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Research Paper

Augmented Reality As A Client Engagement Tool In The Gaming Industry

What Can Businesses Learn From It?

Bachelor Thesis

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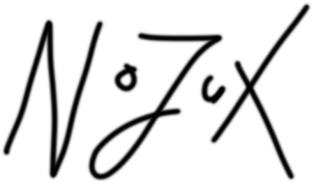
Signature: 

List of Abbreviations

AR	Augmented reality
VR	Virtual reality
HMD	Head-mounted display
FOV	Field of view
AI	Artificial intelligence
GPU	Graphics processing unit
CPU	Central processing unit
PC	Personal computer
RPG	Role playing game
RTS	Real-time strategy
FPS	First-person shooter
MMO	Massively multiplayer online
VFX	Visual effects
GVC	Gaming Video Content
CLV	Customer lifetime value
CLM	Customer lifetime management
APAC	Asia-Pacific (region)
SDK	Software Development Kit
WoW	World of Warcraft
PDA	Personal Digital Assistant

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Abstract

A thorough qualitative research paper of the augmented reality and gaming industries through comparison between five classic video games and the modern AR title Pokemon Go. A look is taken into modern AR implementations in different businesses, as well as how these businesses could learn from AR and gaming to better their client engagement. The importance of this research endeavour is to unearth new possible ways for businesses to implement augmented reality as a customer engagement tool for two specific use cases: hedonic and utilitarian. The research is conducted in the form of a literature review, as well as a series of interviews and an online questionnaire. Ultimately, the conclusion is achieved that AR features implemented in games can be used to help with businesses' client engagement.

Keywords: Video-Games, Business, Technology, Social, Augmented Reality, Video Gaming, Community Engagement

1. Introduction

Businesses that used the yellow pages and grand phone books to sell their products over the phone have advanced to internet-based approaches like newsletter emails, site-collected-data approaches and personalized advertisements - all of which would've never been possible without the widespread expansion of the internet, personal computers and eventually - mobile phones.

However a simple monitor showing pictures with sound over them isn't a solution applicable for all users and clients - thus augmented reality (AR) was born: a way for a machine to trick our brains into thinking we are actually seeing and hearing (and even touching) things that would otherwise be impossible with any currently existing technology. From the first appearance of the technology's roots in the mid-1950s, to the innovation it inspired throughout the manufacturing and industrial sectors - to think that it's already so disruptive in a state of infancy!

Contrary to the general public's beliefs, the technology isn't only used for simple games and media consumption however. Virtual reality has many uses apart from gaming and watching content online - it can take its user practically anywhere on the planet and allow them to explore places that would otherwise be monetarily inaccessible to most - volcanoes, remote islands, steep mountains, etc… But apart from its sightseeing applicability, it's amazing at making people feel that things are actually there, even when they aren't physically present. When it comes to business applications - where a user cannot be fully immersed in what is virtual and still needs to retain awareness of their surroundings and real world - augmented reality seems to be a very well-rounded solution.

By overlaying the digital information over the real world - this technology allows a user to have access to much more data about specific objects, events, places and practically anything at all. By integrating this technique with databases and machine-learning, it's possible to achieve user-machine integrations with efficiency that has never been possible before - all without modifying the user in any way, apart from general training and computer-operation knowledge.

These two technological fields have and still are growing and improving year by year, therefore it's very impressive to see the advancements that have already been made in the performance and user-friendliness of these. There is belief that this technology will allow us to bridge the gap between the ever-rising need for sustainability and the daily conveniences we have gotten so accustomed to.

A key area of interest for implementing AR would definitely be the video gaming market, as gaming is all about the appreciation of virtual environments and content. With today's smartphones being capable of both generating and visualizing captivating 3D AR experiences, players have taken to the streets with the hit freemium title Pokemon Go, which inspired a whole new generation of mobile gamers.

The research paper is structured into an analysis of the AR as a technology and its implementation in different sectors of business, followed by an analysis of the gaming industry. This is then assessed through comparing major video game titles' client engagement features to the recent Pokemon Go AR mobile game. These features are then reflected in the businesses mentioned with direct comparisons to how Pokemon Go cleverly implemented them as game mechanics.

2. Literature Review

Augmented Reality

What is Augmented reality? (AR) - A Brief History Outline:

This section of the literature review will explain the concept of Augmented Reality (AR) as well as a brief summary of the history of AR.

AR is a combination of computer generated perceptual data (augmentation) and the actual physical reality in which the genuine part is more predominant than the virtual. The augmentation of reality can incorporate a number of the human senses or a particular one including: visual, haptic, auditory, olfactory and somatosensory, thus creating an ongoing communication and exact dimensional (3D) conjunction of virtual and physical articles. In this paper, the augmentation of olfactory and somatosensory systems will not be analyzed due to them not being present in the augmentation of gaming.

Early models of virtually simulated experiences originate before even digital computing was fully developed. Morton Heilig had the idea of an "experience theater" that could include every one of the viewer's sensory faculties in a viable way bringing the individual observant into the on-screen action. Heilig wrote about it in a 1955 paper, "The Cinema of the Future" (Robinett 1994). In 1962 he secured a patent (USPTO, 1962) and assembled a prototype of his vision called "The Sensorama" alongside five short movies to be shown in it.

In 1965 a computer scientist in Harvard, Ivan E. Sutherland described what is considered to be one of the earliest digital AR headsets aptly named "Ultimate Display" (I. E. Sutherland, 1965). Three years later he assembled the first AR head mounted display (HMD) system called "The Sword of Damocles" (I. E. Sutherland, 1968) but only for a limited usage localized in his lab, due to the stationary construction of the headset. Later on towards the early 1990s AR was starting to be utilized in industrial settings, however mostly to assist with manufacturing processes (B. Schwald & B. De Laval, 2003), by helping training new developmental assignments through the augmentation of the user's field of view (FOV) with two or three-dimensional (2D or 3D) visuals or to assist laborers to take care of a job involving instruments with very high levels of precision and standardization by showing directions and instructions on where and how to correctly and safely utilize a device or industrial equipment (F. Himperich, 2007). Later on, it became much better known due to the sports industry implementing the "yellow line" marking the first downs in

american football as well as enhancing the visibility of the puck in ice hockey (M. Buesing & M. Cook, 2013).

Augmented reality was not utilized for community building or engagement to any significant degree apart from the sports industry due to the restrictively high costs of its hardware and software solutions, most of which were often designed for industrial, manufactorial or laboratory use cases. Augmentation in real time was also impossible due to requirements of high processing power, beyond the capabilities of contemporary computers, often only having tens of thousands of transistors in the 1980s. The first real breakthrough for augmented reality's application in community engagement was the powerful processors in personal digital assistants (PDA), as well as the MARS project in 1999 (D. Wagner, 2003) showing the viability of a PDA as an AR medium.

After the MARS project and the development of open-source augmented reality code and several source development kits (SDK) in the late 1990s (S. Krakhofer & M. Kaftan, 2015) and the advent of small integrated powerful smartphone devices, smart glasses and even bionic contact lenses (J. Chen et al, 2019) - the AR market has recently been really opening up, with developers increasingly searching to make the everyday life in our world easier or at least more exciting.

Augmented Reality Industry Size:

Worldwide spending on AR and virtual reality (VR) in 2020 was assessed to be up to $18.8 billion with extended positive development, up 78.5% from 2019 (IDC, 2021). Organizations across the globe are attempting to discover approaches to remain at the cutting-edge as purchasers are searching for more innovative and engaging focuses in their everyday shopping encounters. Taking data from 2018 - 2020 and modeling towards 2023, the worldwide VR/AR market is expected to see a 177.4% compound annual growth rate with spending on AR games, expected to increase by a compound annual growth rate of 175.9% (T. Alsop, 2020).

Currently post-pandemic the calculations for the AR/VR market size in 2020 have agreed on over $12 billion with an astonishing $72.8 billion being the projected worldwide AR/VR market size in 2024. (IDC, 2020)

AR Hardware & Software:

Aside from the marketing industry, a large part of the investments also goes into the development of new hardware and software for AR implementation and development. Recently Advanced Micro Devices (AMD) and Qualcomm have both released notices of developing a new generation of head-mounted displays (HMD) called the XR1 Smart Viewer (A. Robertson, 2021). This could

be the solution for the seeming lack of an accessible and affordable format of augmented reality content consumption and creation, akin to the recently released virtual reality headset Oculus Quest 2.

AR And Purchasing Behaviour:

The client's way of buying changes continually, especially with the constant digitalization of their entire shopping experiences, based on data from 2019 - 2020 it was forecast that by 2023 there will be an expected 2.4 billion mobile augmented reality users around the world (T. Alsop, 2021). Worldwide tech market analysis firm ABI Research gauges the augmented reality market might surpass US$140 billion in its total market value by the year 2025.

What Is A Client:

This can be an individual or association. Generally it is an individual or organization that gets a product or service from an alternate individual or association, as a trade for money. Today's clients can discover a wide range of utilizations on their smartphones that empower them to shop, travel, cook, eat, meet their companions, acquire, spend, share, and so on - all at the tap of a few buttons. Organizations are thinking of intriguing mobile augmented reality application ideas that don't just give their clients the simplicity and ease of online shopping, however in addition to an extraordinary encounter. Subsequently, satisfied clients help them develop further advancements in the sector, as well as generate positive word-of-mouth referrals.

AR & The Future Of Buying:

AR presents a special chance for practically any business to draw in new clients and to focus the buyer on the selling points of an item, which is accomplished by involving them in an engaging and virtually aided experience (A. Javornik, 2014). Each chance to engage with a client likewise presents openings that can enhance the general consumer loyalty by providing them an utilitarian or hedonic experience, according to their requirements and personality.

What Is A Utilitarian User Experience:

When customers engage with a product or service in a utilitarian manner, their attitude and satisfaction levels are more important than their experience with the product or service provided. Most commonly in app development this is due to the importance of an app's functionality and feature-set, rather than its UX design and aesthetics.

What Is A Hedonic User Experience:

During a hedonic user experience, the user's perceived experience and opinion are what matter most in this case, a simple-to-use yet engaging client experience, often associated strongly due to its simpler aesthetic comprehension and general strive for basic customer understanding.

Current AR Implementations:

There are several other key areas apart from the industrial and gaming industries that have recently started implementing AR technologies, some are well known multinational enterprises, while others are more general industry-wide applications. However, independent from the industry, most of these seem to relate to either hedonic appeal with simple features and an easy-to-use interface, rather than robust utilitarian systems found in the industry's factories or laboratories. Head mounted displays (HMD) or otherwise wearable AR technology isn't anywhere close to being mainstream, mostly due to a lack of appropriate format for AR, thus almost all of the customers' experience with this technology is through their mobile smartphones.

