everyday uses, and that it will be easier and likely faster to make the glasses light, easy to wear, and more attractive to the masses. Saarinen also made a good point that, although chances are that it will be AR, the one that will push forward the strongest is the one adapted to the best use case when one is found.

6.9 Extra

Have you or your team developed any VR apps?

How was the developer experience?

What is your opinion of the current VR development tools?

On most interviews, I would first ask if they had developed apps for VR if I didn't know that already, and if they did, I would ask about the developer experience. This was to see how big of a part the difficulty of developing apps played in the progress of the industry in general.

There was only one answer, and it was positive. The main developer tools are the Unity and Unreal game engines, and they are both powerful and perfectly usable for this case, especially with the many plugins available, showing that there is no problem on this matter.

6.10 Other matters that came up

Outside of the main questions, the respondents shared other interesting opinions, knowledge, and comments that I want to point out.

Arikkök had one of the most positive outlooks about the industry, and one of the most avid users of it in his personal life. He put a lot of faith in gaming pushing VR forward, remarking that it is a completely different form of entertainment from traditional gaming. He also pointed inflation and disruptions on the market hurting the industry quite a bit, but that being balanced by bigger brands starting to jump in.

Martikainen, leading Virtual Dawn, had a strong grasp on the software aspects. Their powerful SDK is free for anyone to use, and they hold a stance for free education content and access to development tools. That just shows that there are upstanding players in the industry that are driving it towards a very healthy and forward-thinking direction.

To that end, he made a big point of the need for users to have easier access to current content, and of the development environment being in a rapid state of evolution, where new releases quickly outclass beloved older ones. Because of that, he thinks that one should strive to make a top-of-the-line killer app only when the hardware is stable enough for it to last longer.

He also commented how, to enforce the interconnectivity idea of the metaverse (if that concept stays valid for longer), game engines should allow easy access to plugins that enforce that, for example giving access to avatars used by many applications.

Takala seemed to fully believe on a future killer app strongly pushing the industry forward, and imagined the possibility for said app to even be able to replace any screen we're currently using.

He also made a strong comment towards this concept of VR becoming mainstream, that we may not need that to happen, that what is making us wish for it to become mainstream is some preconceived notions of ours. He said that VR has this "wow" factor, it impresses you but you may end up forgetting about it, and that's fine; maybe we will find one very strong use case and VR will serve that and not much more.

And finally he made a point of adult entertainment being a prominent use of VR, which is backed up by any unofficial sources, so I will try to explore that further into the study.

And finally from Participant A I wanted to accentuate a couple of points. A very important one being that, as someone who suffers from cybersickness, there are some high-end headsets (like the ones from Vario) that do not make him as cybersick, clearly showing that some of those big problems that we have seen so much of in the past are naturally solving themselves. But on that point he also said that some people are so sensitive to it that they really can't even get close to a VR headset, and that is totally fine.

And the second thing I wanted to accentuate is his belief that currently, people working in the industry have the bad habit of going boldly forward without learning from the mistakes that have been done on the past, that we should all try to learn from other people's mistakes as to not repeat them.

7 Discussion

We've seen multiple possible reasons for the increasing yet still low VR adoption rates, and a lot of them can be summarised by saying that the technology needs to be developed further. However, that would be oversimplification, so I'll try to discuss the main reasons as to why that is happening and what could be done about it.

VR is still seen as a "gimmick". From its inception it was presented as this strange and fabulous thing, something that is seen only in science fiction, and with which you would be transported to a new digital world where anything is possible. Then people tried it and, as the technology was not yet properly developed, it led to underwhelming results for most. Fast forward to the present day and VR is now comfortable for most people that try it, yet it's hard to actually choose to try it because the public still looks at it and thinks of those in-development days where problems were more prevalent. Of course it's not yet perfect but, helped by the proper equipment, we have already passed the point of VR being uncomfortable. One way to solve this may be with two things: a VR use case that is actually interesting to the masses that we haven't thought of yet, and some out-of-the-box marketing that divorces from the established ideas to change people's perceptions.

Researchers don't have the money to improve the technology because people are not buying into it, people are not buying into it because developers are not making enough content for it, developers are not making enough content for it because the technology is not improving fast enough and there's not much money to be made. The vicious cycle. This is already being solved in multiple ways: the headset manufacturers are finding new markets to get revenue (usually professional ones), they are moving the technology slowly forward, and new games and applications are slowly coming out, all of which with a bit of patience and market stability will bring VR to a better place.

VR is not well understood, and that is understandable if you think how impossible VR is to understand if you have never tried it. It is so different from any technology we had in the past that our brains don't have any past experiences to latch onto. The only solution to this is to fight for as many people to try it as possible.

Knowledge is kept behind closed doors. Right now, the main players developing VR are big corporations that want to be the first and the best in the market, which forces them to keep any progress to themselves. This slows down any technology's development dramatically, so we may not see big and fast steps forward until (or if) there is a context where research is openly shared.

8 Conclusion

With this research I wanted to look at the upcoming industry that is VR from a bird's eye view, trying to understand what brought it to the point that it is now and what is the current situation so I could discuss how could it become something that as much people as possible have access to, in the easiest way possible.

To do that we looked through the technology's turbulent past, seeing how videogame companies attempted to develop it with expensive and unwieldy results. We then saw how Oculus kickstarted the industry anew after a few years with few attempts, and how that caught the eye of Facebook, which years later got so into it that they changed their company name to Meta, referencing the concept of "metaverse", a digital interconnected world that everyone would be able to access as whoever they wished to be.

We saw how now and partly thanks to the feeling of isolation created by the COVID pandemic lockdowns, adoption of VR headsets rose dramatically, giving even more resources for the technology to be developed.

We then gathered this knowledge and other information to see what elements brought VR close to the mainstream, to normal people's homes. There we saw different hardware advances, like inside-out tracking and headsets getting cheaper, and software advances, like solutions to motion sickness and the development of new and better apps.

Finally, we discussed different problems that the industry is facing to reach the desired point in the market, theorised how to solve those problems, and imagined what advancements could be made to forward VR to be more comfortable, understood and widely accepted.

Thanks to this work we can reach the conclusion that there are many channels through which VR can reach every home. Be it through bringing better understanding of the technology via demonstrations and proper information, divorcing from past ideas from when the technology was underdeveloped, or striving to reach a point where all interested parties can help better the technology instead of big corporations keeping those secrets to themselves, there is hope for Virtual Reality, and if everyone who has passion for it pushes bravely forward, the technology will keep moving forward too.

8.1 Learnings

Through the research done in this study I have learned much about this industry that has so many passions behind it. I started writing as an unknowing amateur, with just a Quest 2 and curiosity

under my belt, and through researching plenty of information from many different sources I managed to paint myself quite a clear picture of the industry.

Via attempting to frame my study through the theoretical framework I realised how far it was from the current scholarly research in the field, which to this day I feel uneasy about due to the nature of this thesis wanting to approach scholarly styles. Despite that I did not want to change the focus of the study because I saw the value in it and I was truly passionate about it, so I continued boldly forward, which in my opinion it paid off.

Also thanks to the exploration of the terms used to name the different technologies of the industry (VR, AR, etc.) I learned much more about their relationship, especially the nuanced meanings of MR and the one I'd settle for. Also I learned how the XR nomenclature, even though it is widely accepted in the popular spheres, it is still not fully accepted in the more scholarly or professional environments seemingly due to its vague connotations, though I never had a doubt that I'd go for the most popular definition, which is the one I presented in this study.

In the study and in my mind there was a before and after the interviews. The interviewees presented information and opinions of XR that I never knew or thought about before, and painted quite a different picture, especially of the current state of the industry. Luckily I knew enough beforehand to be able to form decent questions for them, and I'm proud they worked.

For the empirical part (past, present and future), I was determined to do it with that structure because I knew that it would do a great job realising the bigger picture, which is what I wanted, but I went into it blind. What I mean by that is that I knew next to nothing; I was aware of some advancements that were being done and some troubles that we were going through, but I did not know basically anything about the past, was not too well informed about the current situation outside some random internet videos, and was never able to discuss possible futures with anyone.

This fact made me re-structure the subsections of those sections a couple of times, as I found more and more information that could be framed in different ways, but I kept the sections themselves as planned. I learned a lot though these developments, and now I know better what to expect on future similar situations.

As for the discussion and conclusions I didn't fully know what to expect. I thought that it would be a more literal and graphical list, but it ended up being more of a systematic explanation. I am alright with that, and from that I learned to accept how things become, even if it was not what you initially expected.

8.2 Critique

While this study has provided me, and I hope possible readers, with a deeper understanding of the VR and even XR industry as a whole, it is clearly not without shortcomings and biases. Due to that fact I want to address some for them to be taken into account when interpreting the findings of the study.

The first shortcoming that I want to point out is that, this being my first dissertation and my first attempt at formal research, it will lack professionalism and the polish of work done by a researcher or someone wanting to become one. That can obviously be addressed by this being taken by someone with that disposition or co-authorship.

There is also a bias I may have for the entertainment use case for VR, as that's what arose my interest for the technology and the reason why I wanted to do this in the first place. It is proven to be the main use case for private consumers, but that bias may have steered all nuances towards that. To avoid that the study would need to be taken or reviewed by someone commonly partaking in different use cases or outside of the industry.

There was also a relatively small sample size of interviewees, and the study would certainly benefit by a few more.

And lastly there's the point about me not having easy access to many professional papers or not having the ability to find them reliably, which severely cut the sources available and reduced the potential trustworthiness of the dissertation in its entirety. This could be solved by future research having access to these sources or having the experience to know where to find them.

8.3 Next steps

There is potential for further study in this area. One big way would be surpassing the shortcomings mentioned in the previous subsection, but looking past that we see some useful ways to take it a step further.

If one would have direct experience in the industry, it would be good to gather learned lessons from the past to present them to possible interested parties, potentially teaching upcoming professionals the dos and don'ts and giving them a clue as to how to move forward, instead of forcing them to go in blind and learn by themselves.

This is a quickly evolving industry, so it would also be needed to keep the material updated for the times.

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Appendices

These are the transcripts for the five interviews described in chapter six.

Merih Arikkök interview

0:0:0.0 --> 0:0:1.750

Aleix Renom Cisa

[...] transcription, which is nice.

0:0:3.50 --> 0:0:6.70

Merih Arikkök

Cool. I didn't know about this transcription feature.

0:0:6.520 --> 0:0:11.690

Aleix Renom Cisa

Yeah, it is. It is quite interesting, at least for the for, for use cases like this one.

0:0:11.900 --> 0:0:12.450

Merih Arikkök

Yes.

0:0:13.480 --> 0:0:15.820

Aleix Renom Cisa

And for classes and I think that the the.

0:0:14.640 --> 0:0:23.670

Merih Arikkök

So that would you like to tell me about yourself a little bit? Like, what do you do exactly and how did you get interested with the AR and VR and stuff?

0:0:23.960 --> 0:1:32.330

Aleix Renom Cisa

Yeah, definitely. I actually got into VR not too long ago I have had a Quest 2 headset for couple of years now maybe and it has been blowing my mind until (since) then like every new advancement in the technology that comes it's like, shit like, awesome. And I have been actually thinking a bot more professionally as I approached the end of my university degree. And yeah, I wanted to start trying to develop something, but my computer is not up to par yet, so we'll see. Umm, but yeah, how? How about you? What do you what is it that you that you do in the in the XR market?

0:1:33.110 --> 0:1:43.180

Merih Arikkök

Actually I have always been in technology and like about let's say more than 10 years ago, I started experiencing with VR, but back then.

0:1:45.910 --> 0:1:46.230

Aleix Renom Cisa

Hmm.

0:1:44.40 --> 0:1:50.190

Merih Arikkök

It wasn't there. I think it was heavy.

And there were not so much content.

0:2:2.670 --> 0:2:3.190

Aleix Renom Cisa

Yeah.

0:1:51.880 --> 0:2:9.140

Merih Arikkök

And with the Valve Index and so on, then it got more interesting and of course with like with the Quest, the first one really like awesome stuff and I didn't need the computer anymore because my biggest challenge was actually it's a pretty simple one, but I'm a Mac user.

0:2:9.720 --> 0:2:10.100

Aleix Renom Cisa

Yeah.

0:2:10.410 --> 0:2:21.950

Merih Arikkök

So it's not VR friendly at all. And then the standalone this Quest that I was like, OK, finally free, I don't need any cables. I don't need a Windows PC.

0:2:22.140 --> 0:2:22.380

Aleix Renom Cisa

Yep.

0:2:23.250 --> 0:2:33.580

Merih Arikkök

And so on. And finally, it took off like I tried even like the Nintendo one, the device, it was fucking heavy, and...

0:2:33.300 --> 0:2:35.560

Aleix Renom Cisa

Oh, that that really old one, right?

0:2:35.930 --> 0:2:36.940

Merih Arikkök

Yeah.

0:2:36.490 --> 0:2:37.710

Aleix Renom Cisa

I think I've heard about it.

0:2:38.40 --> 0:2:39.840

Merih Arikkök

Yes.

0:2:39.50 --> 0:2:53.520

Aleix Renom Cisa

That must have been an experience.

Yeah.

0:2:41.440 --> 0:2:54.740

Merih Arikkök

It wasn't comfortable at all. It was interesting. But like then, uh, similar stuff already did exist without any batteries, you know? You know those boxes you put in and then it gives some 3D feeling and then it moves.

0:2:55.390 --> 0:3:2.730

Aleix Renom Cisa

It was pretty popular actually.

Surprisingly.

Yeah.

0:2:57.130 --> 0:3:12.760

Merih Arikkök

Yes. So something like that. It was really popular back then and of course like once this Quest took off I was able to, you know, play a lot of games and so on. And of course, like lots of content.

0:3:13.710 --> 0:3:14.0

Aleix Renom Cisa

Yeah.

0:3:14.110 --> 0:3:18.980

Merih Arikkök

And I switched to [...] like I purchased the Samsung Gear also.

0:3:24.590 --> 0:3:24.830

Aleix Renom Cisa

Yeah.

0:3:20.300 --> 0:3:33.580

Merih Arikkök

It wasn't bad at all. It was pretty good, I think for its time. But even like, back then, like when I wanted to use the Samsung Gear that I own, I had to borrow my friend's phone because I'm using iPhone.

0:3:43.950 --> 0:3:44.410

Aleix Renom Cisa

Yeah.

0:3:35.500 --> 0:3:50.800

Merih Arikkök

And you know it. It's like 50 fifty, 50% use Android and most of those used to use at least like Samsung devices. So I was like in my friend's device and it was overheating, you know, because it was really challenging the little phone's resources.

0:3:51.660 --> 0:4:10.880

Aleix Renom Cisa

Yeah. Here in, in, in Europe, I think it is like more prominent Android at least.

Yeah.

Umm.

0:3:57.990 --> 0:4:11.980

Merih Arikkök

I have no idea. I don't know everything. Most of the people I know they use, they use Apple devices, but in Finland it's totally different thing coming from Nokia

than people really use like still Android. I think most of the people here.

0:4:13.320 --> 0:4:19.720

Aleix Renom Cisa

So you do use VR in your everyday life or... do you, is it mainly...?

0:4:20.290 --> 0:4:47.850

Merih Arikkök

Yeah, almost every day, of course. Like uh.

Because I'm working in the XR industry, maybe I'm not the best example, but.

In my free time, I think I use like couple times a week like one times I start my headset apart from other gaming. So as a normal person, let's say I play VR games or try AR like a couple times a week and because of my work every day.

0:4:48.340 --> 0:4:52.970

Aleix Renom Cisa

Is it with the Quest 2 or with another headset?

0:4:52.290 --> 0:4:58.160

Merih Arikkök

Yes, that. I have Quest 2 at home and then uh I installed. Do you know Vario?

0:4:59.390 --> 0:4:59.990

Aleix Renom Cisa

Which one?

0:5:0.140 --> 0:5:0.670

Merih Arikkök

Vario.

0:5:1.450 --> 0:5:3.730

Aleix Renom Cisa

It sounds familiar. What was it?

0:5:3.270 --> 0:5:6.650

Merih Arikkök

It should sound familiar because you are in Finland, right? So.

0:5:6.270 --> 0:5:7.420

Aleix Renom Cisa

Yes, I am.

0:5:7.430 --> 0:5:20.20

Merih Arikkök

We are in Finland and you are interested in XR, so Vario is a Finnish company who is producing the world's most advanced enterprise grade headsets, XR headsets, with cameras and so on. So it's awesome.

0:5:24.70 --> 0:5:25.260

Aleix Renom Cisa

I will look into them.

0:5:20.970 --> 0:5:55.980

Merih Arikkök

They are headquartered in Helsinki. So basically also, if you're interested, you can contact them. They're really friendly people.

They would host you even like for an hour and show you around, so they're really cool people. So basically I took one of them because it has like eye tracking and really like, great resolution.

And of course, it requires a really powerful computer. But then I installed Microsoft Flight Simulator at the office and connected the headset. So basically I can fly and it's awesome because like the graphics are awesome and everything.

0:5:56.720 --> 0:6:0.350

Aleix Renom Cisa

I see. Then I will definitely do it.

0:5:59.920 --> 0:6:6.650

Merih Arikkök

You should definitely try. They have really great simulators. Also they have like a couple of our simulators as well. We have done for them.

0:6:13.970 --> 0:6:14.260

Aleix Renom Cisa

Yeah.

0:6:9.190 --> 0:6:18.200

Merih Arikkök

And if you ever come to Oulu then feel free to stop by at our office and then we can show you like some others simulation stuff. It's fun.

0:6:20.710 --> 0:6:32.940

Aleix Renom Cisa

Yeah. So. You are in the XR market, so it is not like... But have you introduced people that are not in the XR market to VR?

0:6:33.600 --> 0:6:34.40

Merih Arikkök

Yes.

0:6:34.720 --> 0:6:38.490

Aleix Renom Cisa

How? How was that? How was that experience of like introducing this technology to someone else?

0:6:39.860 --> 0:8:8.870

Merih Arikkök

Like in order to explain this, I think I should also give some background information because I told in the beginning that I have always been in tech sales and tech account management, so this also includes, you know, the potential users, potential clients and benefactors to educate the clients first. So basically tell them like what this is, what you use it for, and how they can benefit from it. So you have to show the value to them.

Because regular people like the people outside the people you talk to in, in your everyday life or even like decision makers or basically how can I say let's say we have elderly care center, right? The people who work there, they are specialized in elderly care.

And they are not interested in technology, they use it. Of course, some different stuff, tech stuff, but it's not their core business. So basically it's still you need to teach them. You need to show them because they don't, they don't, they won't start using something just because it's cool, you and me try stuff just because it's

cool. It's awesome. Like you. I saw the excitement on your face when I told you about the XR3, Vario's device and the flight. And so you would try it because it sounds interesting to you.

0:8:3.610 --> 0:8:4.680

Aleix Renom Cisa

Yeah. Without a second thought.

0:7:50.40 --> 0:8:8.870

Merih Arikkök

Yeah, to normal people. It doesn't sound interesting. It sounds even scary.

0:8:9.380 --> 0:8:9.670

Aleix Renom Cisa

Hmm.

0:8:9.770 --> 0:9:25.590

Merih Arikkök

Lots of cables, lots of settings, lots of devices new things, new things to learn. People are resistant to change.

So coming back to your question and answering that, I would say you always educate the client first. It's challenging. So basically, first we tell them what it is and how they can benefit. We also uh, you know, help them warm up with the technology. So what is this? So if we go to like speaking of myself, if I go to a client and if I know that the client is not so familiar with the technology, but somehow would could be interested, I bring a headset with me.

I think a simple, uh experience we have experience, let's say or AR experience, preferably a mobile AR that works with Web AR. So basically the other person the user won't have to download any application, it just works straight through the web browser because downloading something it scares people also.

So I warm them up and then I helped them. I helped them also get familiar with the technology so that they are comfortable with making the decision or adopt using it.

0:9:26.510 --> 0:9:42.590

Aleix Renom Cisa

Yeah. And do you think that only applies to professional clients or do you think that if you introduce the technology to like a friend or a son or wife or whatever, would it be more or less the same concept?

0:9:43.700 --> 0:10:54.790

Merih Arikkök

Same concept like of course with family and friends. It's like more informal, but I also do it because I'm an enthusiast and then I like other people try it. If someone comes over and then I say like try this one and, at first like they're scared, sometimes some of them like, straight, like adopt it. Like oh, it's great. Like open me. Like, show me something else. But most of the people, because there's also the sickness, VR sickness thing.

And of course you can research this because I read the research some different researches, but I don't remember the numbers but I can roughly say that half of the people at least get VR sickness on their first try.

But after like a couple of trials, let's say if they use the headset, let's say for 1-2 weeks couple times a week, it

goes away in like 80% of them.
So in the end it disappears.
But so when you try with family and friends the first reaction is like, OK, this is weird. They are even scared but in a positive way.

0:10:54.380 --> 0:10:56.250
Aleix Renom Cisa
Like shocked, right?

0:10:56.430 --> 0:11:30.390
Merih Arikkök
Shocked. Like there's they say they are scared, but they're laughing at the same time while screaming because they are falling off a cliff.
Or fly flying with like wingsuit and so on. So I have those, you know, all those we weird games like wingsuit and then flying apps and roller coaster, even roller coaster I was myself because of the senses. I was gonna fall while I was standing because in the roller coaster I got out of the tracks. Anyway it is. It is interesting.

0:11:31.320 --> 0:11:39.810
Aleix Renom Cisa
So, in your experience, what is VR mainly used for as a private customer, basically as a personal, normal person. Non-professional.

0:11:46.660 --> 0:13:33.560
Merih Arikkök
OK so.
I can't prove it, but I can say and I can bet that like over 95% of individual VR users, they use it for games.
Nobody would like install, let's say, a washing machine or kitchen personal training application in VR and then try to be, you know, a kitchen personnel or cook so.
Most of them, almost all of them, play games. And I would say because imagine this like, are you... I think you are into gaming. I can see that so.
To me, gaming is like you read a book. It's static. So you read or you experience the writer's world.
From the writer's perspective, you can't change anything, you can imagine. So the limit, there's some limit.
If you watch a movie and if you like the book, you can have like a 2 hours immersive experience where you can also visualize things with, you know, all kinds of sensory stuff like voice, music, visuals, everything. And also you feel something like you get scared, you feel sad.
But in games you have control of it. So the same world and game play is not like 2 hours. It's not like immersive 2 hours, it's like immersive 40 hours. Some games are like 40 plus hours. So basically you are immersed in it with all these voice and so on. But at the same time you can control it.
You have a say in it.
In VR it's taken like a step further.

0:13:34.310 --> 0:13:34.720
Aleix Renom Cisa
Yeah.

0:13:34.500 --> 0:13:43.650
Merih Arikkök

It's fully immersive, you still control stuff the, you know, sound, world, everything like perfect.

0:13:43.220 --> 0:13:45.570
Aleix Renom Cisa
It's literally a new dimension, right?

0:13:45.190 --> 0:14:51.870
Merih Arikkök
Yes, it is. It takes it to the next level maybe like it's not there, I maybe it will never happen like it's just personal opinion, that... I think VR uh, you know, fulfills makes it, like, makes the gaming perfect. But on the other hand, like it maybe won't be like something separate or competing.
Imagine, like PlayStation. So PlayStation has millions of millions of customers and loyal customers.
And people really enjoy playing it. People are passionate about it, but nobody would compare or like pick one or the other when you mention like PlayStation 5 or let's say Quest 2.
They use it hand in hand. Me too, as a person. I play games, I also play VR games. It's not like one is better than the other. But, if you have a PlayStation 5, you can get PlayStation VR, and connect it to your headset and you can play the games in PlayStation VR using your console, so they're also like in the same ecosystem. So I think they make each other perfect.

0:14:52.570 --> 0:15:11.640
Aleix Renom Cisa
Yeah, quite a [unintelligible].
So, for a more general question, what do you think? What do you think of the state of the VR industry or right now, is it... How are you seeing it at this very moment?

0:15:12.330 --> 0:16:3.930
Merih Arikkök
I think it's breaking through like VR has always been like trying to break through.
Like back in 2015, it was like everybody was again, you know, hyped and talking about like it's the time of the VR and so on. And what happened? Nothing. And then it was silenced for some time. And like a couple years ago, it was said the same and we solved the results also in our company like we were selling like cakes.
We are like uh, the largest. We are game publisher and developer in Finland and we have done the most successful game and.
How many percent of this income came from Finland, do you think? Most of them came from the global sales and it was awesome.
So I think this time VR, like virtual reality is going to get a grip.

0:16:4.400 --> 0:16:4.630
Aleix Renom Cisa
Mm-hmm.

0:16:4.750 --> 0:16:25.610
Merih Arikkök
Because.
Like something similar to what happened with the smart smartphones or let's say iPhone.
So at first, nobody had a touch screen phone or an

iPhone, but then apple like accelerated its adoption, so everybody was going after iPhone like I'm talking about 15 years back.

0:16:25.890 --> 0:16:26.100
Aleix Renom Cisa
Yeah.

0:16:26.930 --> 0:18:4.970
Merih Arikkök
So it became accessible.
And about the smartphones like today, everybody has a smartphone because it is cheap enough. It's affordable, it's accessible. That's why everybody has it. But before VR devices, they were not accessible at all. They were like tethered. So you need a cable and the computer and the powerful graphics card, which is VR-ready. It's like only the true, passionate like crazy ones would go after it. Nobody else, a normal person wouldn't buy another as a Christmas gift. But this Quest 1 it was like cheap affordable because the comparable ones were like €1000 and plus requires a computer and you get like for 550.
€550 you get a headset and you don't need a bloody computer to use it. You can charge it like perfect. People started buying it and you could see the numbers in the Steam statistics, like how many headset users there are. You can see them. It's public. How many headsets like check from, for example, from 2020 or start from 2019. It's best from like 2019 so. It steadily increases.
The percentage of quest users like Quest 1 users, it increased. It was taking over like Valve Index and so on, and then, probably like people at Meta saw this, so they even developed a better and lighter and a cheaper version.
What else there is?
And people really started buying it, perfect.

0:18:14.750 --> 0:18:14.940
Aleix Renom Cisa
Yeah.

0:18:6.130 --> 0:19:18.20
Merih Arikkök
And like it was like 2 years ago, I think it was like crazy sales for Quest 2 like it was not this Christmas, but last Christmas, the previous Christmas.
The sales across the globe, especially in the states where like crazy because also Meta did campaigns like it was already costing less, much less than the Quest 1 and then they were also discounting it at some point I saw like it was \$250 for Quest 2, isn't that crazy. Everybody bought it. It was like sold out on the shelves. And then I saw like, my Twitter was full of people unwrapping their Christmas gifts.
Full of Quest 2. So then those numbers reflected in the Steam statistics as well and now a lot of people have Quest, which means like the point, sorry, I made it too long, but like circling back to the point.
The point where almost every household has or has had a VR device.
At that point you can say that yes, it has happened. It's going there, I think.
It's like CDs. Every house has one had one.

0:19:18.780 --> 0:19:45.230
Aleix Renom Cisa
Yeah. And I don't know how close we are to... to that future.
We'll see.
I, as I have been looking through, through VR news like there are many that in the past year saying "Ohh VR is dying" or whatever and then you see this next year that.

0:19:49.400 --> 0:19:49.780
Merih Arikkök
Yeah.

0:19:46.590 --> 0:20:1.240
Aleix Renom Cisa
Apple is working on its own headset. The PlayStation VR 2 is coming and Meta Quest 3 will probably come this year. And like the big players are just like...
You know, pushing for it.

0:20:0.600 --> 0:20:11.50
Merih Arikkök
Of course, like for example if Apple goes for it then surely it's gonna create some hype also.
And lots of other companies.
Umm.

0:20:6.700 --> 0:20:11.590
Aleix Renom Cisa
Umm and the and even for the other companies of the of the sector.

0:20:11.730 --> 0:20:59.470
Merih Arikkök
HP, Lenovo, they're also producing VR headsets. It's great, which they do mostly industrial, but it's good that like more people are jumping on board. One negative thing is that because the because of the inflation and also COVID, like... it's like a chain reaction, but COVID triggered, you know, semiconductors issues and that reduced production. So basically people had money but couldn't get it, get their hands on the product and then. That now there's inflation.
Globally, like people have less purchasing power, so now we have, like people, had money and no devices. Now, there are devices but people are more careful to spend, but I believe this would be temporary.

0:20:59.900 --> 0:21:0.110
Aleix Renom Cisa
Yeah.

0:21:0.300 --> 0:21:4.110
Merih Arikkök
That's a year. It doesn't, I think, permanently affect the future of we are.

0:21:5.800 --> 0:21:15.950
Aleix Renom Cisa
So this this feature that there is, we are hesitant in, in, in, in every home basically do you think it is achievable in at some point?

0:21:14.840 --> 0:21:19.80
Merih Arikkök

I think it's achievable and probably gaming is going to lead.

0:21:20.400 --> 0:21:28.910

Aleix Renom Cisa

All right, so is it.

Is it only the price tag that will decide that or is there other factors?

0:21:30.590 --> 0:21:35.160

Merih Arikkök

Of course, like in combination with the price tag, there are a lot of factors like I mentioned.

0:21:42.770 --> 0:21:43.30

Aleix Renom Cisa

Hmm.

0:21:37.400 --> 0:22:19.510

Merih Arikkök

How good the device is like people, you know, gamers are concerned about the graphics and you have this tethered headset you need to put all the resources like processor, graphics card and so on inside the headset. And you need to optimize the battery life according to that. So your performance, the devices performance is limited to the battery and also the processing power. And it's not bad at the moment, but so, long story short, it depends on the price and also how good the device is so that more people are going to want it and also going to be able to afford it.

0:22:20.170 --> 0:22:20.420

Aleix Renom Cisa

Yeah.

0:22:21.450 --> 0:22:37.440

Merih Arikkök

And as far as Apple is concerned, I think they are going to have this because like Apple is going to of course price it, will price it high, but they are going to be also ambassadors of this as well.

0:22:34.170 --> 0:22:40.400

Aleix Renom Cisa

Yeah, as they have in the past for new technologies. For, for better or for worse.

0:22:40.840 --> 0:23:15.670

Merih Arikkök

It's natural. I worked at Apple, so I know the style a lot. So Apple leads. Apple, you know, pioneers.

[0:23:15.670 to 0:23:28.550 redacted at the participant's request]

0:23:28.550 --> 0:23:49.500

Aleix Renom Cisa

Do you? Do you think it's even worth it to, for, for the industry to focus on more private and personal users? Or will it bring more money and development for the industry if it's on the professional side? If it's for like businesses.

0:23:51.510 --> 0:23:53.720

Merih Arikkök

I think I can't pick one or the other because.

0:23:54.350 --> 0:23:56.130

Aleix Renom Cisa

They go together you mean, right?

0:23:56.860 --> 0:25:4.310

Merih Arikkök

They are two different things like.

I do both, so professionally I'm on the gaming side. I support them, but also I managed the enterprise XR site in our company for example, and both of them are different. On one side you have.

By numbers.

So basically you have one device per head and at least one purchase of game or content per head. On the other hand, in business side you basically you are forced to innovate because there are so many different use cases, so it drives the industry forward.

Because it causes new technology to be invented or improved or whatever. But on the other hand, they don't have the numbers.

A company of 5000 people company would buy 20 headsets, 40 headsets.

And they would pay just once, let's say, for a simulation, let's say 50 thousand €100,000 and that's it.

0:25:5.0 --> 0:25:5.350

Aleix Renom Cisa

OK.

0:25:5.50 --> 0:25:18.80

Merih Arikkök

On the other hand, if you think about gaming, if you have like 5000 people gamer group, it's like 5000 headsets and 5000 game purchases probably from, let's say from €20 and continuously increasing.

0:25:18.540 --> 0:25:21.140

Aleix Renom Cisa

Yeah, I never thought about it that way. That's true.

0:25:22.20 --> 0:25:22.400

Merih Arikkök

Umm.

0:25:21.880 --> 0:25:28.950

Aleix Renom Cisa

That there is like way more, way more heads in there, way more purchases in that aspect. OK.

0:25:28.380 --> 0:25:34.600

Merih Arikkök

As personally, I spent a lot of money to VR gaming to Oculus Store, so it's like money making.

0:25:33.850 --> 0:25:59.70

Aleix Renom Cisa

Yeah, you have to tell me. It's true.

So I am focusing on virtual reality but I do acknowledge that augmented reality and mixed reality are a... another use case that can take a hold off the...

0:26:1.440 --> 0:26:1.730
Merih Arikkök
Mhmm.

0:25:59.780 --> 0:26:17.60
Aleix Renom Cisa
Of the area. So between virtual reality, AR, and MR, which one do you think has the biggest chance of, uh, gripping the mainstream markets? Of just exploding and getting out there.

0:26:17.530 --> 0:26:23.280
Merih Arikkök
I think maybe like, you need to know a lot to answer such question.

0:26:23.900 --> 0:26:24.370
Aleix Renom Cisa
Yeah.

0:26:24.100 --> 0:26:24.530
Merih Arikkök
But.

0:26:25.170 --> 0:26:28.570
Aleix Renom Cisa
At least like a guess as far as you have seen?

0:26:28.350 --> 0:26:34.160
Merih Arikkök
At first glance, I would say VR because it's already here and it already has the audience. On the other hand.

0:26:44.810 --> 0:26:45.40
Aleix Renom Cisa
Hmm.