The groundwork that AR technology provides for imaginative advertisers would now be able to use augmented reality to make vivid brand encounters, make more intuitive promoting, and empower purchasers to encounter items and spaces novelly.

AR in Retail:

IKEA Place:

In 2017 IKEA dispatched a novel augmented reality application that permits clients to test IKEA's items on-the-fly through Apple iOS 11's ARKit innovative technology. Aptly named the "IKEA Place" it is limited to the iPhone and iPad due to their special sensors. This free application includes reasonably delivered, consistent with real life scale 3D items. The application naturally scales items, in view of room measurements, with 98% precision (S. Ozturkcan, 2021). To picture an item inside a space, the application examines the territory of a room through an iPhone or an iPad camera by placing hundreds of dots on objects or by using the Laser Imaging Detection and Ranging (LIDAR) sensors on newer devices. Clients can peruse more than 2,000 IKEA items on their own online database, to make choices that best fit their interior. When picked, clients should guide the selected object toward the ideal spot in a room, at that point locking the selected item onto the space. IKEA Place can likewise save every client's #1 items, share their specific choices via online media, and make direct purchases through the IKEA site.

Wanna Kicks:

Wannaby, a startup originating in Belarus that is building commercial-oriented AR experiences, had dispatched a beta of its most recent application in 2019 with the general idea - to make it simpler to track down the ideal shoes for an individual. Named "Wanna Kicks," the Apple's iOS application utilizes augmented reality to let users "hop into" different sets of tennis, sports and running shoes (D. Popelskaya, 2019). They essentially pick a specific pair of the footwear of their choice from the rundown of 3D models, point their camera at their feet and as easy as that, they are currently visually wearing a very well replicated model of their picked footwear. The impact is really momentous and tracks sensibly well as a user moves and turns their feet or changes camera angles.

AR in Factories:

In light of the AR industrial insights and developments, mechanical and combined assembling will likewise keep on profiting massively from augmented reality. The manufacturing plant floor has consistently been a complex and conceivably dangerous climate, yet AR innovation was being developed to give another degree of perceivability for such perils. Laborers would now be able to utilize augmented reality gadgets to have prepared admittance to significant specialized data just as recognize what hardware is being used and where hazardous zones are found. Boeing, for example, presently uses AR glasses to help specialists while wiring large numbers of its planes, cutting product creation time by 25% and enormously lessening unanticipated blunders. It would be wise to keep in mind that this should become a standard cross-industry, improving creation velocities and item development (E. Bottani, 2019).

AR in Traveling:

The potential for limited movability of AR applications as of now is showing great effects on the travel industry. With AR innovation, visiting famous vacationer locales will turn into a dynamic and intuitive experience. Cell phone applications and wearable augmented reality gadgets will permit guests to exhibition halls and notable destinations to learn all that they at any point needed to think about them with a speedy output of the space. One day visiting a famous spot like the Great Wall of China or the Colosseum of Rome - then having a historically accurate battle or other historical engagement take place. As augmented reality patterns and innovation are further created, the travel industry will doubtlessly be one of the main AR adopters (D. I. Han, 2018).

What is Gaming?

A computer game is an electronic game that can be played on a figuring gadget, like a personal computer (PC), gaming console or smartphone. Gaming is the act of actively seeking out and partaking in various video-games, however the reason to do so is most often recreational rather than utilitarian. Contingent upon their implementation, format and platforms supported, the computer games industry can be subcategorized into three main markets: PC gaming, mobile gaming and console gaming.

In October 1958, Physicist William Higinbotham made what is believed to be the first ever computer game (A. Chodos, 2008). It was a basic tennis-like game, consisting of two paddles on separate sides of the display - similar to the 1970s computer game Pong, and it was a significant hit at a Brookhaven National Laboratory open house after its informal release. Computer games had made some amazing progress since their attraction of mainstream attention in the 1970s as new genres of games were constantly being developed, many of which were designed as Skill and Action ("S&A") based games generally focusing on the user's hand-to-eye coordination along with quick response times (C. Crawford, 1984).

Ultimately S&A games continued dominating the still growing global gaming market, with the greatest advancement of gaming history - the mainstream introduction of the three dimensional first-person shooter (3D FPS) game genre at the hands of id Software[1] in 1993 with the release of their infamous game “Doom”. Although it wasn’t the first 3D FPS, it was the most culturally important game of that era and its influence can still be felt in modern FPS titles. Lately, nonetheless, the development of informal organizations, cell phones and tablets presented new classifications like mobility-based and social games. The modern computer games of today offer photorealistic designs, realtime physics and a general recreation of reality itself to some extent which focuses on providing an immersive, engaging and captivating experience for the player.

Gaming Industry Size:

There are more than 2.7 billion video gamers from all over the world with over 2.9 Billion Players estimated throughout 2021, expected to generate $175.8

[1]id Software LLC is an American computer game designer studio situated in Richardson, Texas. The organization was established on February 1, 1991, by four individuals from the PC organization Softdisk: software engineers John Carmack and John Romero, game architect Tom Hall, and craftsman Adrian Carmack.

billion dollars for the worldwide game industry this year. (Newzoo, 2021, Global Games Market Report)

The PC game hardware industry shows no signs of slowing down as it is estimated to be worth $70 Billion by 2023. Thanks to a Steam user survey, I also have a good insight into the inner-workings of most PC gamer's setups. We know that Nvidia dominates the GPU market with a 74% share, and Intel easily beats AMD in terms of CPU shares with 74.4% to their 25.6% (Steam, 2021).

The greatest observed areas of development are in Latin America and Asia -Pacific (APAC) which are relied upon to develop by 10.3% and 9.9% individually when contrasted with 2019's income figures. Asia - Pacific regions were approximately measured to be worth around $78 Billion during 2020 with China expected to contribute $40.9 Billion of customer spending on gaming and the USA falling behind that with $36.9 Billion (Mordor, 2020).

Free To Play (F2P) games have started to overwhelm the market lately, making up 80% of the video games income in 2018. Microtransactions currently make up an enormous segment of the entire gaming industry's income, with the microtransaction market alone acquiring $2.94 Billion during 2017 (J. Clement, 2021). This has likewise harmonized with the ascent of mobile gaming fame, with 64% of freemium portable gaming clients making in-application buys in 2016 (Statista, 2016).

PC Gaming keeps on being perhaps the most mainstream types of video gaming notwithstanding progressively great competition from both the reassure market and portable gaming stages. The PC Hardware industry alone is set to be valued at $70 Billion by 2023 (DFC Intelligence, 2019), showing that many are still vigorously putting resources into having the most ideal equipment in their PC works for gaming.

What's more, with regards to PC gaming, Steam is as yet the foundation of decision for buyers as it actually sits easily in the best position with regards to video game vendors, getting $4.3 Billion out of 2017 alone. (Steam, 2018)

While the console gaming market keeps on developing, it appears to be that the recent and current-gen (PlayStation 4 / 5 ; Xbox One / One X) gaming consoles and platforms just cannot seem to thump older and better established models with much more games from the best producers and studios, as well as more classical titles. During 2020 the PlayStation 2 was still the top of the line platform chosen by gamers with 157.68 million units sold before its discontinuation (J. Baltrusaitis, 2020), and the top rated console game is still Wii Sports with 82.65 million units (J. Clement, 2021). Altogether, the worldwide console gaming market was estimated to be valued

at $45.2 billion in 2020, showing an amazing yearly development of 6.8% (J. Clement, 2021).

Mobile gaming has quickly become the biggest gaming market on the planet with industry income expected to hit $76.7 Billion before the finish of 2020 and 2.2 million gamers around the world (Plinq, 2019). To place this into viewpoint when contrasted with the more extensive computer game market, by 2022 the worldwide game market is set to reach $196 Billion, and the mobile gaming business sector will represent $95.4 Billion of that by itself (T. Wijman, 2020). While mobile gaming is mainstream in all cases, female gamers are bound to support portable games more than guys, which is reflected with 63% of mobile gamers being female, as well as 60% of them gaming on a daily basis and having a higher inclination towards in-game spending rather than males (Kevin Anderton, 2020).

In our consistently associated world, web based gaming has seen extensive development as of late – much appreciated, in no little part, to the ascent of mobile and otherwise versatile gaming. The web based gaming market is anticipated to reach a worth of $79 billion by 2025 (R. Johnson, 2020) as an ever increasing number of individuals move to game on the web. This development is reflected in the expansion in web gaming traffic as well, which we see expanding from 33.7 Exabytes in 2015 to an amazing 127.8 Exabytes in 2020 (Steam, 2021).

The Gaming video content market has gotten amazingly well known somewhat recently with stages like Twitch and YouTube benefiting from the ascent of both computer games and video web based. Indeed, the income for the GVC market came to $6.5 billion out of 2019 making it an unbelievably rewarding industry (J. Clement, 2020). What's more, at the highest point of this industry, Twitch is as of yet in the best position. They acquired a 65% portion of hours watched in 2020 just as a 72% portion (D. Partis, 2021) of hours streaming when contrasted with their opponents . They additionally created more income in 2019 than their greatest adversary YouTube – despite the fact that, generally, Twitch has a much more modest crowd.

Esports development & Covid-19

The esports gaming industry has been on a vertical direction for quite a while, showing amazing year-on-year development and contacting a joined worldwide crowd of 495 million individuals in 2020 (Statista, 2019). The business' development was eased back fairly in 2020 due to the worldwide Covid pandemic putting an end on numerous live occasions across the globe. The worldwide esports market income has been anticipated to hit $1.1 billion out of 2020, at the end of the day missed the mark regarding this, getting $1.06 Billion all things considered (NewZoo, 2020). Esports prize pools keep

on rising however, with Fortnite offering the greatest 2020 prize pool with a joint prize pool of $10.3 million (T. Murray, 2020). The best ten esports competitions offered a joint prize pool of $177 million throughout 2019 (J. Ilic, 2019) – so it is unmistakably still a colossal and developing industry to be engaged with.

Client Engagement in Gaming

Although the thought of client-sided commitment has been a significant subject of progressing conversation in the scholarly community and business practices, still little is known on the effect of client engagement that contains hedonic and utilitarian qualities, on client conduct and engagement indications toward the brands or firms that continues beyond the moment of purchase. The principle reason for this investigation is to inspect whether and what hedonic and utilitarian components of client esteem mean for client commitment across the gaming market.

The principal reason for this research is to find out how the gaming industry creates and sustains client engagement

Ever since the introduction of the first commercially successful video game (Pong - November 29, 1972) the idea of playing it with a friend seemed to be the most enjoyable way of approaching the new type of interactive media. Due to technological limitations the game was initially released on stationary arcade booths and required two players to be able to start a game. Pong was later released in 1974 on standalone consoles specifically engineered to run it (M. Guttenbrunner et al, 2010). The social aspect was also limited - since the release of the game took place during the infancy of the internet, the game had to be played locally and did not have any online multiplayer aspects. Even considering the technological limitations, the game was a commercial and social success. A bar's proprietor found a long queue of individuals waiting to try the game outside his premises (The Guardian, 2008) the very next day after his bar installed a Pong arcade.

Throughout the 1990s the internet’s advances in its high-bandwidth, low-latency and high speed internet connections allowed for actual multiplayer experiences at a distance, compared to the localization on a single network, especially with the rollout of the internet to the general public in 1993 (T. Johnson, 2015). This, along with the continuing adoption of the home and personal computers and the invention of game consoles which allowed the use of various game cartridges in a single platform - encouraged game developers to focus on a new and growing gaming experience, a key game feature for social play and community engagement for both developers and gamers - online multiplayer.

Game #1: DOOM

The first game to truly show the influence of client engagement in an online community through multiplayer was the 1993 hit game by Id Software: Doom. It was one of the first titles to offer online multiplayer to 4 simultaneous clients through either a local area network (LAN) or the option of using a dial up connection, added one year after Doom's release. In the game, a player takes control of a space marine, whose sole purpose is to eliminate demons from hell, due to a failed experiment on Mars. It was one of the first FPS games ever and its clever use of 2D sprite animations for enemies and items due to hardware and storage limitations, along with 3D maps and a background skybox made the game feel much more immersive than other mainstream titles and truly as close as 3D had ever gotten since id Software released their last game Wolfenstein 3D in 1992.

Most users did not yet have internet access at the time, so to distribute the game various retailers had been supplied with floppy disks with a copy of the initial levels of Doom. If gamers wanted to play the remaining levels, they had to buy the entire game directly from id Software. These disks were given away for free and a copy of the initial levels could also be downloaded online - thus the game made it onto the computers of millions of people. This was incredible for customer attraction, as it encouraged a lot of players to try the game out, if not from a store, then from the hands of a friend, generating enormous word-of-mouth. At one point during 1995 Doom had more installations at over 15,000,000, than the "Windows 95" operating system (TechRadar, 2018), even though there was barely any marketing material for Doom, contrasting the massive campaigns by Microsoft.

What truly added to long-term customer engagement was that the game had a frantic and fast multiplayer with two general modes: co-op and deathmatch. Up to four players could connect together to either cooperate in completing the game's campaign, which although engaging, would eventually get boring for players who've already finished the game. The greater challenge and fun lies in the deathmatch online game mode - four players battling one another with the game's weapons - vicious and fast-paced games in which the point is to score the highest quantity of assassinations of other players dubbed as "frags" - the contestant with the most frags wins(J. Bryce & J. Rutter, 2002).

Naturally, Doom was quite ill-received by parents and religious organizations around the globe due to its realistic depiction of violence and overabundant satanic imagery, however in the end this just bolstered Doom's popularity and increased its appeal to anyone with a computer. The title was seen as "edgy"

and this appealed to a massive teen demographic. However, the fear of Doom inciting real-world violence became very real after the Columbine High School massacre of 13 people, with 21 injured on April 20th, 1999 once it became known that the murderers had expressed liking the game and compared their actions to ones in-game (L. Malkki, 2013). This caused a massive scandal and even lawsuits against id Software, although the idea of the video games specifically inciting violence was dismissed (D. Thomas, 2009).

Doom was able to attract and retain a very large and intense following which eventually evolved the entire gaming community after its release. One unexpectedly genius marketing move from id Software was their release of the source code for Doom, which allowed anyone to modify the game's files and engine to add extra items, visuals, enemies, game modes, game mechanics, etc… This led to the creation of a community dedicated to altering the Doom source code to the point that whole new games were created and the birth of the video game "modding" community (O. Sotamaa 2010). There were so many games utilizing Doom's source engine that they were classified as "Doom clones". The great effect of Doom is less felt today, especially with titles from large studios such as Electronic Arts or Bungie, however many indie developers make mod-friendly games. The modding community not only lives on to this day, but it's ever-expanding each year, with websites dedicated to sharing modifications of games made by players for thousands of game titles, further strengthening the retention of gamers on specific mod-friendly titles. Today the largest video game store Steam provides the ability to install mods on specific titles through its intuitive interface with no technical skills required.

Utilitarian qualities benefitting client engagement:

- Visualization of actual 3D environments with 2D sprites for most characters, players and items.
- Easily customizable programming and data files - great modding support.
- Multiple player support via distance, which opens up both playing for fun, as well as competitively.

Hedonic qualities benefitting client engagement:

- Well received for its "fun and action packed" gameplay experience.
- The game was excellently crafted for its time in both its audio and visuals.
- Controversial in theme it was seen as "edgy" and sought after.

Game #2: Quake

Every passing year after Doom's release, PCs were getting more powerful, with faster central processing units (CPU), larger storage solutions and higher quantities of random access memory (RAM). CD-ROM drives overtook the Floppy Disk's place as the main medium for digital storage, offering possibilities for much larger games. Another key technological progress was the development of 3D acceleration, with the assistance of a graphics processing unit (GPU), computers could now simulate polygonal graphics with speeds and quality never seen before.

In spite of all the pressure, id Software managed to truly shake up the video game industry once again with their follow-up title. Quake was composed of a mixture of thematic inspirations, with the techno-fantasy satanic imagery from doom being injected with yet more Lovecraftian (T. Krzywinska, 2002) grit and seemingly washed-out colors.

Quake revolutionized the FPS industry and put an end to the so-called "Doom clone" era. The rapid change of technology and great expectations affected the entire developmental cycle of Quake. Along with its great level design, the combat and movement mechanics made quake the best title for competitive play. Although Quake was very similar in its gameplay to Doom, the added audiovisual fidelity was revolutionary for its time, as well as the fact that with Doom's success, id Software wouldn't have been wise to defy player expectations. One aspect that was mechanically different from most FPS titles is that the nailgun, super-nailgun, grenade launcher and rocket launcher in Quake didn't fire hitscan (projectiles that instantly hit their target) projectiles, but instead fired physical projectiles, which added an extra layer of skill to master, especially in the rise of Quake multiplayer.

The addition of multiplayer to Quake was a necessity after Doom's deathmatch success. Quake was released with 6 multiplayer maps, however many more different maps were created by the Quake community of players and creators. The added verticality in Quake was a great addition to the sensory awareness when beating an opponent during a deathmatch, and simply having a better weapon was no longer enough. Fast movement, along with tactical positioning and map-control over in-game items were essential for advanced player versus player combat. The community quickly started exploiting the game's mechanics to enhance their mobility in the game, such as continuous jumping or "bunny hopping", zig-zag jumping or "strafe-jumping" or even firing rockets at your feet to gain propulsion, also known as "rocket-jumping". However these weren't seen as game-breaking bugs or mistakes of development, since the combat was based on predictable

damage, consistent accuracy and actual moving projectiles, the capability of one dominating their opponent was based solely on their skill.

Due to the similarity to id Software's previous titles, Quake was easy to pick up for new players and fans of the FPS genre alike. Even though some people found the single-player campaign lacking, its implementation of multiplayer, specifically deathmatch, was something universally appraised and enjoyed. Quake showed that the implementation of social interaction with possibilities for competitive play could really be the future of where the industry was headed.

Interestingly Quake's development team worked with a group of university students in 2000 to develop a completely self-contained and wearable system providing the ability to play Quake in AR with the use of an HMD, a laptop in a backpack and prop gun with haptic controls (W. Piekarski & B. Thomas, 2002) which is believed to be one of the first advanced AR gaming experiences ever created.

Utilitarian qualities benefitting client engagement:

- True 3D graphics for all in game assets
- 3D mobility with jumping and acceleration
- Technological advancements: graphics processing unit (GPU) support

Hedonic qualities benefitting client engagement:

- Higher Audio-Visual fidelity
- Easier multiplayer game set-up
- Client involvement into the community in content creation

Game #3: World of Warcraft

A different game genre to garner a massive and engaged community were role playing games (RPG), especially the massively multiplayer online (MMO) role playing games or MMORPGs. The largest game of the genre has been the World Of Warcraft saga. Released by Blizzard in 2004, with several supplementary expansion packs following its release, it's been the most popular MMORPG of all time, and still is very relevant to this day with approximately 4.8 million subscribed clients in 2020.(Blizzard, 2021)To play, users must buy the game, register on Blizzard's proprietary gaming network and pay a monthly subscription fee. World of Warcraft had an immense social impact on gaming-related research, as well as generating a lot of media attention. This was due to the entire nature of WoW requiring constant

internet connection, since the most important aspects of the game required interaction with other players.

One of the most important first things to do for a new player is to join a guild. A guild in WoW is a local area with a community of players who meet up to share information, assets, and labor. To be scalable and create a large guild, an appropriately responsible member must be named their leader, who should be adroit at numerous abilities, including: drawing in, assessing, and enlisting new members, making apprenticeship and integration programs, arranging the technique and strategy of the guild, and most importantly - settling debates. In-game guilds regularly splinter over frivolous quarrels and other essential disappointments of the executives and the expert should resolve them without losing significant individuals, who can undoubtedly stop and join an opponent society. Without considering the virtual environmental factors, these conditions give true preparation a director can apply straightforwardly in the working environment (Brown, J. S., & Thomas, D. 2006).

But the applications of guild-building aren't only utilitarian, they can also be helpful in other aspects. A study utilized WoW both as a tool and play medium in an undergraduate university-level course for game design. This study was innovative in demonstrating how WoW's in-game culture and mechanisms affected both student-to-student and classroom dynamics (M. D. Dickey, 2011). Another study was conducted, discovering that players who had anxiety in the real world experienced decreased levels of anxiety while playing WoW. Additionally, players who were members of an in-game guild experienced lower levels of anxiety, than those who were not members of a guild (M. Martončik, 2016). This can be due to the fact that massive segments of gameplay are impossible to complete alone, such as dungeons and raids, where a group of up to 40 players would be required to defeat a very powerful enemy. Combat was not only limited to virtual enemies since PVP (player versus player) was also an option, disputes could end in a stand-off or even initiate brawls between groups of players. However other social elements were also key innovations, such as trading: players could skip the investment of time into certain game sections or obtain desires faster by trading for them with other players. However with WoW's popularity and massive time required to actually "finish" the game, a lot of people were concerned about growing levels of reported video game addiction throughout the United States, Asia and Europe. An investigation of 438 WoW players was directed which showed that self-revealed dependence on computer games related decidedly with insights that computer game compulsion included playing a great deal or playing to get away from issues, and connected adversely with discernments that fixation included games' meddling with different real world exercises or not having the option to stop playing (J. Oggins & J. Sammis, 2012). However, even due to the criticisms from experts, the game was a commercial and social phenomenon of grand proportions. WoW was truly innovative in its

ability to create a great sense of belonging in a fantastic community, with in-game events and real life gatherings - BlizzCons organized by Blizzard, WoW managed to gather an incredibly large community of devoted fans.