0:26:35.340 --> 0:27:26.280
Merih Arikkök
To take over at some point, probably it's going to be AR or at least mixed reality, but not headset style mixed reality, but AR. I'm thinking like AR glasses and so on. A lot of companies have tried and still trying to bring it to regular people like us to make it mainstream, but they, it has its challenges. The technology at this point I don't think that it allows us to create such devices because it has to be light, the cameras need to be like so high resolution and high quality, but at the same time you need to have sufficient battery but. Today's like... the battery technology we have today, I think it's not enough. It's heavy, it's large, and you just can't make it small and compact enough. The AR headset or glass.

0:27:37.870 --> 0:27:38.390
Aleix Renom Cisa
Yeah.

0:27:27.350 --> 0:27:54.440
Merih Arikkök
That people can use it in everyday life. I wouldn't. You see, I love it. I wouldn't just put a like HoloLens style headset on my head and then go around all day. You know I won't. But if it is like a little bit larger than my sunglasses, little bit, not too much, then I'm OK with it.

And the day I think we reach there everybody's going to have those Ars, and then it's AR, yes.

0:27:55.490 --> 0:27:55.850
Aleix Renom Cisa
Hmm.

0:27:56.510 --> 0:28:8.120
Merih Arikkök
I think the, you know, sales industry is going to change at that point. Marketing is going to change come on like instead of like Facebook ads, you're going to use ads while we're walking in the street.

0:28:8.910 --> 0:28:10.830
Aleix Renom Cisa
Yeah.

0:28:9.320 --> 0:28:26.770
Merih Arikkök
Like in the movies, because you can do that with a you put anchors there and then show content and you change the content from the back end all the time. Location based marketing, everything.

0:28:23.260 --> 0:28:27.330
Aleix Renom Cisa
Right. So, one quick last one because I am very curious about it.

0:28:27.800 --> 0:28:27.990
Merih Arikkök
Yeah.

0:28:28.610 --> 0:28:50.230
Aleix Renom Cisa
The tools for developing VR applications. How... because I don't have access to them so how is their state right now? Is it usable or is it subpar compared to the ones to develop normal desktop applications?

0:28:52.50 --> 0:28:53.320
Merih Arikkök
Do you mean like engines?

0:28:53.620 --> 0:28:58.140
Aleix Renom Cisa
Yes, basically I just software to develop into this technology.

0:28:58.770 --> 0:29:30.960
Merih Arikkök
Actually like, the best and, it's really useful, it's really easy. It has like so many libraries and SDK's and everything you need. [unintelligible] AR kit, so it's perfect. It's really easy to develop with that and it's, you can like export it to, for different devices. You can create builds like it does it for you. And thanks to the libraries you it makes it also easy for you. On the other hand, like there are other examples like Spark, 8th Wall, have you heard about them?

0:29:31.730 --> 0:29:32.370
Aleix Renom Cisa
I have not.

0:29:32.810 --> 0:29:58.410

Merih Arikkök

You should check them like Spark, 8th Wall and there are like other platforms as well. They're like AR platforms which means like you don't have to develop let's say AR for different devices like for iOS, for Android for Google and so on. But you just create it there and it they ensure that it is compatible with all across all these platforms.

0:29:58.770 --> 0:29:58.990

Aleix Renom Cisa

Mhmm.

0:29:59.410 --> 0:30:7.400

Merih Arikkök

And even like they go one step further, like in the recent years, they did this change, they do like no code AR creation.

0:30:8.140 --> 0:30:18.450

Merih Arikkök

They have created a Photoshop like studio. You just visually, you know, grab stuff and then choose from the drop down menus and it codes behind, perfect.

0:30:17.980 --> 0:30:18.460

Aleix Renom Cisa

OK.

0:30:19.310 --> 0:30:19.810

Aleix Renom Cisa

That's nice.

0:30:20.140 --> 0:30:44.930

Merih Arikkök

That they are easy because it's it makes everyone create AR. Everyone is capable to some kind. You can do it now if you don't know how to code, just go to Spark and use it. Was it, like, the name studio Spark studio? I think. But on all the other you can just grab a 3D model from somewhere, put it there and then create your own AR like in 15 minutes. No code.

0:30:44.50 --> 0:30:46.770

Aleix Renom Cisa

No, I think that is a very important thing.

0:30:48.60 --> 0:30:48.750

Aleix Renom Cisa

That is like.

0:30:48.510 --> 0:30:57.820

Merih Arikkök

Yes, yes, definitely. And for more complex stuff you use Unity, we use Unity also and it's really easy to learn. So you learn Unity or just...

0:30:58.540 --> 0:31:1.130

Aleix Renom Cisa

I have, yeah, I have used it before.

0:31:1.520 --> 0:31:12.90

Merih Arikkök

Like if you start learning seriously like a couple hours a

day in three in three months, you could be like, you know, you could have the basics, the fundamentals, it's easy to learn.

0:31:14.550 --> 0:31:18.230

Aleix Renom Cisa

Alright, so that was it. Thank you. Thank you very much, Merih.

0:31:18.400 --> 0:31:21.620

Merih Arikkök

Thank you, Aleix. It's great that you're interested.

0:31:22.450 --> 0:31:22.740

Aleix Renom Cisa

Yeah.

0:31:24.80 --> 0:31:28.10

Aleix Renom Cisa

So I'll just stop this [...]

Antti Martikainen interview

0:0:0.0 --> 0:0:4.90

Antti Martikainen

My, my, my, my official education is this BBA.

0:0:4.590 --> 0:0:11.900

Aleix Renom Cisa

Right. So where? Where? Where did you where did you study?

0:0:7.770 --> 0:0:24.10

Antti Martikainen

I studied in Jyväskylä and Jyväskylä applied sciences, and.

They, I also went into exchange in Germany for Hochschule Düsseldorf and.

That that's where.

Yeah.

0:0:21.20 --> 0:0:25.110

Aleix Renom Cisa

Well, I would not be able to pronounce it. [Tries to pronounce it but fails].

0:0:25.400 --> 0:2:29.420

Antti Martikainen

Yeah. Yeah. It's like a this.

Applied sciences equivalent so.

Hochschule Düsseldorf. Is that place at so. So yeah. I mean, that's my background is very much not from the VR industry. I mean, I was ten years in human resources and the business there for six years. And that's like my background is definitely from this B-to-B environment. And then I made a pivot in my career and went to helm the Virtual Dawn like some years ago. But I was with Virtual Dawn from 2017.

In this kind of, you know background member, but then officially I took part like some years ago. It's when I quit my other businesses. So I made this transformation.

But I noticed that it didn't change that much because I was in the very conservative business. HR is conservative business and I didn't like it that way. But it's also that.

It's a lot about making things easier to people that that that's what we were selling. We were selling services to make things easier for people essentially like giving stuff and evaluations, blah blah blah. So with virtual reality, I also saw that it's a way to make people's lives easier and solve, especially the training problem because we hired like a 1000 people every year in my business before and we knew that it's super hard to train people almost impossible.

So that, because you know, it's so demanding nowadays in especially this kind of highly competed countries that you know you would need to train people, but no one is willing to pay for the training and no one has time for the training because you can't spend time on training. But no one is trained. So I was thinking that virtual reality might prove some kind of solution to it that people might be able to learn properly from, for example from their homes, etcetera. So they would become a bit better labor force.

0:2:51.700 --> 0:2:52.10

Aleix Renom Cisa

Yeah.

0:2:30.320 --> 0:4:31.220

Antti Martikainen

At this, lifelong learning might be solved. So that's like the mission that we started with Virtual Dawn that we are going to provide some kind of solution to this issue. That's how to make virtual reality training content. First of all, that is cheap, easy to access and yeah, accessible in a way. So that that's like the core of our business that we started from, in 2017 to build it.

And we were building it this way that we started to work closely with at businesses and schools. So we didn't do any B-to-C at that point. You know that B-to-C is quite new to us, but we were concentrating on figuring out the best methods and best ways to train and work using virtual reality technology. So slowly, like I mentioned before the recording, that we tried this virtual reality education world, which would be a place to train, etcetera. It didn't work because of the gatekeeping of certain parties who are controlling the virtual reality markets, so we decided to concentrate fully on our SDK which is the software development kit, and we are having there all the up-to-date best methods to create a training and education content and also videogames currently. So we are making sure that this SDK is up to date and we are testing it with other partners that what is the best ways to train and learn and then other people can create content with that too. So our aim is to... it's already clear, this kind of in free distribution. I mean anyone can start to use our SDK and so on. You know we are not asking money for it. You know, people can start to create, and if they make a commercial product and we take a small cut. But that's essentially how we do it. So, so. So that's some way aim that's. Yeah, yeah, I'm going to answer a little bit to your other questions.

0:4:41.660 --> 0:4:42.20

Aleix Renom Cisa

Sure.

0:4:31.480 --> 0:4:52.30

Antti Martikainen

So I'm not going to [unintelligible], but it's but. But but why we are doing it with this way that we are enabling people to create content and we are not making some killer app, you know.

0:5:6.60 --> 0:5:6.460

Aleix Renom Cisa

Yeah.

0:4:52.800 --> 0:6:48.800

Antti Martikainen

Because I I don't personally and we don't personally believe that XR is still so immature, you know, no one knows exactly what is the added value there. You know that that that I mean that that money is the real this kind of saving your ton of money and everything. I mean we can calculate that people are calculating it, that it has benefits and so on. But really the virtual reality and the XR hasn't taken off. I mean that that's how it goes. I mean if it would be saving a shitton of money and it would be easy, everybody would use it, but everybody

is not using it. You know the big corporations. It's not in every office, in every single business. So there is still some issues there that needs to be solved and we don't know exactly 100% sure that how to solve this issues. So that's why we aim to give people tools to create the solutions that you know that we are not aiming to make one killer app that you can download and this will give you in some business distant that benefit.

I mean, because it's so, so. From our perspective, it's like, it's been not surprising, but a bit disappointing that people start to replicate the reality in virtual reality. That's it's probably the easiest way for us to understand that you are copying what you have here. You know you you like the most ridiculous thing in my perspective is that Meta and other companies put billions into making a virtual office in some virtual reality.

I mean, you have it already. So if you have a virtual reality technology, you should probably do something that is giving added value, not just that you are sitting in your stupid looking avatars around the table. I mean, why do you spend a thought on that?

0:6:42.870 --> 0:6:54.500

Aleix Renom Cisa

Yeah, that was one big selling point of the Quest Pro, if I remember correctly that you were able to use the the controls as a pen and just like put them around and mixed reality.

0:6:55.770 --> 0:7:26.730

Antti Martikainen

Yeah, yeah, yeah. I mean, that's yeah, yeah, there I see some. Probably some some intelligence that you could kind of start to work from your home and be immersed in some kind of virtual office and everything. But I think it's it's not super tangible. It's very hard because. Just go into Microsoft Teams like we are doing now. This is good enough for what the purpose we are having.

0:7:26.20 --> 0:7:27.630

Aleix Renom Cisa

Miss potential you would say, right?

0:7:28.220 --> 0:8:8.470

Antti Martikainen

Yeah, yeah, that's it's not giving...

That it should give like very much added value to people to see the effort to invest into these devices and learn them. You know, it's not enough to, you know, have just something.

Yeah, but of course, it's hard to say. I don't know either, but the, what we are trying to achieve is that we would wish that we push the boundaries of VR and XR and invent something new that you really can't do in real life. And try to bring that way the added value.

0:8:9.180 --> 0:8:19.230

Aleix Renom Cisa

So the the B2C part of Virtual Dawn is the the offering of the SDK right? With that anyone could access that part.

0:8:20.140 --> 0:9:15.370

Antti Martikainen

Yeah. Yeah, yeah, that that's what we are doing to uh, B-to-C, but that we are offering them possibility to create content if they want to and we have like for example. Now yeah we started quite recently to sell this service or offer it because it's free. So it's not selling in a way. But you know we started to promote it. So there is like one school now Sataedu from Finland. It's a gaming they have a gaming department there that they train video game creators. So they now ask the students that they who would like to make a video game during studies. So around eight people already signed up and they are now using our SDK.

We are helping them to make a video game during their studies, that's commercial so.

But that's like in in the best way to use it is definitely this that people can create and learn and create with relative ease, a tangible commercial product that they can sell and make money.

0:9:16.480 --> 0:9:17.40

Aleix Renom Cisa

That's awesome.

0:9:16.90 --> 0:9:48.100

Antti Martikainen

So that's like a. Yeah. Yeah, that, that's that's definitely what we love. And that's sort of B-to-C, but and then we of course use our own SDK to serve schools and businesses if they want custom content. So that's what we do too. We are, you know, there is businesses who want to have a virtual, virtual reality or immersive this kind of experience. So we make this to them with our SDK or ask someone to do it who is using our SDK. So that's how we make our actual money. It's with this custom content.

0:9:50.160 --> 0:10:12.650

Aleix Renom Cisa

So in a more personal topic, do you do you yourself use virtual reality or is it something that you use only professionally?

0:10:1.150 --> 0:11:26.250

Antti Martikainen

Yeah, I mean it's a little bit problem that, I mean I would love to watch movies. I would love to play videogames and everything. And I can't because of the lack of time. You know, it's like 2 small kids and then this business and blah, blah blah. So I wish that I would be able to use it more than I use it now because I'm mainly just using our own content to see if there are bugs. And there always are bugs. But as a professional tool or anything, I don't use it. That's there is no app that could practically help me that much with the professional life or daily life in general, but there was this one app that I used to use when I had time because I was using virtual reality to help with 3D modelling like there was this. I don't remember even it's name any any more, but it was mainly for Oculus and I used it with the Vive Pro this kind of, you know, it's not like it's not the [unclear], but it's the a bit older and nevertheless it's the thing is that you can make a 3D model there with your hands, you know that you can mold it. So instead of being 2D screen you can make a 3D character or 3D whatever using this virtual reality tool.

0:11:19.860 --> 0:11:36.460

Aleix Renom Cisa

I think I know which one you mean. I think I I I I think it's still holding on to this day that it was just it was just to make... That there was the the advertisements were making a lot of shoes like designs and stuff, yeah.

0:11:36.550 --> 0:11:59.80

Antti Martikainen

Yeah, yeah, I think it's still holding. I've seen something about it that, that, that, that was like one app that I was using when I had still more time.

But I didn't. I don't have now time because I'm not doing 3D modeling in our company, so it's a bit irrelevant, but that's a great example of a very good use of virtual reality.

0:12:0.0 --> 0:12:30.850

Aleix Renom Cisa

Yeah, using the technology to to it's actual potential.

So, umm... Do, have you introduced VR to like family, friends, like to more like, to people in your personal life?

0:12:18.890 --> 0:13:51.160

Antti Martikainen

Yeah, yeah, definitely. I have. And, it has been like a I would say great success in a way, because there are some friends of mine who don't play games and don't like computers and especially the guys I know who have a little bit problems with concentration, that they don't even want to concentrate on PC games. With virtual reality games, they are like blown away.

That they are like so because it's so immersive that the people really... I think my internet is lagging, so I'll turn the camera off for a moment. So the the, the people especially with these problems with concentration, they are so immersed in this world that they are completely sucked in by it. So it's like a new way for them to experience content because they can finally enjoy playing videogames and then.

I always show people this Richie's Plank Experience and other stuff, so people close to me that I've I've shown VR are seeing it with a very positive way. So I've been introducing it to people around and then we have also this free content inside Quest VR. You know practically we want all of our educational content to be free because education should be free. You know in our perspective, you can't ask money you're your education. So just. Very, very Finnish point of view but but so so. So we are we are...

0:13:50.180 --> 0:13:52.900

Aleix Renom Cisa

But that's why why Finland works like it works, you know.

0:13:54.240 --> 0:14:55.890

Antti Martikainen

Yeah, I hope. I hope it's a positive thing, so.

So we are, I'm of course telling everyone all the schools sent everyone I know that they if you have a VR device, go and download this content like an anesthesia nurse training and go to see how it feels to be anesthesia nurse and blah blah blah. So.

You know, so so that so that's how I've been, I probably getting some active users to VR because the lack of content is a huge problem there. I mean it's still a huge problem which VR not to mention mixed reality. I mean, god damn, I mean, there is nothing for HoloLens, nothing for nothing. I mean, it's like a a very very, very little content. I mean, we are coming to publish our first mixed reality game soon, which is this kind of training game that you are training to become a printing press machine user so it goes for free of course into the, the distribution for HoloLens? But but but yeah, we are also giving mixed reality stuff with the SDK and it works just like a charm.

0:14:57.930 --> 0:15:17.30

Aleix Renom Cisa

It sounds quite powerful actually.

So. Umm, about the the state of the of the industry it it you you talked about how Meta is like putting these barriers between the customer and the and the developers.

0:15:20.450 --> 0:15:20.850

Antti Martikainen

Yeah.

0:15:20.190 --> 0:15:36.600

Aleix Renom Cisa

So.

Do, is it?

Do you think that uh, Meta is the one that's actually responsible for facilitating these kind of things because it is the main player in the industry or?

0:15:37.580 --> 0:17:55.70

Antti Martikainen

Yeah, I I think the state of industry is definitely in this sense very much following what Meta does and it is a because it's the... if you want to sell your stuff normally, if you want to sell your stuff via stores practically, there is no other store for VR than Meta. I mean, if you are not in the Meta store, then you have 10 percentage of the markets with others like Steam and Pico and such. So.

Essentially, the fact is that if you want to sell anything, you gotta follow Meta and then Meta makes decisions that what content goes into their platforms. I mean there is App Lab, but it's crazy. I mean you have to currently I think it's still so that your app needs to be functional with Quest one and two. So the same app needs to be functional on that device that we are not supporting anymore personally because it's not powerful enough. So and no one finds your App Lab content.

And I mean no no one finds it, unless you somehow promote it heavily. I mean, they only place to really sell your stuff is the Meta main store.

And [chuckles] and I know that it's super hard to get there and especially if you want to distribute, for example, we have a free educational content that's used by Finnish universities and so on. It's a functional, pedagogically valid content, but it's free. I mean, they don't care about it. I mean it's it's not like they are using their bandwidth because if they put the free content, it's going to cost them. You know, if there is a 5,000,000 downloads, they have to find 5,000,000 * 300 megabytes to, you know, cover it. So it's a, it's a bit tricky, tricky.

Tricky that that way. Uh, with the state of the industry. But I'm sure that it will change. I mean it has to change. There will be new devices, new creations, new hardware practically. And then for example, I'm very much hoping that the Steam would that you could download for Cosmos and other devices, these five devices from Steam and the Steam would be this kind of place that it's easier for the content creators to distribute the stuff and put it there.
So.

0:17:55.550 --> 0:18:42.310

Aleix Renom Cisa

So do you think that headsets with the capability of connecting to this like Steam services would need to somehow get to as many people and become as much mainstream as the quest headsets.

0:18:13.280 --> 0:20:5.750

Antti Martikainen

Yeah. Yeah, I think so. Either that, Meta has to open up with their style of distributing content or there should or there will be one day some device. I mean, there will be a device, someone makes a device that is way more open and easier to add content to. I mean, that's the. I think that's the only way. It's the market pressure. I mean, it's not about my opinion anymore, but it is just that the markets are squeezing it into that direction, that there will be some kind of easier [clears throat] easier platform. Easier platform for developers and the consumers to enjoy the content. So. And of course we we because yeah, it also fits in our style because we are trying to democratize the content creation in Virtual Dawn. We are trying to make it accessible and easy to make that content. So of course it's also better for us if our content would be easy to distribute. So it's like we kind of need it too, but that's why we are doing it because we do believe that the market pressure will go to that direction that it's easier like with PC now, you know, you can download, you can put to Steam, whatever you want. They take everything in also, in good and bad. But you can also just share your content and download it like you just make whatever exe file and send it to someone, and Windows just says don't install but if you click that "please install it" installs it so so you know the installation to piece is a super easy and that's one of the, one of the reasons why they are so mainstream also, I mean it's uh... You just can't expect some kind of new technology or platform to be big if you put some barriers to it's content creation or distribution. I mean that just doesn't work, doesn't work like that I think.

0:20:6.440 --> 0:20:18.910

Aleix Renom Cisa

And have you heard of any company or anyone that is going towards that, anyone that has the hope of becoming this future?

0:20:19.500 --> 0:21:8.390

Antti Martikainen

Well, I think that there has been some startups who are making this kind of devices, I don't even remember the names because there are so many which are making this, that you can even 3D print parts to your VR device and such. But then also this Valve... Valve Index and,

you know, Steam itself you know they are launching their new consumer models and everything they are still in the game. I mean they, they they are launching soon this this I think Steam is pushing out this new standalone prosumer, pro-consumer device stand alone and everything that I don't know what is the distribution there that do they integrate it with Steam directly or not. But if they do, then that's it, you know.

0:21:9.360 --> 0:21:9.640

Aleix Renom Cisa

Yeah.

0:21:8.620 --> 0:21:24.40

Antti Martikainen

And they are making new devices. So I see that the solution comes from the, this HTC or Valve direction, Steam direction, you know, so I I I think they will probably figure it out in the near future.

0:21:25.180 --> 0:21:27.260

Aleix Renom Cisa

That's, that's hopeful, actually.

0:21:26.970 --> 0:21:41.800

Antti Martikainen

Yeah. And and besides, with the whole idea of this metaverse and everything, you know, people are talking about metaverse. OK, I understand it's a bit bit science fiction still, but if you want to make any kind of metaverse or Web 3, you know. You gotta do it this way, that it's interconnected and other content is interconnected with everything and Meta's content is interconnected with everything you need to create full interconnectivity.

0:21:52.780 --> 0:21:53.670

Aleix Renom Cisa

It is the definition.

0:21:42.610 --> 0:22:4.620

Antti Martikainen.

Yeah, it's the definition. So how can you be Meta company when you are trying to be a dictator of the metaverse? I mean, your company name is Meta, but you are not doing nothing that's metaverse, so you know.

0:22:4.150 --> 0:22:17.560

Aleix Renom Cisa

[laughs] The irony.

0:22:5.870 --> 0:23:13.60

Antti Martikainen

Yeah, it's it's very much irony. That's why people should change probably the whole name of the metaverse to some... just call it Web 3 or whatever, because I mean it's it's like very much trolling to the whole metaverse term. It's like, you know, Tesla would change its name into something that mean completely different thing and ruin it for everyone. I mean it's a that, you know it's not...

That's definitely it needs this interconnectivity path and, and... we we think that with the game engine because we are also having other SDK in Unity game engine, I think that's like a very important feature that if you

create, we, every, all the content is done with Unity or Unreal and it's super easy to put some kind of you know, um... plug in, that then plugs it in into whatever, so that's very crucial that game engines have easy features that can interconnect it with everything, and if there is this ready [unclear] avatars or whatever they are connected and you can go through this contents with your avatar and everything.

And you know, it's this kind of world where people can can kind of interact. And that's a I'm going to answer to your question that like, like this that, is VR to many private customers. Is it possible or worth it? And this seven and eight parts, I think I'm going to try to tackle them.

0:23:35.480 --> 0:23:35.960
Aleix Renom Cisa
Definitely.

0:23:13.810 --> 0:25:54.770
Antti Martikainen
So it's this that this when it comes to interconnectivity and B to C, and B to B and everything, I think that everything comes from the people you know. I'm not an old commie, but I'm just saying that if we don't get the plebe, you know, the average Joe, if we don't get them into VR, no one gets to VR I mean. Because if businesses want to use them for training and education or schools want to use them in education, you know the people need to be open and able to use the devices. So we need to get the people behind the technology and they will become the future decision makers. It's that... but it's great that in the United States, for example, over 50 percentage of the young people have used a VR device now. So this means that it's a critical point has been achieved and these people will become the businessman of the future. The foreman of the future, the teachers of the future. And they know VR. So they are going to introduce the VR into their workplaces and communities and so on. And it comes from there. And then it spreads to the businesses and everything because the people know how to use the technology. People like the technology. So we need definitely the B to C sector in it.

And sure, there are some businesses who are doing their niche like put millions of EUR into making some super sophisticated mixed reality experience. That's anyway going to be completely irrelevant and old in the next one and a half years that that that's why we are making, in Virtual Dawn we make this robust and cheap, cheap stuff for cheap VR headsets because the technology is going so quickly forward that if we put ton of money and effort into some kind of top of the game mixed reality experience, today the devices are already like a light year ahead in two years. You can of course update it and everything, but then it's always good to you know, design it into the good device. So. So I I would personally concentrate on top of the game high end content creation when the devices are really there because even the current best of the best, you know, it's not that good experience. I mean it's not like you are there or whatever you know [laughs].

0:25:56.570 --> 0:25:57.100
Aleix Renom Cisa
It's true.

0:25:55.910 --> 0:31:1.320
Antti Martikainen
That's. Yeah, I mean it's it's still far from there, but what I see is that this cheap standalone devices they deliver if you know how to make content to them that you can do stuff with them that's tangible. And I, and I think that between mixed reality, VR, AR, you know the biggest market will be definitely. I mean, I'm absolutely sure about this. It will be this mixed reality or AR you know between them because that's where people have everyday uses in the future because to make XR mainstream means that you need to get people use them every day. And how do you use them every day is that if they give you some help.
Like, imagine that you have some kind of device that, I mean imagine that teenagers would wear some goggles or some glasses. You know, that takes a lot for them to feel it's pop. But one day it might be pop that you have this sunglasses and then they give you some information or something you can't get otherwise or they give this information in a better form. Like I'm using a Google Maps a lot on my phone, OK? So if it would be cheap that I have some mixed reality goggles that I just put like this and I see front of my eyes these arrows or even if I have contact lens, some kind of cybernetic contact lens that I just put the lens on and then I see even this arrows that go there idiot or go there idiot because I'm very bad at orienteering. You know, even though I'm a guerrilla team leader in military, I don't know how to orient. That's why I probably I tell other people what to do. But instead of looking at the phone like this, you know, I could just be free to use my hands and look around and use the, yeah, this mixed reality or AR we... with easy way, so.

So, because virtual reality, the pure VR where you immerse yourself into another dimension and world, it's like for sure going to be a smaller part because people on average don't spend themselves immersed in completely other world that much, even though some people, of course, are spending their time in World of Warcraft, that they sleep five hours and the rest of the day is World of Warcraft, so they are immersed in another world. But the average Joe, these teenagers who use Tiktok and everything. You know, they, they, they, they are not going to be in this VR like this like 15 hours a day. You know, they might be using mixed reality and AR services as part of their daily life like the 10 hours a day easily if it's functional. So I think that if the technology goes that far that the devices are small and cheap, you can immediately start to use it in your everyday life, like cooking for example. You know you can go to a kitchen with your goggles or the contact lenses and you see there. It finds out that OK, there is eggs. It reads that use 3 eggs and you know things just get easier. People like things to become more convenient. And then also when you could be in that level that with this easy goggles you can also jump into immersive world. That's awesome that you could then enter into virtual reality also using them.
And, then it flies and I do see that it's like a uh, it is the future in this sense that I do personally believe that it

will be part of everyday life in the within the next 10 years because it's just tested to offer added value and make the world a bit more efficient place. I mean the world is going towards efficiency. I mean it looks now stupid when we have these devices which are big and dumb and everything that but, but so did everything. I mean I started my career that way that we have, I I started my career in a huge company in Finland and they have the fax machine there.

And then I was like, why do you have a fax machine here? Because I'm already having Google Mail. Some people said that it's better this fax machine because it gives you the paper and everything. It feels safer or something because you get something tangible. You get the paper, but it didn't make any sense anymore because I was from the generation that... When I was born, the Internet didn't exist, but the internet came to be when I grew a bit older. And then I'm, I'm... I've lived in this information technology society all my life, so for me it's obvious that the fax machine doesn't deliver, but some people still thought it delivers when I started my career. It's the same with the mixed reality and this VR devices now that there will be for a while people just saying that it's better to learn from 2D screen, you know or at school they say that it's nicer to learn on paper or whatever, but the fact is that today already the tangible effect of learning a device, for example using VR, it's just light years ahead of any other form of learning. But people are against it because whatever reasons so.

0:31:0.970 --> 0:31:1.460
Aleix Renom Cisa
Yeah, there is this barrier.

0:31:3.190 --> 0:31:33.960
Antti Martikainen
So, but it's just it will happen. I mean, because it's better. It will. You know, it's all all the time getting better. I mean, even though there are all the time in news that OK, Meta is losing money. Microsoft is cutting out HoloLens everything. But it's not too much gloom. There are like ton of other hardware manufacturers who are emerging and people are still pushing devices in the markets and investing like shit ton of money to them. It's just normal that some companies fail, and many VR content creation companies. I mean, we have been around like like I said, we are self funded. We don't have any other investors than ourselves. We've been around, I don't know, we were found 2012 and we concentrated on VR since 2016 and we have seen probably like hundreds of dead VR companies you know, [chuckles] during that time.

0:31:58.440 --> 0:31:59.680
Aleix Renom Cisa
Yeah, unfortunately.

0:31:34.40 --> 0:33:1.420
Antti Martikainen
So you know they just come and go because the market is you know completely volatile you know it's like a... VR, XR, is like a cryptocurrency in that way. [chuckles] You know, it's just. It's volatile. I mean because like I said in the beginning

of this interview that, no one really knows what's the golden nugget there. That what is the exact added value that will bring shit ton of money. I mean because I've seen like I've seen in news that OK, some companies get €12 million just to make a game for mathematics or whatever. I mean with our SDK we can reverse engineer that in a week, you know with our SDK you can if you know how to use it, you can just create whatever you see practically. So it makes it quite useless to make any killer app because we can just, eat, eat it in our SDK just how it looks like and then we are also have this pedagogical stuff and everything, so it just feels weird but...

0:33:0.870 --> 0:33:13.240

Aleix Renom Cisa
Yeah, and it is not fully discovered yet and things are, yeah. Just like going, going really fast because it's completely new.

0:33:12.40 --> 0:33:35.590

Antti Martikainen
Yeah, it is and, that's why I I love it that that that's why. That's why, you know, it's still a passion project because it's not like shit ton of money you can make with this but. Or you can, but I don't know that how many people can make, you know, in long term solid good money with it because it's, yeah volatile. But I don't know, did I answer your questions?

0:33:38.360 --> 0:33:39.110

Aleix Renom Cisa
Ohh yeah.

0:33:36.910 --> 0:33:52.570

Antti Martikainen
I'm trying to look at them, but should you... I mean, it's been such a, I know it's an interview, so I should probably talk more, but I've been talking over you and everything. So if you have some questions, you could ask them, you know.

0:33:52.230 --> 0:34:37.410

Aleix Renom Cisa
No, no, don't worry. Umm because I, like you gave me, like, such interesting material, seriously. Like they... I actually learned a lot from, from, from hearing you. Uh, and kind of got a perspective of the industry that is very grounded in reality. You know? But, but yeah, like, definitely. Thank you very much for for actually like taking the time to to think about all of this, and... And yeah, like answering it in in, in, in, in a, in a professional's eye view.

0:34:38.120 --> 0:35:4.710

Antti Martikainen
Yeah, that's awesome. I mean, I'm, I'm just so thrilled that there are people who are interested about the topic and everything. So hey I sent you invitation in LinkedIn to our academy channel. You see the other you know SDK and everything that you if you want to download and one day you use you know it's our channel where we can talk about the use of the SDK and blah blah blah. So I sent you some invitation in the LinkedIn so. You can...

0:35:4.100 --> 0:35:9.610

Aleix Renom Cisa
Yeah. OK, wait, so.

0:35:6.330 --> 0:35:19.40

Antti Martikainen
I I do it now. I mean, after this interview. So you can ask
me questions there you can ask community questions.
You know, if it helps with your thesis, you can make
some questions there also so.
So you know.

0:35:19.870 --> 0:35:22.350

Aleix Renom Cisa
Yeah, I'll I, I actually just like [cuts].

Tuukka Takala interview

0:0:0.0 --> 0:0:3.190

Aleix Renom Cisa
Teams can make the transcription.

0:0:4.440 --> 0:0:7.280

Tuukka Takala
Ohh, of course. Yeah, yeah, sure. Why not?

0:0:7.630 --> 0:0:29.670

Aleix Renom Cisa
Awesome. Thank you.
Yeah. So I will just quickly introduce myself. I'm Aleix Renom and I'm finishing my university green in software development in Haaga-Helia in Pasila with [redacted].

0:0:26.410 --> 0:0:28.710

Tuukka Takala
What? What software development?

0:0:19.150 --> 0:0:29.670

Aleix Renom Cisa
Yep.

0:0:30.590 --> 0:0:32.650

Tuukka Takala
What? What software development?

0:0:33.420 --> 0:0:39.850

Aleix Renom Cisa
I'm focusing at this moment in web development, in front end development mainly.

0:0:39.520 --> 0:0:40.230

Tuukka Takala
OK.

0:0:40.660 --> 0:0:51.990

Aleix Renom Cisa
And... but I do want to touch as many technologies and as many things as possible to actually find my niche in the market.

0:0:51.530 --> 0:0:54.300

Tuukka Takala
Right. So but this is for your thesis.

0:0:54.920 --> 0:0:56.850

Aleix Renom Cisa
Yes. Yes.

0:0:56.260 --> 0:1:3.480

Tuukka Takala
Right. OK. OK. So is your thesis about virtual reality or about several different technologies?

0:1:4.480 --> 0:1:11.230

Aleix Renom Cisa
It is about virtual reality because I... it is, it is something that that I actually love.