Utilitarian qualities benefitting client engagement:

- 40 player teams and guilds of up to 1000 members
- Massive, seamless & interactive 3D world
- Engine allowing hundreds of different ability variables

Hedonic qualities benefitting client engagement:

- Community building around chosen guild and in-game class
- Ability to find friendly players to interact with in-game
- Extensive options of customization allowing complete character personalization

Game #4: Minecraft

People say that Minecraft is the most important game of the last decade. Originally Minecraft was not even similar to what was considered an “engaging” game - a simple sandbox game with the world consisting of differently textured and behaving cubed blocks, where players are rewarded for blindly exploring and experimenting with items, thus giving the game its name. Now each game world is a massive, randomized world. Originally developed by Swedish video game programmer Markus Persson, better known by his alias Notch. Minecraft was a passion project that attracted attention once he uploaded a very early build of it on the Tigsource forums in 2009. The same year, Notch established video game developer group Mojang Studios, synonymous with the title’s success. After this Minecraft started gaining underground popularity as Notch kept developing and releasing new builds for the game, meanwhile the added content was quite cryptic, thus it kept the growing community and playerbase attentive. Minecraft was coming out as video game Let’s Plays (filmed play sessions completing a game, typically with commentary) became popular on the growing video platform YouTube, along with the birth of now popular primarily-gaming dedicated streaming site Twitch. Due to the simple yet engaging gameplay, seamless and easy multiplayer and child-friendly theme, Minecraft had a very symbiotic relationship with video content. A great example could be the impact of the YouTube channel Yogscast, created by L. Brindley and S. Lane in 2008, with their instrumentally important Let’s Play “The Shadow of Israphel” which implemented the idea of narrating your own story throughout the game. Their Let’s Play lasted a total of 2 years and 3 seasons, attracting millions of views per video. As the hype started building around the free game and due to its

exposure on various online platforms, forums and video sites, the site added an option of buying Minecraft for around 10$ and being guaranteed of receiving a copy of the final game upon release, a technique common in today's gaming development world called "early access". Minecraft managed to make over 3,000,000$ while still in Alpha with this model. Another key feature of Minecraft that helped cement it as a revolutionary game was the ability of wiring complex mechanisms and writing actual code into the game with "command blocks" - allowing people to recreate almost anything they wanted: a working guitar, a playable version of the 1980s classic "Pac Man", or an entire playable recreation of the immensely popular 1996 hit game "Pokemon Red". Many games tried utilizing Minecraft's Survival and Creative game modes as mechanics, but none seem to recreate the creative endlessness that Minecraft seems to provide, however some did attract great attention, Terraria is a great example of this. Minecraft seemingly galvanizes people into sharing their in-game creations with others in the game's community. The game peaked in popularity in 2014 and has been in the decline ever since (Google Trends, 2021). In 2019 the very popular YouTube commentator and gamer PewDiePie started a Minecraft Let's Play series, with his first episode alone receiving over 48 million views and kickstarted a second wave of mainstream interest in the game. Currently Minecraft has around 130 million monthly players and is the best-selling video game of all time with 200 million copies sold on all platforms, surpassing GTA V (145 million) and Tetris (100 million) and raking in revenues of 415$ million during 2020 (D. Curry, 2021) Minecraft comes to show that graphics, story and realism all take a second seat to a great idea with a simple yet approachable implementation in gaming, and potentially other applicable areas as well.

Minecraft Earth was an AR mobile game released in 2019 by Mojang Studios, similar to other notable AR mobile titles, it was centered around free mobility and user collaboration to complete minigames, build and battle in game. However due to its unfortunate timing of release, most people could not enjoy the game to any significant extent, since the majority of the world was undergoing quarantining and lockdowns. A game designed around free mobility and community play was a total miscalculation, as stated officially by Mojang, since those two things had gotten close to inconceivable in the current worldwide circumstances. Mojang thus decided to drop support for Minecraft Earth in June 2021 and focus on other products of the franchise, however a comeback of a different AR project by Mojang should not be ruled-out.

Utilitarian qualities benefitting client engagement:

- Randomized game-worlds generated with a shareable code or "seed" in 16 x 16 x 246 cube segments called "chunks"

- Easily accessible yet sophisticated game mechanics allowing complex in-game structures
- Amazing 60,000 kilometers by 60,000 kilometers in-game play area with 256 block height limit.

Hedonic qualities benefitting client engagement:

- Start of the “Let’s Play” format content creation trend, incentivizing everyone to share their creations.
- Extreme amount of player freedom, thus allowing for entire game personalization.

Pokemon Go:

The hit mobile AR game, released in 2016 on both iOS and Android smartphones it was a social phenomenon all of its own. Launched on a freemium model, with players being able to pay real cash and get many benefits, as well as in-game exclusive currency. With close to 300 million users in 2016 (Niantic, 2021) and the game’s parent company Niantic being valued at $4 billion in 2019 Pokemon Go is the most popular AR mobile game on the market (M. Iqbal, 2021). Built around the Pokemon franchise, the players must go out and walk in the real world while catching monsters from the animated series, using items obtained by visiting pokestops - real world areas of interest. With an AR view of the monster being captured and the need for physical movement, it was a very revolutionary experience for anyone who tried it. There are many parallels between the video games discussed above and Pokémon Go, however the main difference being the platform of utilization along with the requirement for real-world mobility to achieve multiple actions in game.

Pokemon Go - Social Gaming Feature Similarities With Business:

According to a study from 2006 by F. Liarokapis the classic game “Breakout” was recreated, consisting of a player-controlled paddle, a bouncing ball and breakable bricks. The goal of the game consisted of the player having to simply break the bricks by bouncing the ball off their paddle. The game was recreated in 3D viewed through a 2D monitor, VR and AR to test the differences in user opinions on the game’s medium. Due to the limitations in processing power, the 3D version was superior in the realism, efficiency and camera categories. The AR version of the game scored higher in categories of: general usefulness, physical learning and interaction with the game.

There are multiple common factors in the features implemented by Pokemon Go that correlate directly with the features in the F. Lariokapis’ recreation of

Breakout, however it also has features common with all other video games mentioned:

- A first-person point of view when aiming the pokeballs at monsters (Doom, Quake)
- The selection of an in-game team represented by color (WoW)
- The possibility of player avatar customization (Minecraft, WoW)
- Battling against other players and teams (Doom, Quake, WoW, Minecraft)
- Befriending & trading with other players (WoW, Minecraft)
- Massive accessible play area (WoW, Minecraft)
- Virally spreading user-generated content about the game (Minecraft)

By contrasting this study with the advancements in business adoption of AR, along with the different social game mechanics implemented by the aforementioned video game titles, a comparative process can be applied to Pokemon Go and some examples of business implementations listed in the Current AR Implementations section:

AR in Retail:

Surprisingly, the application developed to help shoppers visualize furniture they want to buy by overlaying it on their phone's screens through scanning their surroundings utilizes a technique also employed by Pokemon Go: by placing hundreds to thousands of dots on the surrounding area, the app can show furniture with nearly perfect accuracy. This is also employed in the growingly popular category of virtual clothes & accessories try-on applications, such as the Bielorussian AR sneaker try-on app - Wanna Kicks. This very same technique is utilized in Pokemon Go, by making the player "look around" for the AR visual of the creature. This is disguised as an in-game action of looking through bushes and leaves, allowing the game to hide any and all trackers - as this is done a pokemon can suddenly appear in the phone's screen overlaid atop the player's surroundings. This allows even phones that do not have dedicated AR hardware to engagingly utilize AR content.

AR in Factories:

A prototype system for assisting General Motors (GM) engineers with the action of spot-welding was deployed in Australia. A decrease of 52 % of the standard deviation of manual spot-weld situation was seen when utilizing augmented reality viewable prompts (D. Ashish, 2017). All welds were inside the necessary determination and datasets assessed in this investigation were utilized as well as the end result made accessible to shoppers. The augmented reality system providing viewable signals empowered all

engineers to spot-weld at a more significant level of exactness and precision. This is very similar to the implementation of subtle visual cues implemented by Pokemon Go when the player is in the process of throwing the Pokeball at the monster, by tracking the player's finger inputs, movement and acceleration, the game can therefore produce various different throws, including a spinning throw. The player must also visually track the pokemon for any visual changes - the creatures cannot be catched during certain animations, while others tend to randomly move around, which makes it difficult to catch them. A small round ring is constantly following the creature, depending how small the area of the ring is at the moment of a pokeball contact, the player can achieve better rankings for their capture efforts.

AR in Traveling:

Pokemon Go has established the idea of designating specific landmarks and locations in the real world as Poke-Stops in-game. By approaching them, players are greeted with an image and description of the area of interest and a prompt to spin the stop. If they interact with the Poke-Stop, the players receive a random selection of items that assist with gameplay in many different factors. The app by Fondazione Sistema Toscana: Tuscany+. It is a principal AR application, and one of the first of its kind. developed for use explicitly in the Tuscany area it works like an advanced local escort. Drawing data from Internet sources, like Wikipedia, Google Places and the area's official websites Tuscany+ conveys vacationer data in Italian and English with respect to user convenience, best restaurant locations, the city's nightlife and obviously touring around the best spots in town (C. D. Kounavis, 2012).

3. Methods

This paper consists of primarily qualitative desktop analysis of academic, educational, informational literature, along with Q&A interviews and a survey on social engagement in video games in the area of client engagement. The two key areas of study are *Augmented Reality* and *Video Gaming* and how they relate to the client engagement of online and physical communities of individuals in a novel and useful way. Information relating to client engagement and retention was gathered on two key sectors based on their applicability in hedonic and utilitarian use cases.

Additionally, each game is to be assessed on what of its client-engagement features through the comparison of parallels between the five video game titles and Pokemon Go as a medium for gameplay and interaction. During the conclusion of the literature review, a set of keywords based on client

engagement are to be selected from both sectors' literature's keywords. All of the literature's accessible information is then carefully exported as raw text and analyzed with textual data mining and analysis software. The use of this software is for the correct designation and finding of overlapping categories in both subjective categories.

Model & Hypothesis:

The Research basis and literature review data gathered for this paper was based primarily on an academic article proposed by K. Żyminkowska in 2018 demonstrating two different drivers in client engagement, these being hedonic and utilitarian dimensions. Although the idea of client commitment has been a significant subject of continuous conversation encompassing the gaming business policies, still little is known on the effect of client engagement that involves hedonic and utilitarian measurements, on client engagement indications toward the companies, after the moment of purchase. The fundamental reason for this examination is to look at whether and how hedonic and utilitarian elements of client commitment in AR games and the parallels with AR applications in different business organizations.

According to information gathered from the literature review, the hypothesis formulated for this study is:

- "AR features implemented in games can be used to help with businesses' client engagement."

Research Setting

Due to the nature of gaming being accessible to both very young and mature audiences, along with its still rapidly growing pace, no set age, location or gender is utilized in this analysis.

In this paper an examination is undertaken into the gaming industry having similarities with how mass AR adoption in businesses worldwide is implemented as a technological medium for client engagement. Extra attention is put on socially engaging features from both technologies, especially more synergistic ones from both aspects of research: hedonic and utilitarian.

Research Strategy (**plan**)

Research question: How does the gaming industry create and grow client engagement?

- Conduct research of information on the topics of the gaming and augmented reality industries in the form of a literature review. Analyze

historical information to compare the social engagement advancements in each area.

- The information to be collected using the publicly accessible Google Scholar search engine, consisting of academic publications, editorial essays, journalistic articles.

- The key objective of this research is to examine the key applicabilities of gaming and augmented reality for client engagement practices, as well as their synergistic effects when combined.

- Analyze the relationship between the social features of augmented reality gaming - relate them to current AR implementations by businesses.

- Topic analysis to be accomplished by both reading and manually analyzing the information, as well as utilizing the help of online and desktop applications for visual data analysis.

- Upon completion of the analysis of specific key areas, interviews of multiple gamers to be conducted, questioning them on the designated key areas of study about client engagement using AR.

- The responses of the interview's participants will be utilized to assemble a questionnaire. This questionnaire will use key questions about AR gaming and AR as a social engagement method.

- The information collected from the questionnaire will be utilized to analyze and decide on a best practice for implementing AR for client engagement in a business setting based on gaming-oriented features.

Data Analysis:

Literature Review:

Literature review utilized to refine and assess historical and business-related aspects and curiosities of AR and gaming in a socially engaging application. Both AR and gaming are analyzed as a separate topic and related under the unifying mobile app video game Pokemon Go. The similarities between Pokemon Go and games #1. to #4.

Visualization Method:

All of the publicly accessible data from the studies is added as unstructured text into the service provided by Dcipher Analytics for assistance with

language processing and data visualization in a single environment. Due to the software's specific features of analysis, visual networks between words can be formed based on many variables, as well as the search of any keyword and its corresponding location in-text.

Exploration Method:

This is the fundamental exploration to explain the specific idea of the issue to be addressed in the crafting of the following research method. The exploration method in this case will consist of the conduction of semi-structured interviews to explore previously untouched or barely researched aspects of the implementation of AR in social engagement scenarios. These Q&A meetings are utilized to guarantee extra data separated from the examination material is taken into consideration during the further investigation, just as deciding examination needs, gathering information and focusing on social AR executions which might be hard to observe without this outer exploratory exploration.

Content Validation Method:

Construction of a questionnaire to be utilized for the validation of the proposed hypothesis and verification of the findings from the interview. The content validation alludes to noticing every one of the particular things on the questionnaire developed to decide if the questionnaire tends to the point by and large. This permits the guarantee that each thing compares to an ideal estimation and that all that ought to be estimated is really estimated.

Data Collection (**outcome**)

Data Sources:

All of the information for this research has been gathered through the publicly accessible search engines Google and Bing, as well as the Google Scholar search engine.

The primary data sources consist of academic articles and analytical studies.

The secondary data sources that have been investigated during this research consist of informational & journalistic articles on both the gaming and augmented reality industries.

Data Collection:

A key part of the desktop research was constructing and assessing data specifically for this paper, as well as incorporating as many external,

previously unthought-of factors of interest as possible. A series of seven interviews with 6 self-described gamers and an online content creator were conducted on the subject of social and client engagement in AR & gaming, as well as other possible applications for the growing technology.

Furthermore, a questionnaire has been conducted based on the data from the literature review and interview sessions. The questionnaire received responses from 115 individuals, the majority of whom were gamers.

Units Of Observation:

Literature review:

- The historic growth of gaming as an industry
- The historic growth of AR as an industry
- Similarities between AR & Gaming
- Common features between Pokemon Go and businesses' AR usage

Interview:

- How can gaming implement AR?
- How can other industries implement AR?
- What's the social impact of Pokemon Go as an AR experience?
- Does AR provide a tangible benefit?
- Why isn't AR mainstream already?

Questionnaire:

- If the respondents are gamers
- Play time per week by respondent
- Encounters with AR in games by respondents
- How many respondents would play a social AR game
- Inclination towards social gaming in AR
- Main AR limitations
- Main AR features for social play

Data analysis:

- General literature review and comparison-based analysis
- Mainly qualitative research by applying visualization
- Content exploration: consisting of an analysis of the interviews
- Content validation: of the questionnaire respondents

Limitations:

- The survey was anonymous for privacy reasons, due to the ease of personal-identification of respondents based on their application usage.

- The interviews were conducted online due to interviewee location and health & safety regulations.

- Some questionnaire questions were unanswered due to difficulty or misunderstanding.

- A large subset of users has still not been introduced to augmented reality.

- Many users confuse augmented reality technology with virtual reality technology.

4. Findings

AR has been used very sparingly for a long time compared to other growing technologies of today such as the blockchain, AI or machine learning however in recent years, many companies have started adopting this new technology.

As some industries limit the application of augmented reality to strictly utilitarian use cases, many others have implemented AR in a more visually engaging way, akin to how many video games have been implementing their features for many years.

Retail AR:

by implementing a tracker-based visual augmented reality system in their products, both IKEA and Wanna Kicks have benefited from a great deal of interest from both users and media alike. The discoveries recommend that augmented reality adoption is set to become a standard as client fulfillment becomes moderately high and their utilization furnishes orderly experiential advantages alongside benefits to retailers. Regardless of certain disadvantages, their utilization is emphatically connected with numerous retail results. Versatile AR applications are viewed as changing buyer conduct and are related with progressively high client valuations of retailers offering them.

Factory AR:

Upon implementation of AR as a technology assisting engineers, manufacturers and other workers, factory plants have noticed very significant improvements in their employee's efficiency, productivity and motivation with a positive decrease in errors and the amount of time spent asking managers for instructions. This paper shows the AR execution measure in plant settings through its execution in Pokemon Go, introducing a thorough survey of right now accessible gaming items with related highlights. This paper likewise recognizes and examines themes justifying customer commitment to guarantee that the AR innovation is effectively carried out on the modern workshop or factory floor.

Travel AR:

By utilizing the same idea of attracting customers to a specific location by digitally enhancing it, the tourism industry was really inspired upon the release of Pokemon Go. Pokémon Go can be utilized to investigate, explore and memorialize new locations and landmarks, and to interface with others through basic encounters of play. These activities comprise a type of expanded reality in the travel industry that is characterized by energetic and

intuitive, yet additionally homogenizing, experiences with new individuals and spots.

The general takeaway from this research is that features that have evolved and been implemented in the gaming industry for client engagement can be translated into similarly engaging client/user experiences, which when applied creatively can lead to very novel and engaging experiences for clients. Depending on the use case, the application of AR can be utilitarian or hedonic, with business-related applications often focusing on the utilitarian aspect, while gaming tends to focus similarly on both hedonic and utilitarian areas of augmented reality implementation.

5. Conclusions, Limitations, and Recommendations

Conclusions:

Augmented Reality might actually be the greatest thing in online business since the web search tool. It's an incredible idea from the work area, however when mobile, it takes it to an entirely distinctive level. This could both disturb physical retail locations and supplement them. With the aftereffects of the examination pointing towards a high acknowledgment of this innovation, online also as disconnected item advertisers could acquire now by considering their intended interest group and putting resources into AR showcasing efforts.

Five video game titles are taken apart for analysis and their client-engaging features are compared to augmented reality solutions implemented by businesses. The comparative analysis is done utilizing the hit mobile AR video game Pokemon Go, due to its implementation of all features from the previously assessed video games.

An example of innovative AR usage could be the detection and analysis of clients' emotions in physical shopping locations, so that the sales representatives have a better understanding of what they should offer.

Another example would be the visualization data directly from a screen by taking a screenshot and translating it into an AR display, where the image could be amplified and zoomed onto the field of view of its editor.

Overall AR seems to have massive potential for completely transforming the way businesses and brands communicate their products and services to consumers. Apart from business implementation, augmented reality might even be the next logical step in the evolution of networking and telecommunications, especially with the upcoming optical AR devices and displays. Although the technology has massive potential, what's currently lacking is a perfect format that wouldn't sacrifice technical features for portability, along with a need for more software and content created by AR developers.

Limitations:

Limited data accessibility into the mobile gaming market makes it difficult to gather precise quantitative data about augmented reality - an already niche area of implementation.

The high cost of analytical documentation has also decreased the accessibility of absolute precision in this industry-wide analysis.

Recommendations:

A quantitative research of customer satisfaction with specific key AR integrations in products could be undertaken, which would help consolidate the main point of this paper, that AR does help better engage with customers.

A quantitative research of user satisfaction with features common in both gaming and business oriented applications.

An in-depth analysis of how the client's responses and interactions with the brand change as AR features get implemented in their products or services.

Safety analysis of augmented reality implementation into basic services and games - safety is a vital key factor for the longevity of AR as a technology and its mainstream adoption.

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Appendices

Interviews Consensus Form:

All interviewees read the terms specified before each interview was conducted. All participants willingly committed to assisting with this research and had no problems from partaking in the interview.

“I agree to participate in the research paper entitled "Augmented Reality As A Client Engagement Tool In The Gaming Industry" undertaken by a student from Geneva Business School named: Nojus Mugenis. By concurring beneath, I recognize that: I have consented to participate in this investigation, I have been educated regarding and comprehend the reason for this examination, I see how the information gathered will be utilized, and that any classified data will be seen simply by the specialists and won't be uncovered to any other individual. Subtleties identifying with anonymity and privacy have been clarified and I comprehend these. With full information on all previous, I concur, willingly, to partake in this investigation.”

Interviews:

#1 - JORIS LINGĖ

Nojus M: OK, so hello there, how are you doing?

Joris L: Oh, hello fellow gamer, I'm doing well.

Nojus M: Could you please introduce yourself?

Joris L: I am a programming student at Vilnius University and a program developer in my free time. I am also an avid gamer, spending most of my time in front of the computer - It's only natural to want to unwind after long sessions of studying or coding.

Nojus M: Well, very nice. Very nice. I wanted to ask, do you know of a concept like augmented reality or AR.