0:1:12.850 --> 0:1:13.430

Tuukka Takala
Cool.

0:1:12.990 --> 0:1:27.860

Aleix Renom Cisa
And I do feel that there is a... a place for research at this moment in the virtual reality industry and in the XR in general.

0:1:28.890 --> 0:1:41.380

Tuukka Takala
I agree. Cool. Yeah. Please, sorry. I stopped... continue with your introduction.

0:1:37.100 --> 0:1:50.460

Aleix Renom Cisa
No, that's... that's what I wanted, what I wanted to say mainly so.
So what... what is it that that you do in the XR market and...

0:1:50.30 --> 0:4:34.950

Tuukka Takala
Oh me? Oh yeah. So I'm a researcher. Umm, I've always been doing like research and development. First time I was working with VR was 2006. I was, uh... a summer intern in Aalto, back then it was called Helsinki University of Technology.

And then 2007 I became like a full time research assistant and I continue working with VR.

And I did my masters, graduated on 2009, and I continue there, in the computer science department of Aalto university.

From 2000 then I started doing my PhD, or I mean Doctor of Science. In Aalto, it's Doctor of Science not PhD, but anyway, yeah, I also... that research was, was about VR and XR.

Uh, I was... so the dissertation was... I did, like, I developed some software, I developed my own toolkit for doing XR because back then, you know, 2010, 11, 12, there weren't really any good, there weren't any good headsets and... There were some but they were kind of expensive and, [laughs] not like we didn't have those. We had a like, this small, this kind of affordable CAVE environment with four projectors and everything and... So but I needed to develop my own software to make everything work. We were using these kind of official components like PlayStation Move, Kinect, and so on. So that like, basically much of my research was, and development was about that. And then also in my dissertation I had a lot of like, software development stuff. I made a survey for VR developers and... well, anyway, that kind of stuff.

0:4:38.80 --> 0:4:38.350

Aleix Renom Cisa
Yeah.

0:4:36.120 --> 0:5:26.370

Tuukka Takala
And after in... so I took some years to finish my doctoral dissertations, so I finished 2017. After that, 2018, I went to Japan, Waseda University in Tokyo, where I continue my research on XR, mostly doing stuff with full body avatars and that kind of stuff, and I'm still kind of in that field.

And now I'm still a researcher. I have affiliation in, Aalto and Waseda, but I'm now about to move the work in industry.

0:5:24.950 --> 0:5:35.290

Aleix Renom Cisa

So. Is it... is it mainly VR or do you also dig into AR and mixed reality?

0:5:35.980 --> 0:6:11.130

Tuukka Takala

Mostly I've done VR, so I had, like I had a project where, I... I got some funding and I hired a, like a trainee to do this kind of AR mirror thing.

That's basically the only, like, AR project I've been directly involved in.

Uh, well, there were some like kind of virtual opera things with projection screens, but everything else has been VR.

0:6:11.650 --> 0:6:21.680

Aleix Renom Cisa

That's nice. So do you actually use it in your everyday life, VR headsets? Or is it more for the professional, for the research?

0:6:23.640 --> 0:7:17.30

Tuukka Takala

Very rarely, actually.

I've been using VR so long and... so not many things kind of surprise me anymore. So I've seen a lot of it already.

So yeah, like I occasionally use something like VR Chat or like these social things because I just wanna check, like... uh, where are we going with that. Like, you know, the metaverse or whatever, but I don't, like... I don't really. Or sometimes I might play Beat Saber or something, but very irregularly. So I wouldn't say that... I don't use regularly, very, very irregularly. I'm not. Not much, but anyway, yeah.

0:7:17.510 --> 0:7:39.80

Aleix Renom Cisa

Yeah.

So what about the... the people around you basically, right? So because you must have introduced VR to family and friends, and people in your... how was the experience on introducing them and how did they receive it?

0:7:40.860 --> 0:8:16.790

Tuukka Takala

Well, I have introduced my family but... Like, my little brother is a gamer, but he wasn't into it at all. I tried to introduce him to Beat Saber, but he doesn't... He's not into exercise or anything, so he didn't get into it.

I mean, my father also tried it and I guess he was interested. But none of, none of my relatives are like, uh... how should I say, I don't think there are... users.

0:8:17.650 --> 0:8:17.970

Aleix Renom Cisa

Right.

0:8:17.470 --> 0:8:32.400

Tuukka Takala

I have some friends who seemed to use it. I have a friend in Japan, he has like basically every VR headset there is.

0:8:44.730 --> 0:8:45.30

Aleix Renom Cisa

Yeah.

0:8:33.330 --> 0:8:59.720

Tuukka Takala

Yeah, his apartment is super small, but it's like full of... I mean, he even has the Vario, like the VR3, the super expensive one. So yeah, yeah, he's the most hardcore hobbyist that I know, but other than that, I don't really... I'm not sure, I don't know if other friends do VR at all.

0:9:2.900 --> 0:9:24.830

Aleix Renom Cisa

But... and I'm guessing that you have interacted with a lot of individual consumers that do use VR. So in in your experience, what do they mainly use it for? Is it only gaming or do they use it for like exercise, or watching media, or...?

0:9:26.310 --> 0:10:40.480

Tuukka Takala

Ah, well, I don't really... Yeah, it's actually, it's funny, I... don't remember like. Yeah, I haven't really interviewed like, you know, how often do you use, or...

I have very vague idea about that, so I don't have any good anecdotal evidence, but my feeling looking at the market, it seems to be that, yeah, mainly for entertainment.

And here entertainment can be, I guess Beat Saber is kind of like, is it exercise? Is it entertainment? It's a bit of both.

So but definitely, I mean Beat Saber and those... I think Super Luminance or whatever is the other one, and they seem to be popular and games are popular, and also it seems like also adult entertainment, is one of the uses that people use it for at least looking for... looking at the number of productions. They wouldn't be making it unless it was profitable.

0:10:42.310 --> 0:10:43.630

Aleix Renom Cisa

Yeah, I do agree with that.

0:10:44.260 --> 0:11:0.490

Tuukka Takala

Yeah, so everything is basically under the entertainment label.

I guess somebody... some people use it for like art, like making 3D paintings and stuff, but I think that's pretty rare.

0:11:2.670 --> 0:11:3.30

Aleix Renom Cisa

Yeah.

0:11:2.620 --> 0:11:45.910

Tuukka Takala

In the industry like obviously, like, training and simulators, I would be actually curious to know like how many people use it for flight simulator.

Because there are, there are a lo... obvious that there has to be a lot of pilots.

So basically anyone who uses the like, those big expensive flight simulators, that's basically VR.

So that, that's one, that is one area in like the

professional side that training side that that probably the biggest, biggest use case. But yeah, that's my general feeling.

0:11:42.680 --> 0:12:17.210

Aleix Renom Cisa

Hmm so.

Yeah. So the, like... comparing between the professional and the more user, individual user side, what do you think the industry should focus more on? Which, which... between the professional and the, and the personal, which would bring more advancements and more money flowing into the industry?

0:12:17.940 --> 0:12:24.40

Tuukka Takala

Ohh you mean to get more consumer users? Or you mean...

0:12:22.50 --> 0:12:29.340

Aleix Renom Cisa

Yeah, to more funds more... Just, people in the industry, like, coming behind it.

0:12:31.730 --> 0:12:37.820

Tuukka Takala

Wait, what? Which number of question is this? 5, or?

0:12:36.240 --> 0:12:44.220

Aleix Renom Cisa

Ohh, I'd... because you were. You were talking about it and it's... it would be, uh, number 7.

0:12:45.120 --> 0:12:52.550

Tuukka Takala

Oh, we're already in number 7?

0:12:47.490 --> 0:12:54.430

Aleix Renom Cisa

No, we're not there. But like, you were talking about, about this more or less, so I just thought that it would, it would be appropriate.

0:12:53.690 --> 0:13:14.120

Tuukka Takala

[reads the question from the screen] Right, OK. So you mean consumers versus like, which is more...

When you're saying "industry's better off", do you mean like making more money, or what's the...?

0:13:14.950 --> 0:13:19.830

Aleix Renom Cisa

Yep, more money, more research, more visibility, more acceptance.

0:13:22.370 --> 0:14:31.830

Tuukka Takala

Well, I mean. I think obviously it's, yeah, the private customers.

Because, there... Yeah, I do think that that the, like, obviously, the masses have more money than like...

Of course B to B like if we're, I mean, if we're talking about, like, from a company perspective, like B to B can be very lucrative, but if we're talking about the market size you can't really compete with, like, consumer

markets.

So I mean that, eventually that is gonna be the more lucrative area.

Like entertainment and so on. But like, we're not there yet. So meanwhile it might be more profitable for some companies to fall, just focus on the B to B market.

0:14:29.590 --> 0:14:57.570

Aleix Renom Cisa

Yeah.

And I don't know if you agree but like the, the B to B market requires a lot more powerful technology. So it also pushes the boundaries in that direction instead of trying to make it... make everything cheaper and cheaper and cheaper and more like, umm... for the B to C. It helps.

0:14:55.720 --> 0:16:20.20

Tuukka Takala

Yeah. Yeah, I mean it's very common at least if we're talking about like flight simulators, they're obviously, they want to use high resolution display like Vario and whatever.

But on the other hand, like for training some tasks, even something like, yes, cheap as Oculus Quest 2, is fine.

So it really depends on the B to B.

Like what is the, like, who is it... What is the training or what they're trying to do? But yeah.

Actually I'm not sure, I'm like, I know that for all like flight simulators and, kind of, tank simulators, there, like, there's a market for that in B to B. I don't know how big is it on other training, uh for a, like, a B to B company, I guess ideal case would be that you train some Amazon workers or something. You have a big contract with Amazon and you have like a tens of thousands people using it for training. But I don't know if that kind of thing is really happening or, you know. But anyway.

0:16:22.620 --> 0:16:35.930

Aleix Renom Cisa

So I will bring you, bring you back on track. Sorry for that. So what do you think of the state of the industry at this moment? Is it going forward? Is it stalling? What, what's happening?

0:16:37.910 --> 0:19:34.490

Tuukka Takala

Ah well. Like, there's been like, these cycles, hype cycles, and the biggest one was started in 2012 by the Oculus Rift kickstarter that got people very excited and... of course in 2015, 2016 we got the like first consumer devices, and...

But from that, yeah, it like, the hype has gone up and down and, right now it's somewhat stalled like it, it hasn't, it hasn't become as big as many people hoped.

So yeah, a lot of like startups have given up. And I mean obviously this is like we had this thing already in the 90s, like early 90s, there was a VR boom, but the technology wasn't there yet.

Now the technology is there in the sense that it doesn't, at least for most people, doesn't make them sick, so it is like, of course it depends on the content.

But it it's like, it's, it's usable, and it's not too bad. It's not perfect yet, obviously.

Like there's all kind of ergonomic issues with the eye strain and you know, heavy headsets and so on. But

now it's more questions about, like, the applications. Like it, it is the... OK, so we have some kind of VR, it works OK, how do we use it?

So there isn't, there isn't any killer application and I, I think like the whole VR thing probably will be more or less a niche.

Umm, one thing that would be really interesting to know is the kind of, the... Uh, how do you call it? Was it re-tainment or? I mean, retention. Yeah, retention.

Like so, people get like the Meta, Meta Quest... [connection cuts for a few seconds]

... like, do they keep using it after, after the initial excitement? What is the retainment? Or do they just throw it out like in the corner where it gathers dust?

0:19:35.450 --> 0:19:41.840

Aleix Renom Cisa
Hmm. That's true.

0:19:35.490 --> 0:20:31.360

Tuukka Takala

So that kind of info, I don't know, like Meta doesn't as far as I know, Meta hasn't published any info about the retention. Maybe like Steam? Steam releases, Steam has their, they release some data about how many people have the VR headsets and so on, but I don't know if they have any, like, also info on retention. So it is a question to me like is the VR market, like, is it growing, as a niche? Or is it stalling?

That would be interesting to know, but yeah, right now, it's kind of stalling.

0:20:31.790 --> 0:20:38.150

Aleix Renom Cisa

Yeah, I think that that Steam has some, some statistics publicly.

0:20:40.100 --> 0:20:41.320

Tuukka Takala

Yeah, yeah.

0:20:43.600 --> 0:21:3.660

Aleix Renom Cisa

So, in a in a perfect future, like if everything goes well and technology advances incredibly, and everybody wants to use it, how does, how does that future look?

Like, what would be the perfect scenario for VR?

0:21:5.360 --> 0:21:50.290

Tuukka Takala

Well if you're talking about VR exclusively, then it is the kind of perfect VR that you have in in the matrix, where you don't... you cannot distinguish it from, like, what is real or what's virtual.

So you, like, you fully like embody the character, you feel the feelings and you can't be sure if this is reality or virtual reality, so that, that like, that's kind of the ultimate VR experience.

0:21:49.720 --> 0:21:51.830

Aleix Renom Cisa

Do you think that's possible or is that science fiction?

0:21:53.10 --> 0:22:3.0

Tuukka Takala

Well, right now it's science fiction. It, it's like uh, it's very, I don't know. It will take more than 50 years.

0:22:3.400 --> 0:22:4.980S

Aleix Renom Cisa

Yeah. So...

0:22:4.440 --> 0:22:12.390

Tuukka Takala

Because it probably requires some kind of direct interface with your brain, and...

0:22:21.900 --> 0:22:22.150

Aleix Renom Cisa

Yeah.

0:22:13.500 --> 0:23:25.320

Tuukka Takala

We don't, like, you may hear things about Neuralink, but that's not even close. So that that kind of like, interface, it's very much sci-fi right now and actually even going beyond that, like, uh. If we're talking other really like, the kind of idea of perfect VR, then you could embody any kind of avatar like animal avatar or like... and obviously that would, like, how would that work? Because you have a human brain, human nervous system, how can you map, kind of, map that into some kind of animal?

Like then we are asking like really difficult questions and... Like how, how... how malleable? How like... plasticity, how plastic or, or...

0:23:31.520 --> 0:23:32.920

Aleix Renom Cisa

Malleable, I think it is.

0:23:26.610 --> 0:24:8.330

Tuukka Takala

Yeah, can we, can we manipulate the mind in a way that we can actually experience that we have, I don't know, four hands? Or like, we can be all these kind of weird things and, does that... if you spend time in that kind of VR, does it, like, affect you when you go back to your human form in real life? Then it's like are you, have you become disabled because your brain is like... ohh. You know, anyway.

But that's, that's just the... the point is that in the ideal case you would embody not only humans like as yourself, but like, anything.

0:24:19.890 --> 0:24:20.190

Aleix Renom Cisa

Yeah.

0:24:9.120 --> 0:24:25.70

Tuukka Takala

But that, that's even more sci-fi than just the matrix stuff.

0:24:25.260 --> 0:24:27.280

Aleix Renom Cisa

Yeah. So what, what if you...

0:24:26.470 --> 0:24:37.500

Tuukka Takala

And yeah, I mean...
Yeah.

0:24:29.110 --> 0:24:39.530

Aleix Renom Cisa

What if you add the AR and MR to the picture? Do those have more accessible... are more accessible to that, to the future picture?

0:24:38.470 --> 0:27:54.20

Tuukka Takala

Yeah. So, so... AR, yeah, I think the Meta's, like, big hope, is AR. And it's pretty clear to see like instead of smartphone screen we have glasses and like the, the display can be anywhere like maybe we still have some kind of pad for user interface, but like we have a heads up display. Like, anything becomes a display.

That is much more achievable than, or much closer to be real if compared to the matrix kind of VR.

So yeah, that's much closer, but there are still issues, like... because you need a lot of processing power. You need, like the six degrees of freedom tracking for the glasses, you need battery. And also preferably you would need the kind of display that, that's... how would I say? Doesn't suffer from eye strain and it can, it solves these, the so-called vergence-accommodation problem, meaning that you can focus your eyes at different depths on the virtual content. That's one of the sources of eye strain.

And of course, then there's like some problems with the optics and also the weight of the headset. So now if you have a Magic Leap or HoloLens, it's pretty crappy and it's pretty heavy. So there's also the form factor.

So you want it to be as small as possible, as close as, like, sunglasses as possible, but at the same time you want it to be very powerful so it can display graphics without any problem and track the movement very smoothly, and have a large battery life. So those are very conflicting goals. So we have to, like... right now it's very much a compromise. I mean, it will get better.

But I think like Meta has made a... their feeling is that it might take 10 years for them to start making profit with their, uh, their XR stuff.

And that sounds reasonable, like, it could very easily take 5 to 10 years until this kind of AR glasses become as popular as smartphones.

0:27:55.900 --> 0:27:59.720

Aleix Renom Cisa

Yeah. And those...