Joris L: Yes, I am aware of what that is.

Nojus M: All right. Have you encountered AR in your life?

Joris L: No, not really, not in a first hand experience.

Nojus M: OK, what if I prove you wrong right now? I know that you play Pokemon Go.

Joris L: I did, yeah. OK, you got me there, I guess technically it's not only like a camera assisted augmented reality experience as in the sense you can catch Pokemon, like throwing the pokeball - doing so in a real location. But the fact that it has real life locations to go to and interact with in the game, like

you have to be near it - to even be able to actually interact with it - it shows that it's sort of like an augmented reality.

Nojus M: Correct, right. So did you notice any social aspects of this?

Joris L: Well, if we can reference that time we played Pokemon Go together back in 2017, right? I think that's a community aspect that you need to construct some sort of quick assembled team to battle a stronger Pokemon or even gym in that case.

Nojus M: So do you see like Pokémon go that it was sort of like a community building tool?

Joris L: Yes, I think that it has a very strong aspect of community building in the core of the game. Mm hmm.

Nojus M: And do you maybe like what is your favorite game right now?

Joris L: Favorite game huh? I currently "grind" a lot of ROTMG (Realm Of The Mad God).

Nojus M: Describe the game in a few sentences.

Joris L: Well, it's not an 8 bit game as people often confuse it with - it's in a pixelated style. It's an MMO, RPG, co-op shoot 'em up. That's what it's classified as.

Nojus M: So do you maybe even see augmented reality being implemented in a MMO sort of roguelike manner?

Joris L: In the future, it could be doable. Like with the real life locations with like, yeah, yeah, I think that that's possible entirely. Mmhmm.

Nojus M: And what do you think is mainly the downside right now of this technology?

Joris L: I guess one one thing a lot of people have is that I guess not trusting the developers or the owners of the system, I guess, like showing them everything you see through the camera.

Nojus M: So privacy issues mostly?

Joris L: Yeah, yeah, yeah. I think a lot of people are weary of it. I guess, yeah, they are turned off by that factor, like referencing the idea that to use the now popular virtual reality system, Oculus Rift, you have to have a Facebook account.

Nojus M: Right, so people are afraid that you might need to have, like some sort of ID system that shows your personal information to the company that provides you the service of augmented reality.

Joris L: I suppose people would much rather prefer to stay anonymous, like disconnect their identity from their virtual activity. From their general use of products and systems.

Nojus M: Very interesting. Could games implement augmented reality as more of a utility tool for aiding communication and maybe Stat visualization. Well, uh, to give an example, GTA five and Warframe and many other games have a companion application for like a smart mobile device where you can do certain actions in game without being inside of the game.

Joris L: Yeah, well, what if you had an application that sort of extended your monitor or had a hug where you had the information that would normally occupy a part of your screen real estate be transferred over there? Essentially in your field of view, but also freeing real-estate on your monitor.

Nojus M: Essentially like some type of Google Glass, in a way?

Joris L: Yeah, I think that that moving part of the HUD would be kind of cool to have, like moving together with your vision, always be in the corner. Yeah, it would make screen space more efficient because, obviously you see more than your monitors, you see way wider than that. So your monitoring space could be taken up solely by the game itself. And then you have the GUI Elements, these could be on your peripheral vision like around the monitor itself.

Nojus M: What would you like to see from AR implementation in gaming?

Joris L: From the programmer & developer standpoint, I think what's important is giving the possibility to develop to the community itself, because obviously the community itself wants to bring the games they play forward, like upgrade and polish them. Make them better and better with each passing day - and being part of the developers, I know we will. We should do it ourselves as communities meanwhile the large studios and companies are too busy in other areas to do that. But with modern regulation it's like it's never going to happen. Like, why put a roadblock there when there's people who are willing to help you, like, basically for free to just better the game and possibly the industry as a whole.

Nojus M: So you're talking more about open source type applications?

Joris L: Yeah.

Nojus M: Right. So this comes right back around to the point that I'm trying to make that augmented reality is a community tool, like it's a community building and community driven tool.

Joris L: Yeah, probably more driven by communities than used to build them, but it can be used either way. I'd say given these days the community like building themselves up into clusters, but it's still able to attract a lot of people that are interested, like in general technology to the field of computer vision and general like visualization and alteration of reality through electronic means.

Nojus M: Now, hmm, and how do you think the effect of this general global pandemic and our inability to normally communicate and go outside, we are actually asked to stay at home most of the time, we can't really have any physical contact. So would augmented reality be like the next step for social interaction through, like, the Internet?

Joris L: Well, like the next step being that the current step is virtual reality, like not games such as the Vacek current step is just like social media. And the moment we're having right now, the ability to communicate, what's the method of communication, apart from seeing a hologram of your friend in front of you?

Nojus M: Well, maybe since we're talking about augmented reality, we're not talking purely about a video perspective. We could talk about sound and other types of interactions, for example, haptics and other types of feedback providing. A good example would be the twenty eighteen like automobile manufacturer BMW, I believe, had produced a holographic display with a haptic feedback like interaction with the hologram itself, with light through a speaker that would basically like vibrate the air around your finger to make you feel as if you touch something.

Joris L: I think that's cool. I can imagine someone touching someone else using nothing but sound waves in their own room, but. I mean, that would be very interesting to see now, do you think like an augmented reality handshake?

Nojus M: Yeah, yeah. Like augmented reality as a sort of interaction through a distance. A more informal, maybe even friendly interaction than the standard like display and camera that we have right now.

Joris L: More friendly, like what does that entail in your mind?

Nojus M: I mean, it may entail more visual feedback from the person. You know, you could actually look somebody in the eyes when you're using augmented reality. OK, you could actually, like, supposedly put somebody at

least simulate that interaction and maybe not even touch like a small poke interaction could be like enough now. Should I poked you?

Joris L: Yeah. 2013 Facebook all over again with the pokes.

Nojus M: But that was an actual feature of Facebook, interesting why?

Joris L: Yeah, yeah, I know that. That's why I mentioned it. I think it's still possible to do it, only with it being super hidden.

Nojus M: But you see AR then more of just a utility for general, like specific tasks, maybe like wearable displays.

Joris L: Taking into account what currently AR is used for in the world, I'd say it's more informative, like helping experts of fields display their information when doing important things, yeah, of course there are tons of different applications. There are very interested and engaged people that make their own wearable displays. So there's a guy on YouTube that, like, always wears a, I guess I'll call it like a Google Glass type of thing and he uses it as a teleprompter in all of his videos to create a script. And he's like looking straight at a camera at the same time.

Nojus M: That's like added utility.

Joris L: So, yeah, I'd say it's mostly used for utility these days. Right. That doesn't mean people can't use it for community themed things, I guess. What would be cool, eventually when when this technology becomes way more portable: once you enter a convention or even university - you get a wearable display and it would show you where's your next point of interest or lecture or something, you know, like where's the information stand, where's the toilet or whatever, like show up bath or something or just like information pop up. I mean, you could, if such a technology was available, gather like 30 people and give them all AR headsets so you could play games in the city itself, like treasure hunts or even good old Counter Strike.

Nojus M: All right. Thank you for your time, Joris, and also thank you so much for participating and that was a great experience.

Joris L: You're welcome. Thank you. I had fun as well.

#2 - LUKAS DRAZDYS

Nojus M: Good day to you.

Lukas D: Good day to you too.

Nojus M: Could you quickly introduce yourself?

Lukas D: Yes, my name is Lukas Drazdys. I am about to graduate in the field of data science, which I greatly adore. I also like technology in general, before this I used to partake in a lot of personal projects to do with 3D modeling. I also have always played video games, and would consider myself as a casual noncompetitive gamer.

Nojus M: Wonderful. Alright I have a few questions for you.

Lukas D: Sure, go ahead.

Nojus M: Do you know what augmented reality is?

Lukas D: Yes.

Nojus M: Have you encountered it in your life?

Lukas D: Not in any significant way, apart from its implementation in Pokemon Go.

Nojus M: That's something. For example, how did you see AR being utilized in Pokémon go?

Lukas D: Well, it was a more immersive gaming experience. You basically could get interactive and engaging moments in your actual surrounding environment. I was never too big of a fan of the Pokemon franchise. So basically, that's it.

Nojus M: Hmm. Did you notice any social factors that came together with that experience?

Lukas D: Yeah, well, a lot of groups of people were going outside and trying to catch those Pokemon, so probably, yeah, there were more or more social gatherings.

Nojus M: Using augmented reality, do you think that the factor of geo location and basically making certain spots actually intractable in the game? Improved usability for larger groups. For example, the ability to place a lure and attract more Pokémon to a location does not have a social implication.

Lukas D: I don't think so, because usually if you place a lure alert, you place it for you and your friends, you don't really expect the other people to join in, at least not on most of the occasions. But at most times they do join in. But

basically, you always stare at your phone and just keep chatting with your friends so it's not really socially boosting.

Nojus M: What types of games do you find most engaging? Strategy, first person, shooters…?

Lukas D: I generally enjoy platformers & puzzle games most these days.

Nojus M: And do you see augmented reality being applied in a platforming or puzzle type scenario?

Lukas D: Yeah, sure. There is an old PS2 game that you can play as a detective and utilizes augmented reality really is just that.

Nojus M: Wow, OK. I didn't know that that's actually new for me.

Lukas D: OK. Hmmm, I hadn't played it, but it seemed interesting. Mm hmm. Yeah.

Nojus M: And aside from mobile gaming, do you see AR being implemented as an everyday tool in your life?

Lukas D: Due to the fact that you would need to wear glasses or anything, or even thinking of a perfect scenario if you had, like, contact lenses that were smart, for example... Well I would have to answer that at this point - not really. But I can see it being utilized for ads, because it would be a lot cheaper to place virtual ads instead of physical ones.

Nojus M: What about the personalization factor, like if you have an augmented reality ad, technically you have a personal screen for each person watching, right?

Lukas D: So you could target them based on all of their customer data that you have acquired - yeah, that would also be, in a way, cheaper and more efficient, especially when it comes to customer attraction and retention. It'll be like browsing the Internet through life. Mm hmm. Mm hmm. All those personalized ads on the streets.

Nojus M: Very interesting.

Lukas D: Now with all the Google tracking and so on, it would also be a lot more efficient to place those ads. Actually, it would depend on how those ads are placed in life using augmented reality.

Nojus M: Yeah. And overall, do you see this technology advancing or do you think it might just be a gimmick and might be just forgotten?

Lukas D: That can be easily advanced and is used in everyday life, in many aspects and applications. The horizons for this technology are truly broad and I believe that it's up to the developers and designers to implement something truly unique to attract a larger user base. In the end these technologies start generating their own content and sub-communities or even "subcultures". I think only time will tell what will happen with this tech, but it does have my favorable vote.