0:27:56.50 --> 0:28:25.590

Tuukka Takala

Probably closer to 10 years, but yeah. Anyway, that's much closer than the matrix stuff and, but yeah, I mean obviously that's the, that's the, umm... idea that that most people have, that smartphones or the smartphone display will be replaced with AR glasses and that's very kind of easy to see.

0:28:27.840 --> 0:28:45.740

Aleix Renom Cisa

Definitely. And with those lighter glasses, the more AR centric classes you would, with some, well some or zero amount of modification, you would probably be able to use them for VR too. Right?

0:28:46.640 --> 0:29:28.900

Tuukka Takala

Yeah, yeah, I mean, depends how they're done.

Like usually in VR, you want, like, to cover the whole field of view. You can't really do that with traditional... with optical see through unless you have some kind of shutter that you can either electronically or just attaching something there to block off the incoming light.

But anyway, yeah, yeah, like eventually, yes, when the AR, you know, when they go mainstream, I'm sure you can also use them for VR as well.

0:29:29.510 --> 0:30:12.780

Aleix Renom Cisa

Uhuh.

So, Meta wants to start getting their money back after 10 years. What do you think they would require for that, or for in general, for the VR and the headsets to become something that everybody wants to have at their home? Is it only the price, or?

Of course you mentioned the form factor too, that it needs to be lighter and slimmer and easier on the eyes. Is there any other factor that we need to fix before that reality comes to pass?

0:30:15.840 --> 0:32:0.850

Tuukka Takala

Well, I mean those are the most important ones like the cost, the cost of it, the ergonomic, like umm, eye strain, the strain on your neck, that kind of stuff. I mean, nobody wants to use it if they get eye strain after one hour or even a couple of hours. I mean, that's pretty clear. And I mean, obviously, like, right now, when the experience is crappy, no one's gonna use it unless they have a clear use case. That "OK, this is much better than using like smartphone" or something. I don't think we have that use case yet. So when, if and when we get a like, uh, killer application, then people will be more willing to sacrifice comfort.

But I don't think that application really exists, yet, for AR.

Ah, maybe, but not for, like, mass markets.

So and of course, people talk about like, do I look silly?

[Interviewer chuckles]

You know, if I have a HoloLens, and yes, you look silly. But I mean that's one part of it I guess. But I don't think that's that important.

Like, if like, if the benefits kind of outweigh the costs and people are gonna wear them anyway, even if they look stupid.

0:32:1.820 --> 0:32:2.80

Aleix Renom Cisa

Yeah.

0:32:2.380 --> 0:32:13.880

Tuukka Takala

Yeah.

At least in professional life.

They're probably aren't going to take it to a nightclub with the cool kids. And just you know, but anyway, yeah.

0:32:14.880 --> 0:32:50.300

Aleix Renom Cisa

Uhuh.

So just to, just to finalize.

[tries to find his thoughts and fails]

It slipped my head.

[finds his thoughts]

Alright, yeah, so. To get that... what do you think is stopping for someone to invent that killer app? Is it just imagination? Or is there a barrier that the software is not being able to keep up, or there is not enough customers to justify actually investing on making these killer app?

What do we need?

0:32:53.950 --> 0:34:39.520

Tuukka Takala

Well, I mean right now I, like, it's very unclear.

Is there, like, the real benefit of VR or AR? Well, what can you do that you cannot do with a regular display?

That's not clear. Like basically what, like all these extra devices, you get a better, like, depth perception. You get stereo vision, you get headtracking.

And hopefully, I mean, they already have prototypes where you can focus on different distances. So that's also additional, but that's all depth perception.

And like, it's not really clear like where that, like...

You know, how... like, what is the application where that is super important? Maybe something, like, if you're 3D modelling, you know, you use your hands to do 3D modelling.

So, but most of the stuff you can do with just a regular computer, regular screen, even smartphone.

So most of our tasks seem to be like that. So...

Yeah, the killer application.

I mean obviously, like, for AR glasses the killer applications would be that if they worked perfectly. Then, I mean, you don't need a TV. You don't need any screens anymore. Everything just comes.

0:34:40.130 --> 0:34:40.410

Aleix Renom Cisa

Yeah.

0:34:40.180 --> 0:35:17.580

Tuukka Takala

You know, I mean that would be great, but the technology just isn't there yet for AR.

So yeah, it's hard for me to imagine.

The killer app, it's just not clear. Like, you know, that it's a thing that you that you can do in VR or AR and it's much better there than just using a regular computer.

0:35:18.240 --> 0:35:18.700

Aleix Renom Cisa

Yep.

0:35:18.580 --> 0:35:20.870

Tuukka Takala

You know, those things are kind of rare.

0:35:21.730 --> 0:35:21.950

Aleix Renom Cisa

Yeah.

0:35:21.620 --> 0:35:58.930

Tuukka Takala

So I mean the in the end, the killer application might be something, you know, adult entertainment or something.

Like if they do the volumetric capture or, uh, some kind of other, light field technology or whatever like where you can move your head freely. That could be like, that could be a thing.

Like, people, when they usually talk about technologies that like, I don't know, maybe you're too young for this, but like VHS versus the beta tape.

0:35:58.450 --> 0:35:59.0

Aleix Renom Cisa

I remember.

0:35:59.720 --> 0:36:17.170

Tuukka Takala

So the, so apparently like one of the things that the VHS kind of won was because you could do, like you could do adult videos for it. I don't know how true that story is, but I guess it has some significance.

0:36:18.170 --> 0:36:18.470

Aleix Renom Cisa

Yeah.

0:36:18.510 --> 0:36:48.860

Tuukka Takala

So yeah, but the beta, beta videotapes they were used professionally, because they had higher quality.

So but anyway, yeah, I don't know.

It's difficult, the killer app question. Yeah, I don't have any clear answer on that.

Yeah.

0:36:36.980 --> 0:36:52.790

Aleix Renom Cisa

And I think that's the point, right? That nobody has the clear answer yet, that we have to piece together the why of the technology. I think that that's what you mentioned, that, the... How to use it for its own sake.

0:36:56.720 --> 0:36:57.130

Tuukka Takala

Right.

0:36:53.870 --> 0:37:1.600

Aleix Renom Cisa

Not to just simulate the 2D scene that we have at this moment.

0:37:1.920 --> 0:39:10.60

Tuukka Takala

Well, yeah, well, the clearest, like I said, the clearest path is when the, the technology is good enough.

Then it's obvious. Like I said, with the AR headset, but when it's lightweight it works perfectly, you can, you know, you can focus at different depths, the resolution, it matches eye resolution. So you don't need any additional displays. So yeah, that for AR it's clear.

And maybe also in VR when, when kind of the rendering and the content is good enough. Then it's like "OK, this is... this feels real".

Like in case of VR the big, big, like missing piece is haptics. That's the big... because the sense of touch is such an important, uh, modality of human senses, it's like, I would like for, personally, like, vision is probably most important to me. Or that it has like... it's equally important with a sense of touch.

Because there are people who don't have a sense of touch and like, they, their life is pretty difficult. Like they can burn their, like, they can put their hand on a stove and like, you know "What smell... ohh smells like something's burning. Ohh it's my flesh."

0:39:10.740 --> 0:39:10.990

Aleix Renom Cisa
[chuckles] Yeah.

0:39:11.320 --> 0:39:30.660

Tuukka Takala
You know, so but like we're talking about human interaction and even like training applications, if you don't have sense of touch, you're really.... it's not very realistic, so if the haptics were real, or the haptics were much more realistic, that would already make VR much more, uh, much more important, like it would be much more engaging for people. But unfortunately doing haptics is very difficult, the vibrotactile, you know those motors, it's not enough, it's not. It's just not enough. But doing it properly is very difficult, so I don't have any hopes that we will see any realistic haptics anytime soon.

0:39:31.400 --> 0:39:47.750

Aleix Renom Cisa
Uhuh.
Yeah. I, I'm... I may dig into that also.
So thank you very much for, for your insights, Tuukka.

0:39:48.510 --> 0:40:44.840

Tuukka Takala
Sure, sure, no problem.
I mean, this is very... I saw your questions and[...] [cuts video]

[resumes video]

[...]Is that something that is needed or is this technology more like a solution looking for a problem?

0:40:44.0 --> 0:40:44.870

Aleix Renom Cisa
OK so.

0:40:46.900 --> 0:40:47.450

Tuukka Takala
I mean.

0:40:45.880 --> 0:41:17.880

Aleix Renom Cisa
Umm so like, if, do we... so do we even need this, this technology itself? Or do we need it for, for everyone to have it, we don't need for everyone to have it, but it is, it is OK if we just solve a particular problem with it.

0:41:5.990 --> 0:41:21.760

Tuukka Takala
Yeah, yeah. I mean, because right now it like, it seems like for the story of VR so far is that "Wow, this is cool". You know, this is cool technology, but no one can figure out, like, what's it good for?

0:41:46.820 --> 0:41:47.450

Aleix Renom Cisa
Yeah.

0:41:23.0 --> 0:42:13.920

Tuukka Takala
Because there, there's like a, well, part of the problem is that the technology isn't there, it's kind of half baked. And getting to the perfect or near perfect technology is, it's a long road and you know Meta is spending \$10 billion a year and it's still gonna take 10 years. [both chuckle] So I yeah, I mean... Kind of, kind of like... and the big thing is that there is this "wow" effect. Like when you first try VR with [audio cuts momentarily] it's great. Like, it's like "wow". But you get tired of it pretty quickly. Like, OK, I've seen this. Now what?

0:42:14.620 --> 0:42:14.790

Aleix Renom Cisa
Yeah.

0:42:14.640 --> 0:42:21.790

Tuukka Takala
That, you know, that's why the retention... like what's the use? What's the use case that keeps me coming back?

0:42:22.380 --> 0:42:22.700

Aleix Renom Cisa
Yeah.

0:42:22.580 --> 0:43:13.250

Tuukka Takala
Like, I can play like, I can play PC games, I don't have to put this sweaty thing on my face. I can just play them and I'm, I'm still pretty immersed. So anyway but that, yeah, that is the question that, do we even have to make it like, yeah, because now it seems like people are kind of trying to like "Oh, this is cool. How do we, you know, sell this to everyone?" And like, if the people don't want it, then you know [audio cuts momentarily] the Meta point, like the AR glasses replace the smartphone some point, and they're gonna make... someone is gonna make a lot of money with that, obviously. So that's why they're doing it. Well anyway. Yeah, that's just one perspective I wanted to bring into here.

0:43:13.790 --> 0:43:33.660

Aleix Renom Cisa
Yeah, yeah, it may be something that is, yeah, only necessary for particular niches maybe where we are just a... obsessing, like maybe this thought is here just because of this consumerism mindset that it is default in our society right now.

0:43:34.20 --> 0:43:38.580

Tuukka Takala
Yes, yes. I mean, yeah, yeah, that is true.

0:43:39.330 --> 0:43:42.220

Aleix Renom Cisa
Alright, great.
Yeah.

Santeri Saarinen interview

0:0:0.0 --> 0:0:1.50

Aleix Renom Cisa
It is the time.

0:0:1.670 --> 0:0:2.50

Santeri Saarinen
Yeah.

0:0:8.770 --> 0:0:21.480

Aleix Renom Cisa
[finishes clicking something on the screen]
Awesome.
So welcome. Thank you for attending, for coming.
So could you... could you tell me a bit of what you do?

0:0:22.440 --> 0:0:56.810

Santeri Saarinen
Yeah, sure. So my name is Santeri, I work at the Helsinki XR Center. I'm the technology expert slash R&D lead so I'm responsible for all of our research activities related to XR technologies and well some other technologies as well, but.
Yeah, that's my main role. I'm basically preparing new research projects and then overseeing all of the development work that we do.

0:0:57.580 --> 0:1:5.900

Aleix Renom Cisa
That's, that sounds actually really exciting.
Um, so what the... what is it that Helsinki XR does, actually?

0:1:7.170 --> 0:2:3.200

Santeri Saarinen
Yeah. So there's a couple of different things. First, of course, like I mentioned, all of the research stuff. So we do a lot of research projects.
Then secondly, we support early stage startup teams. So we run a startup hub for the teams. We offer them free office space, computers, headsets, mentoring and stuff like that. So teams that don't have the financial capabilities of developing something by themselves, then we can support them and they can bring their ideas forward.
And then thirdly, we kind of support the Finnish and European XR ecosystem at large by organizing a lot of networking events by running our own showroom where we can showcase different solutions, different technologies and just share the information, what's happening in the technology field.

0:2:4.700 --> 0:2:24.640

Aleix Renom Cisa
That is powerful.
Umm, alright, so if you don't mind, about your personal relationship with VR. Do you actually use headsets and this kind of technologies that allow you to access VR?

0:2:24.150 --> 0:2:51.650

Santeri Saarinen
Yeah, well, of course. Like at work, I used a lot of different technologies than at home. I have now Oculus Quest at the moment kind of borrowing some

equipment from work whenever possible.
So I do use that for entertainment purposes every once in a while. Of course I have a bit limited space so that makes it sometimes difficult but.

0:2:51.420 --> 0:2:51.810

Aleix Renom Cisa
Yeah.

0:2:52.480 --> 0:2:55.470

Santeri Saarinen
Yeah, I try to try out a lot of different new things.

0:2:58.0 --> 0:2:59.520

Aleix Renom Cisa
And these... did you in your personal life, ever introduce VR to family and friends?

0:3:7.740 --> 0:3:9.920

Santeri Saarinen
Yes.

0:3:0.540 --> 0:3:10.850

Aleix Renom Cisa
Do you usually do that? How did they... how was that experience?

0:3:11.690 --> 0:3:33.790

Santeri Saarinen
It was really successful. Like uh especially, well, depends of course on the content, but we use the Beat Saber. We've played that a lot at work as well. So I showed that to my family, they were really into it.
And also my parents, they really understood. Like they don't play a lot of games, but like that was interesting for them as well.

0:3:34.720 --> 0:3:59.60

Aleix Renom Cisa
Yeah, I remember like this winter, I did, uh, show... I did bring the headset to Spain and I showed the, showed it to my family and friends and they, they are surprisingly into it and...
I think a lot of the problems that there has been in the past, that... with the technology like the motion sickness and the, and all the uncomfortability of the headsets have been alleviated, you know, since...

0:4:10.160 --> 0:4:10.440

Santeri Saarinen
Yeah.

0:4:0.390 --> 0:4:16.140

Aleix Renom Cisa
Umm, but do you think that's true or am I speaking out of place?

0:4:16.670 --> 0:5:9.540

Santeri Saarinen
No, I think that's correct. Like say 5-6 years ago, some of the motion sickness was more hardware related. We didn't have a high enough refresh rate and the headsets were bulky and required a lot of cables and so on. But nowadays if a software causes motion sickness, then in most cases it's related to the design of the software

instead of, instead of the hardware. So we can avoid most of that since we know what people react to and we can design the content based on that. So it's a lot easier to avoid. Now of course there are still, like, I'd say, I don't know, maybe 5 to 10% of people who are more prone to motion sickness, so it doesn't matter really what kind of hardware they have, they still get motion sickness pretty easily, but that's something we can't really avoid.

0:5:10.550 --> 0:5:15.990

Aleix Renom Cisa

No, it's a drawback of the nature of the technology itself.

0:5:16.440 --> 0:5:16.780

Santeri Saarinen

Yeah.

0:5:16.790 --> 0:5:36.50

Aleix Renom Cisa

But that will always happen with like, many different ones.

And, just to have your opinion on the subject. In the day-to-day lives of users of VR, what do you think it is usually used for?

0:5:39.420 --> 0:6:31.870

Santeri Saarinen

I'd say... I'd say there's like two different user groups, one is purely for like entertainment and gaming, but then on, I'd say in more rare cases there are some that use it for work like there are some companies that utilize VR a lot for like design purposes and stuff like that. Or having virtual product reviews or something like that. So I'd say those are the main parts, and often I would guess that like if you're using VR for work and kind of understand the technology, then it's easier to kind of transfer that to a home environment as well, and utilize it for entertainment purposes or showcase it to your friends and family.

0:6:32.510 --> 0:6:50.610

Aleix Renom Cisa

Uhuh. Do you, would you put watching media like watching Netflix or movies or videos in 360 as entertainment? Because I have heard that it is quite like a relatively big use case.

0:6:54.60 --> 0:7:37.780

Santeri Saarinen

Yeah, but, I don't know, I kind of... I'm kind of on the fence, like whether if I'm just watching a 360 video, whether that's considered like using VR or if it's just like a... since that's like, uh, passive content and I think, like, the main part of VR is about the interactivity and the spatial relations so, so... just using it for passively watching a video, that kind of defeats the purpose.

0:7:34.400 --> 0:7:38.960

Aleix Renom Cisa

Yeah, you could do, you could do it with a smartphone, right? And it would not be that much of a difference.

0:7:39.500 --> 0:7:39.900

Santeri Saarinen

Yeah.

0:7:40.210 --> 0:8:10.770

Aleix Renom Cisa

Yeah, I get that.

Umm, so about the state of the VR industry right now. I think you have a lot of touch with the... with the bottom up part, so with the start of VR projects and how do they affect the industry in general. What do you think it's the state of the industry right now?

0:8:12.530 --> 0:9:34.110

Santeri Saarinen

I think the industry or, like, you have to kind of divide the industry into different sectors, like some of them are further along. But I'd say in general, like, we've seen a lot of support for VR technologies from like the European Commission, they released the, kind of position paper on the industrial VR/AR coalition last year.

And a lot of companies are kind of understanding what you can actually do with these technologies. So there's a lot of new things being developed, but at least in Finland it's still not that big, like people are doing like small trial runs but not really developing, like, large scale environments where they could like, change the whole work ethic or create new roles for people working in some industry. So it's, there's still a lot of steps to go before it's actually, like, affecting the whole industry. But we're getting there, but maybe slower than anticipated a couple of years ago.

0:9:35.580 --> 0:10:16.440

Aleix Renom Cisa

[unintelligible] So about these, umm, this use case that you are, uh, defending of using it as office or for the office. Do you think it will be something that brings development and money to this industry?

Or does it compare to the entertainment sector of just like, selling headsets to end users and just using it for games?

0:10:18.690 --> 0:11:45.50

Santeri Saarinen

Hmm, that's a good question. I think, I think currently the headsets are still a bit expensive. Especially if we think about headsets that are connected to a PC, of course, like Oculus Quest is fairly cheap, but like there's still some barriers for the end users to actually purchase the devices or use them. So the number of devices at the hands of end users is quite small.

So creating for example VR games, it's a really difficult field because you need to have like a huge hit or then you aren't really making any money, or you have to make something that is really small and quick to do to kind of try to break even. So in that sense I think currently the B2B market is where the actual money is and that's where the most development happens because it just costs too much to actually create good gaming content for VR, and I think that's why we will see more, like, industrial solutions and then maybe in like 5 years we start to see more entertainment options, I think then at that point we might be thinking of like replacing console gaming in some... or for some users at least.

0:11:45.960 --> 0:12:2.840

Aleix Renom Cisa

Yeah. And you have seen a lot of companies asking for these kind of technologies to support their business?

0:11:54.110 --> 0:12:52.500

Santeri Saarinen

Uh, yeah. At first it was just like, yeah, there's this VR technology, we want that, but they didn't know what to do with it [both chuckle]. But now they are kind of, like understanding how to utilize it. Like you can replace physical training with virtual training. And you don't have to bring people into the office. They can do that remotely. And you can, like, execute dangerous tasks multiple times in virtual environment and save a lot of money in that sense or do some like flight simulators for pilot training to save thousands of dollars every time they use the simulator. So there's more use cases coming out basically every week.

So I think now the companies are understanding that it's actually about the content that they are developing and not just the technology but you need a good use case to actually utilize the best things in the in the technology.

0:12:53.0 --> 0:13:6.790

Aleix Renom Cisa

Yeah. So right now is a lot of training, but then there has been a lot of developers that have been putting other things apart from just, like, training in the map.

0:13:8.250 --> 0:14:6.590

Santeri Saarinen

Well, yeah, there's, like, there has been a lot of different things like, I think training is just the easy choice.

Then of course, if we look at like the cultural sector, there's a lot of these like, art pieces or museum content that is being created all the time.

Or just like because of COVID you saw a lot of the companies moving to using Teams or Zoom and then just finding alternatives to those, uh, new ways of working. But I think it will become more common in the future when we can get, like, even easier to use machines, when we get rid of all of the controllers and people use their hands, or lighter devices that they can actually wear outside.

0:14:7.550 --> 0:14:41.930

Aleix Renom Cisa

Yeah, that would, that would be a big use case if that ever happens.

So what do you, what do you think... how do you think the world would look when the technology is at its most stable and recognized moment? For example, like, would it be that AR just like pushes forward and we all have AR glasses everywhere? Or how would it, uh, a perfect world for the technology look like?

0:14:43.270 --> 0:15:19.880

Santeri Saarinen

That's a good question. Uh, I don't know if I have a good answer for that [chuckles].

But yeah, I think like AR glasses could replace, say, mobile phones. They could be used for similar things like contacting people, chatting with people, finding information and playing some small games.

That could possibly be a use case that you could replace some technology that's available right now or with VR glasses you could possibly replace your laptop if you use that for similar purposes. But the...

0:15:23.390 --> 0:15:30.260

Aleix Renom Cisa

I have seen some headsets that are starting to be able to do similar things like that, so...

0:15:28.820 --> 0:15:39.170

Santeri Saarinen

Yeah, yeah. But there's always some tasks that are difficult to do. Like you need a keyboard to actually be able to write long things, and that's still difficult to do in VR.

0:15:41.310 --> 0:15:47.0

Aleix Renom Cisa

Umm, so do you think those things are achievable? That it is possible to reach that point.

0:15:47.870 --> 0:15:54.40

Santeri Saarinen

Yes, but I think it will still be quite a while. Like I would say 5 to 10 years minimum.

0:15:55.240 --> 0:15:55.510

Aleix Renom Cisa

Yeah.

0:15:56.460 --> 0:16:27.480

Santeri Saarinen

Then we'll see what happens. It's interesting to see what happens when Apple comes out with their devices, because you see what happened with iPhone when that was released and everything is, every company started to make these smartphones with touch screens and so on, so. They have this kind of new way of designing things to actually make it attractive for people, so the same might happen with the glasses as well. But we don't know until a few years in the future, what the what situation is at that point.

0:16:28.250 --> 0:16:41.20

Aleix Renom Cisa

It will be very interesting because Apple is indeed famous for creating trends and just leading the wagon of development for different technology... in all these technologies like that.

0:16:41.590 --> 0:17:4.130

Santeri Saarinen

Yeah, yeah. And the user experience is really important. They are like, how it actually feels to use it, not just like if the technology works, but what it looks like and what it feels to have it on your head, and what it feels to touch it and so on. So all of those things matter. So that's why I think the kind of perfect design is still quite a way in the future.

0:17:5.690 --> 0:17:36.700

Aleix Renom Cisa

Yeah.

Umm, so the biggest challenge right now to accomplish,

or the things that one... that the industry needs to focus on to truly push it forward to, up to a perfect place, um, is it, is it mainly the hardware or do other things matter for us to reach a point like that?

0:17:38.120 --> 0:19:38.700

Santeri Saarinen

That's a good question, I think especially for VR, there is things on the content creation side that should be, I don't know, fixed in in some way like now it's really expensive to create a lot of content because you need to create the whole 3D environment and so on. So you need a lot of resources for modelling and animation and stuff like that. So like, before, you only had the 2D screen, so you only needed to model it from, like, one direction. But now you need to model everything around you, so that, kind of like, difficulty of creating enough content, that kind of causes that all of the content created has to be quite short. Like if you have VR games they are pretty short. You can't have these like 50 hour experiences in VR because it's just too expensive to create. So having some ways to, like, automate that content creation part maybe.

With the help of artificial intelligence, that might work to automate some parts of it. So that would definitely help in, in bringing better experiences to people.

On the hardware side, I think hardware is kind of developing. I think one thing, one part that is lacking is kind of the haptic feedback, like with gaming consoles you have this kind of haptic feedback on the controllers. But with VR, it's still lacking, like the gloves are too expensive for anyone to buy. So when that technology gets cheaper then I think we will have a lot better experiences.

0:19:21.500 --> 0:19:43.730

Aleix Renom Cisa

Yeah, it is... right now it is in a very prototype stage, right? Like the, the technologies that allow that are very bulky, very expensive, very unreliable sometimes and not all of the applications support that because you need to code it in.

0:19:43.610 --> 0:19:43.960

Santeri Saarinen

Yeah.

0:19:45.550 --> 0:20:5.730

Aleix Renom Cisa

So, talking about the, the making of the software and the applications, have you had experience with the tools to develop that? Are they, are they easy to use? Are they accessible? Are they ready to create something more powerful?

0:20:6.900 --> 0:21:5.920

Santeri Saarinen

Uh, I'd say yeah, like most of the content is created by different game engines like Unity or Unreal.

And those are pretty much the same tools that are used in the movie industry or the gaming industry. So I think the tools are definitely there. It's just like, how to kind of, be more effective in their use. Like, it's just that, it's just about the amount of content that you need to create. It's kind of growing all the time like the more dimensions we invent for people to enjoy, the more stuff we need to

create. So it's getting more difficult, so I don't know if, what the future will be like if we are going for like fewer big experiences or just a large number of smaller experiences. Like, it could be either one.

0:21:7.760 --> 0:21:42.510

Aleix Renom Cisa

Yes. That's a very interesting viewpoint.

Right. So there is, well, at least right now there is VR, there is AR, and there is MR like trying to mix the two. So which one of them do you think will be the one taking over in the future? Which one will be the most prevalent of the ones, and the one actually worth to put money on?

0:21:43.300 --> 0:22:50.120

Santeri Saarinen

Yeah, I think all of them could be, like we saw with AR when Pokémon Go released, everyone was playing that. Though I think most people were just turning off the augmented reality view [chuckles]. But anyway, like then, like after that we didn't have anything else that was as successful.

So I don't know why but like for AR the market is there already. So it's just about creating something that actually people want to use. So might be that they thought "Let's try Pokémon" and then noticed that it's not that fun anymore, so they, they're not interested in that kind of content. So it might be that mobile based AR is not the way to go.

But I think it's difficult to choose one over the other. I think all of them have their use cases and that's like what I mentioned before that you need to kind of decide what kind of content, what kind of use case you have and then select the correct technology based on that.

0:22:53.230 --> 0:23:26.90

Aleix Renom Cisa

Yeah, that does, that does sound like it. And it may be even possible at some point, if there is, if there is a precise technology that allows it to actually combine the two because MR can be more or less used for the same reasons as AR, but with like extra levels of development. And if you, basically, occlude the world from AR it becomes VR.

0:23:26.420 --> 0:23:26.770

Santeri Saarinen

Yeah.

0:23:27.170 --> 0:23:44.450

Aleix Renom Cisa

Right. So. Maybe that will...

Do you think...

0:23:32.980 --> 0:24:29.510

Santeri Saarinen

Yeah. Yeah, I think like having those kind of like multi-purpose devices makes sense. Like why would you just build something that allows you to do one thing, if it's possible to do several?

And that's why I think like Vario's devices like the XR3 you can do that already.

But that's still like, that's really expensive and really bulky, and you need the PC and the cable, so that's not really usable for the end users, but like something like

uh, the Leap's headset that you can do that with it, you have the VR view or you can then smoothly transfer into the mixed reality view, so you can do both of those, and it's only like a bit more than €1000 so.

It's already possible to do that. It's just about like creating good content and then getting the users to actually buy the devices.

0:24:33.800 --> 0:24:57.690

Aleix Renom Cisa

Yeah. So lastly, just out of out of curiosity, if you can disclaim it. Are you receiving a lot of manpower in Helsinki XR? Are a lot of like, people interested in creating startups to develop things for VR and help in that way?

0:24:59.890 --> 0:25:6.600

Santeri Saarinen

For like, people interested in building new startups, or?

0:25:4.350 --> 0:25:8.700

Aleix Renom Cisa

Yeah, are you receiving new startups and new ideas?

0:25:7.820 --> 0:25:47.80

Santeri Saarinen

Some, some. I'd say that based on the premises we have and how much of the people work remotely, we would have capacity for more teams as well.

But uh, yeah, we have like, every year we have like maybe 10 new teams joining.

But there would be capacity for more, but I think that's about the limit for the new teams in Helsinki area. So that kind of tells you that the industry still quite small.

0:25:51.550 --> 0:26:1.390

Aleix Renom Cisa

Yeah, awesome. So that is basically all that I was interested to know, so thank you very much for helping me with this.

0:26:2.60 --> 0:26:2.860

Santeri Saarinen

Yep, no problem.

Participant A interview

0:0:1.770 --> 0:0:7.990

Participant A

I just apologize if there's any background noise. My sons and everybody's home now, so.

0:0:9.150 --> 0:1:6.410

Aleix Renom Cisa

Same for me, my cat is being a bit crazy, so if he starts like screaming like a baby, then... [laughs]

No.

Yeah. So.

I'll, I'll... I'll just quickly introduce myself. I'm Aleix Renom and I...

I'm finishing my Business Information Technology degree at Haaga-Helia in Pasila.

It is software development that I'm studying.

And I decided to make the thesis about VR because I am passionate for the technology, and about how to bring it to every home because I was curious about it [laughs]. So I wanted to do some research on the topic and there was not many already done.

So that was something.

What about you? Where do you place yourself in the in the XR market?

0:1:8.760 --> 0:3:20.910

Participant A

Yeah, that's an interesting question. Ohh, well...

Right now I'm the founder and CEO of [redacted], and we started out as [redacted] originally and the idea of [redacted] before it became an actual private company was to bring the Nordic and Baltic communities together. So basically like an umbrella association. But then then when I, you know.

I when I met my business partner, we decided to turn it into a private company and we thought perhaps we could help. We can help the ecosystem better by helping to generate business. We noticed that a lot of these smaller XR companies, whether they do AR like a two person team doing creating AR experiences or... Or a VR game company or what have you.

Many times, if they're looking for a project, they kind of competing with each other. So we figured if we bring them together and kind of act as their face, we can get bigger projects and they kind of split the pie, you know, some goes to the 3D modelers, if that's what the company does and the other ones go to you know, the AR face filter creator, depending on what the project is. So that's what we did. We created this ecosystem and we have almost 80 companies now and we connect... We connect these smaller companies. Startup scale ups even scale ups with brands for their products and services and we connect them with each other.

So you know to, to scale up their projects. If somebody needs a green screen photography or 3D modeling or something to help their project. So that's that's basically what we do.

And and that's where I am kind of in in this, always been always care about like what the ecosystem needs and kind of mapping it out and trying to fill in the gaps. So, so not so much on the technical side, but more you know on the ecosystem community building side.

0:3:21.510 --> 0:3:37.970

Aleix Renom Cisa

Yeah. And as as far as I understand, it is functioning relatively well, right? Because if you have already 80 companies being, waving around the the ecosystem and being connected with... with one another, it is relatively...

0:3:38.720 --> 0:5:26.450

Participant A

Yeah, it it. I mean, in some ways it's, umm...

It's a successful in the in the fact that, you know, people see a need for what we do, they they you know, they of course getting another pipeline for sales is always a plus for a lot of these companies being able to connect with potential partners, find out even to find out what's going on. Like who's doing what in the scene.

Umm. And these kind of things is very helpful. We have, we have partnerships with Telia and Microsoft and companies like that. So it can be very helpful for, for our membership member companies. But on the other side. You know it's... Because, because the industry is... Still not as developed as it could be then, then you know there's the sales pipeline takes a lot longer than it would for services that are well understood in, you know, in in software development and these kind of things. So you're talking about three to four months where, where we have to speak with the company and consult and find out what their actual needs are if they actually need something that's XR related, then you know, then help them with the RP process and then find the right partner for them and then be with them all along to the end of the project and then see if, if you know if it's a marketing campaign for example if, if there's other things in in the company that can utilize AR and VR, which is, you know, there are, but you know, then that's a whole other three or four months and so, so.

0:5:25.290 --> 0:5:31.340

Aleix Renom Cisa

You know, you have to convince them, get with them, reassure them that everything...

0:5:30.850 --> 0:5:59.30

Participant A

Ohh yeah, absolutely, absolutely. But then of course, you know, the other thing is that a lot of these smaller companies, they do like these one offs, but we try to stay there, stay in relationship with the company so that, you know, we can introduce them. It's kind of like getting your foot in the door you know letting them see "Oh yeah, this worked out well. What else can we do with this kind of technology? What other problems can we can we solve?" That's where we wanna you know create this kind of continuity that maybe a smaller company might not because they couldn't.

0:6:2.50 --> 0:6:19.130

Aleix Renom Cisa

Awesome. So... Just to... like in a more in a more personal aspect, what is your relationship with VR like? Do you do you use VR headsets in your everyday life or is it something that you use only in your professional life or even that?

0:6:20.210 --> 0:7:28.420

Participant A

Yeah, for, well, for me, I can't use it every day because I get cybersick.

So, so you know when you talk about like VR in a in a very personal way it's still very niche for me. Like if an experience is well developed and when there's not like a lot of lag and this kind of thing and is short then I can try it on. So for that for that matter I don't even have a VR headset myself if I need to use it for a particular occasion then I'll borrow it.

I mean like our company has like a HoloLens and my business partner has a Oculus.

Not a quest, but one of the earlier ones and.

And this kind of thing. So otherwise I'll just use, you know, my laptop in in, you know use the web-based experience and you know join in that way. So for me it's not something, you know, that I use often at all.