Nojus M: Well, thank you a lot. Thanks for your time, Lukai.

Lukas D: Thank you for this great session.

#3 - LUKAS LAGO

Nojus M: Hello, nice to talk to you.

Lukas L: Hello, nice to be here.

Nojus M: Could you introduce yourself quickly?

Lukas L: Sure. I am Lukas Lago, I would call myself a pro-gamer, but I do not play competitively enough to deserve such a title. I am also a learning programmer, currently not enrolled in university, but planning to do so soon. I am firmly determined to continue programming.

Nojus M: Great introduction! Now let's get to the questions.

Lukas L: Sure.

Nojus M: Do you know what augmented reality is?

Lukas L: Yes I do very well.

Nojus M: Have you encountered it in your life?

Lukas L: Several times, actually. Most recently, I've noticed a bunch of new places where it's been used more often.

Nojus M: Right. Give me an example.

Lukas L: I mean, Wikipedia a couple of years ago actually started to do a program where they made 3D models, animals, for example. Like if you're using Google browser on your phone, if you search for "horse" you scroll

down and you can see a 3D model of a horse. It can even put it up on your display in its real-life scale and even place it in a room using AR.

Nojus M: That really is useful!

Lukas L: Right, yeah.

Nojus M: And have you noticed any gaming implementations of augmented reality?

Lukas L: I don't think so, actually. At least not in my area of gaming.

Nojus M: Are you sure? There are many huge mobile games utilizing AR, Pokémon Go is a big example

Lukas L: I mean, yeah, but I'm more into PC and console games. I don't see it being implemented into these areas that much. But yeah, I know a bunch of examples for mobile.

Nojus M: Oh really, which others do you know?

Lukas L: I know there's like they made a bunch of those types of games, like, again, Pokemon. They made a Jurassic World one, a Harry Potter spinoff, even a licensed Digimon AR game somehow. Oh, yeah. I didn't even play - I just saw them. But I thought it was interesting because it's a new type of interaction with the game and I think it really is cool.

Nojus M: And did you notice there are any social implications in AR gaming?

Lukas L: Again, going back to Pokemon Go, where people had to walk around and actually do stuff to catch the Pokemon. I now remembered a quite dark and negative aspect related to the question. I heard there have been muggings using the game where people would lure people into alleyways and parkings with things called incense. Basically a consumable object in-game, which made more Pokemon appear around an area which also lured people.

Nojus M: What about a more positive social aspect?

Lukas L: Yeah, there was also a more positive aspect of it. There were people who went outside more and started doing exercises. A lot of people created chat groups and online communities surrounding the game and would all go out together. There was a lot of self-policing of the community and an ill-behaving person wouldn't generally be accepted at all. However another major factor was the media generated to do with Pokemon Go. The memes of this went ablaze all around the Internet. It was completely flooding all social media sites and tons of blog sites.

Nojus M: And what is your favorite type of video game?

Lukas L: I recently really got into the Souls-Bourne series. Like Sekiro and Dark Souls and all those. I also really like third-person shooters, first-person shooters and even occasionally a battle royale.

Nojus M: Right. So you are pretty pretty varied.

Lukas L: Yeah I like to change games once in a while.

Nojus M: And you see augmented reality being implemented in one of those genres to any useful extent.

Lukas L: I really see it being implemented in VR chat and other VR titles.

Nojus M: There was an idea of being able to toggle between VR and AR modes.

Lukas L: Yeah, exactly.

Nojus M: But what about like don't you think, like it could be adapted more of like us a social tool, like for chatting or at least like as a as an informational tool to show like your video game,

Lukas L: Most useful for me as a gamer would be the HUD and data being in AR instead of it being on the screen. It could be like a screen extension around your monitor or at least in your field of vision. I think that would be a cool thing, definitely. But I think it's already being used again in VR games, where you have visual representations of real places that are to scale like I'm pretty sure you can, there's like representations of New York that are like to scale, allowing you to simply take a stroll through the city.

Nojus M: Thanks a lot for your contribution, that was a great session.

Lukas L: Thank you for contacting me, it was great being able to share my thoughts!

#4 - MATSVEI KALESNIK

Nojus M: Hello there.

Matsvei K: Hello.

Nojus M: Could you introduce yourself?

Matsvei K: My name is Matsvei Kalesnik. I am currently studying business and am an online content creator. I dabble in gaming casually, although I enjoy simulators and visualizers more than simple video games. My content isn't about gaming - I love travelling, working out and generally am interested in new technology as well as social matters.

Nojus M: Great, Let's start with this: do you know what AR is, also known as augmented reality?

Matsvei K: Yes, I am aware of it.

Nojus M: Have you encountered it yourself?

Matsvei K: I have encountered it in cultural heritage institutions like museums and galleries.

Nojus M: All right, well, what was the implementation of AR there?

Matsvei K: So basically, one gallery was using augmented reality to immerse you into a game, and through that game you were basically completing a virtual tour of a location. And you could be an animal, for example, like a pig or any other creature and in this form you could interact with the environments and with other characters in the game as well. Yeah, it was pretty new and exciting.

Nojus M: So it was like a gamification of a learning process?

Matsvei K: Yeah, the idea and implementation were purely recreational with a strong gaming basis.

Nojus M: It wasn't like a scientifically accurate representation for study purposes?

Matsvei K: No, no, it wasn't like a simulation where you are supposed to do an experiment or anything like that.

Nojus M: And do you think that it could maybe have an implementation like this. Like maybe. Let me rephrase this. Could you maybe gamify the teaching of history to kids by using AR?

Matsvei K: Yes, I think so, potentially, you could emerge them into into, let's say, historical battles and create the settings in which they actually happened, like Napoleonic wars or something, or you can make them the main character of a Roman history period, like the killing of Caesar when he was stabbed by his fellow student, you know. Yeah, you could absolutely implement AR

games into the process of learning. The potential here is enormous and there's still a lot to discover.

Nojus M: Still a lot of potential, indeed. And you probably noticed that this game is called Pokémon Go. And there are many others like it, but none are as popular as it. Did you notice any social phenomenon attached to that game?

Matsvei K: Very much so. The fact of it augments your reality by including creatures to catch and objectives to fulfill, actual distances you need to cover or points in gyms that you need to go through physically to interact...

Nojus M: Did all of that have anything to add to the social factor of the gaming experience?

Matsvei K: Yes, I think that it definitely influences the way that people interact socially with each other and with the world. And there's not a clear cut way of determining whether it's good or a bad influence on social interactions.

Nojus M: Right.

Matsvei K: Because for some people, it became a stimulus to go outside, all because outside you can go and catch Pokemons, and go towards those spawner locations, you could also meet fellow Pokemon catchers and maybe interact with them and establish new social connections outside of the game so it can have a potential social bounding element to it.

Nojus M: And what would you like to see, like not even in gaming, but what would you like to see from augmented reality? How would it be most helpful to you?

Matsvei K: I think. To me personally, I see a good learning potential in simulations, so let's say I'm a car driver and I want to learn how to drive a truck, and instead of having to physically be driving a truck, I could go and practice in a simulation first. Or if I wanted to become a pilot, AR already is a practice being widely used. And yeah, instead of physically putting myself in danger, I can first go through the simulation and adapt to the environment, learn to control my reaction and then have a higher chance of succeeding.

Nojus M: These days during the global pandemic, since we're confined in our homes and can't really have much social contact. Do you think augmented reality could be utilized? To actually like maybe bring in another type or maybe even the next step of human communication?

Matsvei K: Well, I think in the absence of face to face communication, augmented reality and the digital means for communicating can be the only

way to interact at all, especially over long distances when borders are closed and so on. And I think we saw a good implementation of it in virtual bars, for example, where people would just join in online and have a chance to to have some sort of a social interaction with other people. And potentially, if the trends continue, the way they are, maybe will become the only way that we will be able to socially interact. But still, I think the offline way of interacting is still superior and will hopefully remain to be the main way that people interact with each other, because that's how we are, that's what we're made for.

Nojus M: And do you see augmented reality then as more of a tool or more as an entire idea, movement or a system for change?

Matsvei K: I see it as a cool technological tool, which, if used properly, can bring a lot of benefits to the learning experiences and give people more possibilities to learn a much larger quantity of quantity information quicker.

Nojus M: Supposedly, if you have bio trackers on you already, like a smartwatch or whatever - you could technically go for a run and simulate a number for experience points calculated by your general well-being, which could motivate some certain individuals to take more care of themselves or at least go out more. The gamification of just getting fit, basically.

Matsvei K: Sure. It can stimulate people too. To compete with each other, because then you can put it all on the virtual board and compare scores of different people at different times and create room for competition or go full out crazy and create like a virtual currency that we like gets reported to you. Then you can get skins for your avatar or whatever. I think there was already a system like that implemented where you were getting some form of cryptocurrency for not not necessarily for working out, but maybe for walking.

Nojus M: Well, thank you so much for your time.

Matsvei K: Thank you for inviting me, a pleasure.

#5 - ROKAS MIKALIŪNAS

Nojus M: Hey there. So how are you doing?

Rokas M: Hello, I am doing fine.

Nojus M: How would you introduce yourself?

Rokas M: My name is Rokas Mikaliūnas, also known by my alias Obsalon. I have been and am deeply invested into electronic music production for years now. It is one of my biggest passions.

Nojus M: And are you a gamer?

Rokas M: I used to be an avid gamer. Not so much more to me. I just have a lack of time to spend on video games. I mean, everybody goes through it like you can't really game anymore when you're studying or working. Yeah. It's a sad truth of life. What I'm getting to is basically, have you noticed like any games that are starting to include augmented reality, as in basically the projection of virtual objects on top of the real world instead of, for example, like virtual reality?

Nojus M: OK, basically, do you know what augmented reality is?

Rokas M: I have a vague understanding, the general gist of it.

Nojus M: What it does, it replaces the real world, augmented reality. It introduces basically a character from a video game who's standing in your room and reacting to you, for example.

Rokas M: I have heard of that.

Nojus M: A good example of this would be Pokémon go.

Rokas M: Oh, yeah. If we're talking about that kind of augmented reality... I know it, I've played it a little bit when it just came out.

Nojus M: Oh and while playing Pokémon go, did you notice any social phenomenon going on as you like playing the game?

Rokas M: Yeah, definitely. I don't remember exactly how they're called. I do recall gyms or something and they were in different parts of the city and you just noticed a bunch of people hanging around those spots. Of course this was pre-covid, so that was legal. But you see a bunch of people or just a handful of people hanging out in the same place, battling out Pokemon or catching the same Pokemon. And it was a nice and innovative way for social gatherings to happen. A nice social phenomenon where where people are not intending to meet anyone or or even trying to we're not even expecting to meet anyone, still being able to to interact with other people

Nojus M: Do you see any other matters that augmented reality could enhance social experiences?