0:7:29.370 --> 0:8:9.940

Aleix Renom Cisa

Right. So.

Seeing other people be introduced to VR...

Well, first of all, have you seen many people being introduced to VR in a personal level as a as a private customer, or...?

Or was it always like, you know, in a professional environment that you have introduced people to VR?

0:7:58.20 --> 0:8:15.710

Participant A

Yeah, in a, in a... you know, because, because since I don't personally use it, then I'm not gonna be the one you know, to say... Hey, come try my headset if it... If it was the case, then I would definitely be introducing people. But most of the time it's in a professional capacity and many times those people have at least tried it once or twice or something like that. So, you know, I haven't really seen cases too often where people are like, you know, their mind blown. And you know, because it's the first time they've ever used it. I haven't actually ever seen that probably.

0:8:38.760 --> 0:8:44.260

Aleix Renom Cisa

Alright. That's good. So what about AR? You interact with it in any way?

0:8:44.940 --> 0:9:22.360

Participant A

Sure, sure. Actually my introduction into the industry. I was working for an AR startup in Helsinki called [redacted].

And they created this 3D modeling software in augmented reality, so you could use your smart phone and kind of look through your smartphone camera and create with like 2 buttons, you know, basically like little game scenes.

Really cool technology. Unfortunately the company is not around anymore. I just the difficulties of being a tech startup in general.

0:9:23.830 --> 0:9:24.240

Aleix Renom Cisa

Yeah.

0:9:24.20 --> 0:10:4.830

Participant A

Umm but yeah, so you know, I would use AR more and I've used AR more. But even then, you know, I would rather wait until like the, you know, AR / MR glasses are, to a certain point, you know, and then start really using AR then. So, you know, I'm. I'm like I said, I'm an ecosystem builder and I'm very interested in the industry, but as far as like the tech side, I'm not one of those early adopter types.

0:10:5.140 --> 0:10:37.520

Aleix Renom Cisa

I, if you don't mind me asking, I have a question about cyber sickness. So... How does it work? How? How do you feel? So, when it... is there... is it a heightened sensibility of your brain to... pick up these wrong signals that VR is producing on the brain? Or...

0:10:38.190 --> 0:11:19.310

Participant A

I yeah, it I I'm not sure. You know, I haven't done so much studies on cybersickness in general or, you know. But for me for me it's like... I think it's like the frame rate. You know like, messes me up, but it's kind of like for some people like, almost like being on a boat, you know, and kind of like you're off balance and somehow, you know...

It starts gradually making me feel like I'm off balance and then it just then gets on full blown, like almost, like, seasick.

0:11:20.170 --> 0:11:20.990

Aleix Renom Cisa

That's very interesting.

0:11:20.170 --> 0:11:56.10

Participant A

And it... And it happens, you know, maybe after I'm in it like 2 minutes or something. So I mean like the... for me, the like Varjo headset for example doesn't make me cyber sick.

Because they... the content that they create or they've created for is really high level and so, you know, I can use that for a lot longer than I can use, you know, a poorly created experience on a crappy headset.

0:11:56.630 --> 0:12:3.520

Aleix Renom Cisa

Do you think, you... Do you think there will be a moment where the technology is sufficiently advanced so you will not get sick anymore?

0:12:4.850 --> 0:13:15.900

Participant A

For me, probably yes, because I don't think I have it as strongly as some other people do. Like some people don't even, if they look at a headset they won't even try because the first time, you know, and they have this kind of, it was like aversion therapy for them and they'll never try it again.

And for some people I think that it might always be that way. So, but I think for those that are kind of have it like me that are still willing to try because some experiences are good and some experiences are not so great, then I think that it will get to a point, you know, the headset

and the quality of the content, and perhaps something like 5G will kind of erase those things for somebody like me.

But you know, I think for that reason it might always be, at least in its current form, niche.

You know, with the bulkier headsets and kind of, you know, the frame rate that exists currently now and I think, you know, if it continues on this path it... it'll be niche. Or for short time use. The way it is now.

0:13:21.150 --> 0:13:56.720

Aleix Renom Cisa

So just one quick final question about this, have you seen it happen to a lot of the people that have interacted with AR in your... with VR in your environment, or is it something more rare to happen?

0:13:36.280 --> 0:14:1.730

Participant A

No. Well, I mean, you know, it happens to enough people, but I mean the people that I've witnessed myself, I knew one person that he wouldn't even try anymore. He would try it once and it was horrible and he just, you know, he was done with it. He wouldn't even try like Varjo, he was just like nah, forget it. So...

0:13:57.470 --> 0:14:2.550

Aleix Renom Cisa

Yeah, the... it's... well, kind of the trauma, just stays with you in a sense.

0:14:2.420 --> 0:14:3.0

Participant A

Basically.

0:14:4.590 --> 0:14:24.960

Aleix Renom Cisa

Thanks. So what about the industry itself, you that are directly in this level where... where you connect startups and companies to grow? How do you see the state of the industry at this moment?

0:14:26.450 --> 0:16:43.260

Participant A

Yeah, it's, it's going through a rough patch. You know if we think of like the sun setting of Altspace VR, questions about the future of HoloLens, the holding off of Apple and their MR glasses or headset, which is, you know, really not surprising because this this is not the first time that they push back any, or you know their rumours about it's gonna, you know, the glasses are gonna come out, or they're not gonna come out. But still, and then you think about like the downswing of Meta.

If you think of like the conflating of Web 3 and NFTs and the problems that they've had with the concept of metaverse, and that being conflated with XR, then all of these things and of course economic downturn, all these things have kind of contributed to like this rough patch that AR / VR are going through right now.

I mean, you still have companies that are willing to experiment that, wanna learn, that see the potential of this technology to, you know, potentially solve business problems. But overall, you know, I know that this year is gonna be more difficult than it was the previous years. You know now that people can go back to work and this

kind of thing, and the reliance on Zoom and related tools is not as high as it was then, you know people say like "well we I guess we don't have to look into, you know, these kind of virtual collaboration platforms right now" and these kind of things.

So, you know there there's a usual kind of 7 to 8 year cycle. I mean there are like veterans that have noticed this. You know, this kind of 7 to 8 year hype cycle for VR and the last one kind of started when the whole metaverse thing started. You know they kind of, like, went hand in hand and the metaverse idea kind of pulled VR with it in a way but then also...

0:16:42.380 --> 0:16:48.630

Aleix Renom Cisa

Do you think it was around the time when Oculus started developing their first prototypes, or was it after that?

0:16:48.710 --> 0:17:22.970

Participant A

No, I think it was more when Mark Zuckerberg started saying "metaverse" and changed the company's name to Meta. It was like VR was already going back on an upswing on its own, but then kind of like getting joined with metaverse concept kind of helped boost it up really fast. But also as the concept and the company Meta started kind of going on this downswing, then, you know, and all these other things that I mentioned, VR is kind of like, well, you know, it kind of like the, the... the 7 to 8 years was contracted, and the hype was high and then the drop was fast and that was only in like one or two years. So, I... you know, who knows? Does that mean that it's gonna go back up again sooner rather than later?

It, it... I don't know. Everything's kind of up in the air now. I mean, with these kind of emerging technologies you never know when all of a sudden is gonna be the, you know, just like a turning point, and everybody starts using it. And for VR, you know, once companies start seeing the usefulness of it for training, then that could be like, you know, that could be the time. But who knows?

0:18:12.640 --> 0:18:24.470

Aleix Renom Cisa

Yeah, yeah, I have heard that training is a... the, basically the main contender for use case in the professional environment. At this moment, at least.

0:18:24.800 --> 0:19:13.830

Participant A

Yeah, I would agree with that.

I think you know my, in my company, that's one of the main things that we hear from potential clients, they're interested in "Hey, but what about, you know, what about VR training?" I mean, I don't, I think that it's very rare if they don't ask about that.

So I think for sure that's the one from experience. You know, for saving money, for saving time, for being able to train in dangerous, usually dangerous situations like mining and you know heavy machinery, and learning about heavy machinery and these kind of things.

I think it's a terrific use case.

0:19:15.50 --> 0:19:46.420

Aleix Renom Cisa

Good. So what do you think... like talking back to the... how did you call it? The staleness of the of the VR industry right now. What do you think would need to happen for this bump to be over with? For everything to start going back up again? Is there any main solution?

0:19:45.10 --> 0:20:6.840

Participant A

Yeah, that's... I, I don't know if there's a main solution. I think it's always a number of... it always could be like a number of things.

You know, right now you kind of seen this like new very smaller lighter headset. I forget the name, there's a brand new one that came out and it's like really.

0:20:6.900 --> 0:20:9.530

Aleix Renom Cisa

The Bigscreen one.

0:20:8.60 --> 0:21:33.610

Participant A

Yeah, the the, yeah, those. And you know, and those are... they're cool looking. They're smaller. So lighter, more powerful, less expensive hardware even more useful content. You know, where... where, you know, you have industry and enterprise players starting to use this for training onboarding and this kind of thing. And then of course, like, you know, with hopefully with more power and maybe 5G connectivity, then you could have less cybersickness for that, you know, that other subset of people like me that, you know, now will be able to use it for a lot longer.

But of course you know it it's something that it can't be used for many, many hours. It's just not, it's just not for that.

You know it's, it's still going to be niche in in one way or another whether it's for the amount of time that it could be used, you know. So I think I would, if I was to put, you know, money on a betting, on a horse to bet, it would be more on the AR and MR side. But of course VR has its place and it's separate, you know, they don't... they can be separate, they don't have to be... one doesn't have to take over the other.

0:21:34.840 --> 0:21:35.200

Aleix Renom Cisa

Yeah.

0:21:35.30 --> 0:21:48.620

Participant A

But yeah, but that... but I would, you know, that's something that I would... that I'm very much looking forward to being able to, like, replace my smartphone with. A headset that won't give me brain cancer.

0:21:49.280 --> 0:21:59.630

Aleix Renom Cisa

[laughs] Definitely. So, thinking about VR in particular...

0:22:5.130 --> 0:22:5.440

Participant A

Hmm.

0:22:0.560 --> 0:22:20.660

Aleix Renom Cisa

In a more utopic future, do you see it even existing? Or will it... will AR be the only solution that's there and MR, and we will not need VR anymore? And will be pointless by then.

0:22:21.380 --> 0:23:50.20

Participant A

Well, I think it... I think in one if you can have a... glasses or some kind of goggles or something where you can kind of like, you know, have layers of immersivity, you know? So this is the VR layer, and then this is the MR layer, and this is the AR layer, and this is regular glasses that fix my myopia, and this kind of thing. I think something like that would be really, would be a possibility, you know, and a good step. But really I would love, I would love... I mean, for me a satisfying endpoint for virtual reality would be like a holodeck. I don't need anything on my head. I walk into the room, it transforms into whatever. There's, you know, I don't need any special haptics. I don't need any, you know, maybe I do but I don't notice them. And, you know, and I can talk to and I can learn from historical people, and I can interact with my friends in in this room. Uh, you know, like a virtual reality room. And I don't need to put anything in my head, and this kind of stuff. So I think that that would be for me as satisfying end state for virtual reality without having to put anything in my brain or anything on my head.

0:23:42.40 --> 0:23:56.760

Aleix Renom Cisa

And you think it would be... because I think one of the big selling points of VR is that is actually fully in immersive, especially with haptics and everything. Do you think it would be immersive enough so people would adopt it and accept it?

0:23:57.170 --> 0:26:6.980

Participant A

But like, the holodeck? Oh, absolutely. I mean that's... I think that's one of the things, you know, Star Trek holodeck is one of the reasons that, like, some of the earlier generations of VR, AR and VR folks even started this, you know. I want... I wanna be able to be one of the ones that helps create that, you know, and then the matrix was another one of those, you know, movies that got another generation interested in this kind of immersive world.

But for humans, I don't know, you know. You don't even need, you know, you don't even need a headset to be to be immersed in a world. I mean, a book, a book can get you immersed, you know. So we don't, we don't... We're special. We're special creatures in that way that we don't, you know, we can immerse ourselves, you know, in in a song, in a video game, in a movie, without any special recourse to other kinds of, you know, haptics or... So I think that if, if the content is well made then you can pull on the heartstrings and you can you can ignite ideas and the imagination and this kind of thing. So yeah, I don't know what it means to be, like, fully immersed, you know. I don't know. I don't... We don't really need all that stuff, to be honest. So then, you know, what is this special thing? What is a special version of immersiveness that that involves the VR

headset and certain kind of haptics and body suit? You know, I think content should be created for that, for that particular, you know, that's a whole other thing. It's different than the immersivity in a book or in a movie or in a video game. So you know, I think that there should be content created especially for that mix of technology, that special medium.

I don't know what that is, but I think that's kind of how I see it there, it's a unique thing.

0:26:7.670 --> 0:26:7.970

Aleix Renom Cisa
Yeah.

0:26:7.820 --> 0:26:51.120

Participant A

Yeah. But, but I mean, like, you know. It's very tricky, still the whole haptic thing it's been kind of going in circles and happening for a long time, and it's a really hard, a hard nut to crack.

And smell is coming along. That's very interesting.

And this kind of stuff. So I mean, there's very interesting things on the horizon, but, but... still many years in the future.

0:26:40.540 --> 0:27:1.60

Aleix Renom Cisa

I keep seeing different technologies, of course all of them in development, keep popping up. Like the treadmill, and the suit, and the gloves. And there is... it just, it keeps being developed, but... never, well, it still, it doesn't get to those final stages.

0:27:1.430 --> 0:27:48.730

Participant A

No, no. And I mean, I mean, one of the reasons is because people don't remember what happened before or haven't searched for what happened. And before they kind of like just... you know. They see a need and they... "We're gonna go with it", but there's a lot of interesting things that have been done in the past 35 years all over the world in the UK and US and France and stuff like that and, you know, is a foundation that people are not building on the kind of, like, reinventing the wheel and keep running into the same problems instead of, you know. So it's a very strange disconnect between, you know, our history, the XR industry's history and kind of like the new breed.

0:27:58.20 --> 0:27:58.430

Aleix Renom Cisa
Right.

0:27:49.430 --> 0:28:3.350

Participant A

There, you know there's... And so the older, the older heads are constantly trying to fight and say "Hey, look, we did this already, let's...", you know, there's this whole, you know, there's all this information, there's these people to talk to.

0:28:2.750 --> 0:28:8.220

Aleix Renom Cisa

So there is no, not a constant flow of information. It's more like, segmented.

0:28:8.360 --> 0:28:14.690

Participant A

Yeah, yeah, it is. And I'm not really sure, you know, how that, how that will be changed.

0:28:15.230 --> 0:28:15.510

Aleix Renom Cisa

Hmm.

0:28:15.460 --> 0:28:23.890

Participant A

You know, it's... I don't know, probably the same thing happens in other emerging technology fields as well, I would imagine.

0:28:25.940 --> 0:28:51.940

Aleix Renom Cisa

Alright, so if I wanted to... like if I wanted to bring a lot of revenue and a lot of like, voices and popularity into the XR industry, would I focus on the professional users or would I focus on the individual customer? The casual users?

0:28:52.640 --> 0:30:28.20

Participant A

Yeah, definitely the professional users.

You know, and I go back to the training, I think that's the, that's really the easiest way to prove that, this technology can save, can bring, kind of like, bring, you know, save money, save time. You don't have to travel, you know, you don't have to do this lengthy, don't have to give a big book and take a, you know, a couple of days for the onboarding process. You don't, you know, it's really easy to see how this could work once a company, an enterprise gives it a chance, so.

I mean, but on the other hand, you know, the enterprises, the ones they can, that can afford you know 20/50 headsets. And some people just can't, not even one. So, so you know, that becomes a disconnect for some people, and it's not gonna be the same AR to AR smart glasses, and AR to a phone, you know, smartphone is just not the same thing, it's cool for a little while but you're not gonna be holding your phone up all the whole time. And it's just not... it's just not there for the individual casual user, the tech is not, the hardware is not there, and the content, the content is not there. Not yet.

0:30:29.50 --> 0:31:6.900

Aleix Renom Cisa

Alright.

Yeah. Amazing. So just if you, in case you have been exposed to it, just one quick question about the software and development environments to develop this XR experiences, be it like VR or AR or MR. Have you... have you developed or seen someone develop these experiences? Because I would like to know what is the quality and the state of the software to make these experiences.

0:31:7.640 --> 0:31:9.590

Participant A

Yeah, I can't, I couldn't say.

0:31:9.890 --> 0:31:10.300

Aleix Renom Cisa
OK.

0:31:10.40 --> 0:31:19.480

Participant A
Uh, it's not my specialty, but I mean, I do know plenty of people if you'd like to talk to people about that topic.

0:31:21.670 --> 0:31:39.330

Aleix Renom Cisa
Yeah. Yeah, the definitely.
Yeah. Awesome. So, so the... that that was basically it, thank you very much for answering my questions and [...]