Rokas M: I've heard of something relating to screen projections. It's something like a projection of a screen onto a flat table or wall. Once you use it you're well aware that it's an extension of your desktop or study.

Nojus M: For example, the GTA franchise and many other games like Warframe, have implemented an ability for you to access game statistics through an application on your mobile phone. What about including that information in your visual view, as you said, extending your display, using augmented reality?

Rokas M: Yeah, I mean, that would be definitely interesting. I would really love for that to be implemented as either a gaming tool or just a quality of life improvement.

Nojus M: And you yourself are involved in the music industry, right?

Rokas M: Yes.

Nojus M: And you see augmented reality being innovative in the music industry in some way or another?

Rokas M: If we're talking about screen real estate, there are multiple there. It's quite a common occurrence where our screen real estate is lacking on a single display where you have a bunch of selections on your program and you want to see your results, your monitoring or whatever, or just playing a virtual synthesizer, and it just you don't have enough screen real estate to have all of the screens or rather windows open all at once. So if we're talking about augmented reality in the sense of extending screen real estate - yeah, I definitely think it's useful in the music industry.

Nojus M: What about the visualization of music?

Rokas M: It really depends on how well the visualization would be presented because, yes, obviously monitoring of your volume levels and frequencies is a very important part of music production and mixing and mastering. But there are plugins that are made specifically for that, with quite a bit of research and development behind them. So depending on how the augmented reality version of that would be implemented, would determine how well it is. Let's hope it's implemented in a way that the developers would make it show very exact levels and frequencies or I guess improve usage efficiency.

Nojus M: I have a quick example for you. BMW had already devised the technology of how to use speakers to provide haptic feedback on holograms: basically how to make you feel objects that are made of light as if you're touching them. Crazy idea time - what if you project a virtual piano with a set

like an array of micro speakers beneath it that can simulate like the haptic feedback of a real piano?

Rokas M: While the idea is definitely interesting to explore, the biggest point of stress of that would be, I guess the quality of the keyboard. Right. Not the sound or anything, but the actual playable keyboard that you touch the AR keys. The quality of them is determined by how they feel. And we're talking about electronic keyboards where they're not acoustic. Yeah, it does have the innate like it's impossible for them not to have any beat, whereas electric keyboards, electronic keyboards or digital or analog - they're just keys that are based in third quality, is determined by how the keys feel and their response time. If you could combine a really good virtual electronic keyboard, with the haptics aspects with augmented augmented reality, you could definitely simulate a completely realistic piano style, because when a hits a note, it produces a vibration normally not present on electric pianos.

Nojus M: As you see right now, we are limited through our covid times and in general we're not asked to go outside. We have to wear masks. We can't really have much social interaction. Do you think that augmented reality in gaming and maybe in even other social aspects such as education could really enable us to have a new way of socially interacting or maintaining the norm of what is considered social interaction?

Rokas M: I guess that just boils down to the creativity of the developers of such technologies. The same way that the Internet and smartphones enhance our lives in general. You can see how they are enhanced and extended, how people socialize and interact with each other. I believe that AR could be the next step.

Nojus M: Thanks a lot for your feedback and a great session to have with you.

Rokas M: Thanks for the questions as well, a truly informative subject!

#6 - SÉBASTIEN DE BEAUFORT

Nojus M: Hello. Hope you're doing well.

Sebastien de B: Hey there, nice to meet you!

Nojus M: How about a quick introduction?

Sebastien de B: Of course. I am Sebastien de Beauffort, a true gamer since my early childhood. Right now I would describe myself as a serial entrepreneur and developer.

Nojus M: Alright. Have you encountered augmented reality in the real world, or is it just a concept for you?

Sebastien de B: Well, I have had the chance to to play a bit with it at a very early stage of it.

Sebastien de B: Okay, well, I mean, firsthand the only augmented reality experience for me was four years or so ago, that technology I've used is all I know. But I've been using related applications and following with what's happening in the field and what 3D visualization does with that. It's very interesting.

Nojus M: And are you familiar with gaming, would you consider yourself as a gamer or at least interested in that aspect?

Sebastien de B: Yeah, if I was not on my phone but desktop, I would show you my Steam account on my computer.

Nojus M: But a more specific question, as you said during your early days - you probably experienced gaming first as a kid, right?

Sebastien de B: Yes. Well, I guess the first video game I have played, or at least watched my dad play was a game back in 1992 - I was two years old back then. I started playing myself at the age of probably around five when the first-person shooter genre had a huge boom.

Nojus M: And what was your most influential game?

Sebastien de B: Very good question. Well. That's played a lot of different games. I don't reach a 100 percent completion on every game, but it's hard to find. Um. Well, I wouldn't say there is one per category. Well, the first game I played really extensively was the F 22 Raptor, a latest release of a flight-simulator type aerial combat game.

Nojus M: And these days, you see how games have advanced a lot, not only in their graphical fidelity, but also in their storytelling, mechanics and general player interaction with the game. For example, right now I'm playing one called Warframe. What you can do, which is interesting, is that you can perform certain actions through a companion app on your mobile phone: you don't even have to be in game to do certain tasks, which would require you to waste some time to approach a computer, but now you can do that all on your smartphone. Can augmented reality actually enhance the gaming experience for standard games, maybe even a strategy game or an isometric observation game, because you don't necessarily have to be in the first person of something to actually enjoy it.

Sebastien de B: I think you are right, especially when you are talking about the asynchronous games, so you have different types of games where the players do not have the same experience. Well, the big player who put a lot of faith into that concept was Nintendo. And, you know their Wii U console as it came with asynchronous games. I think we didn't have the great categories of success that they had because they might be in the situation that the players are not yet ready for such experiences. Maybe it's because of AR knowledge and its implementation in gaming is not ready yet. I haven't seen it for augmented reality yet, like how is it that much more beneficial that with a person playing on a computer with the standard keyboard and mouse? And it was exactly like that in-person when a person tests something in an event. And maybe well with time I guess we'll add some new features to either the games we play, that allow a more approachable and easy AR experience.

Nojus M: One game that has actually implemented augmented reality in a very well thought-out manner from the usability perspective, the marketing approach and game quality was Pokémon go because it was a huge success in general, like. The generation of attraction of customers was magnetic for some groups of people, and it also had augmented reality factors in it, not just the fact that you catch up like a virtual Pokemon, but you have to go to actual locations, you need to cover real distances, you need to interact with other players or walk up to certain structures in the game to actually get a benefit from it. Point is - you can't be stationary. So do you think that other games would implement this or that this would continue on as a trend?

Sebastien de B: Well, it has already come out quite a few years ago and we have seen a few games trying to do AR in some ways, with some kind of success. But then think about Jurassic Park, for example, it's done well and still a good game. And still I haven't played it, but the reviews were good. But in the end, Pokemon's go: it's the social electricity. It has been dubbed as the deluxe is the augmented reality gaming experience, and that's adding something, that's what's creating something for other developers to begin from - because they are true to a great part of the game, as you know, when many more aspects of the original Pokemon games are untouched. But you can have the part where you actually travel across the world and go to places and actually interact with environments and you have the part where you have the integration of the touch commands on the camera, on the phone, which is more an exotic experience. It doesn't change so much in the gameplay right back where you can just deactivate it. Or if your phone just doesn't support AR, that's not a problem from the gameplay perspective. But if your phone doesn't have a GPS - well then you are out of luck. So because in the end, augmented reality is adding some virtual layer to reality and you can do it in multiple ways. One is just to add something on the map, which is the man in Pokémon. Google maps is also now implementing AR into its service, but they

are doing that as some fun feature for people curious in technology. Yeah, but also we have some other games that are well integrated with what I would call an augmented pseudo-reality. There are these treasure hunts in the real world...

Nojus M: I do know what you're talking about! I don't remember what they are called, but I had found a couple of those boxes in a couple of areas in Lithuania. One of them was a fake ventilator, which was only a magnetic 3D printed shell that you would just take off of metal objects. And there was a message inside for the next clue, and so on...

Sebastien de B: Yeah, so that's also had some success, not as popular as other AR games, but still a unique experience.

Nojus M: Yeah, but with Pokémon go, one of the most interesting phenomenon which other games would kill for basically is the community aspect, because it wasn't only a community, it was more of a new way of socializing for certain individuals of fan bases were you are sure to meet somebody who is also either playing or a fan of Pokemon. At least back in the summer of 2017 when it was launched.

Sebastien de B: Yeah, well, actually it was a bit disappointing from the community side of it, especially when you look at the previous game of the same company. Ingress I think it was, because it was really community-building. This one you had to play socially, you could not play alone if you wanted to do actions in game, such as build or destroy portals. You needed to be a team member. It's a bit less so in Pokemon Go. And in the end, you have more players but less players playing the community side of the game. I think especially because the old generation players like me are missing the strategy part of this game. And of course it's fun to play because, yes, it's nostalgic love. It's simple. It's to be honest, but. But you don't see getting a stronger integration for like a generation of a large community-base. Even the interaction is just: "Oh, hey, you're playing Pokémon go. How's it going" And that's it? Really, the developers need to think, in the sense of interacting with others: "what can they do for me in the game?" While you may be able to exchange a few gifts because anyway, you don't have anything else to do with it, plus you get a reward for that, but apart from that the interaction is empty and it fills your inventory, which already fills up quite fast in the game. Well, and also at the beginning I think the friend adding system was not well polished either. If you were not good friends in the game already, you could see someone who was standing right next to you. You could not find your friends directly either. This all was a great...

Nojus M: Hindrance to the game?

Sebastien de B: Yeah. I think the community for this is built outside of the game, rather than on the inside, don't you think?

Nojus M: Yes, definitely. But ever since the dawn of gaming, for example, let's look at some of the most influential games ever, Doom and Quake, right?

Sebastien de B: Yes.

Nojus M: They had very, very strong modding support ever since day one and many other games like Team Fortress 2, Portal and even Half-Life were inspired or even built on the same engine. Why not make more augmented reality engines open source and let the community basically build games for free for you? There are people who are really dedicated to this and they want gaming projects to come to fruition, without even taking money for that, instead they would invest their own time and effort to do such projects.

Sebastien de B: There is a way to do this. Well, when you look at, for example Unity 3D if you want to go for a quick development and an easy development job. I want to go for something deeper. You can go for Unreal Engine and now you're free to to use much more advanced tools, plus the 3D render is pretty fast to take into your own hands and start utilizing, even if you're a starter. Of course it's better if you're a developer and you know how to code at least a little bit helps. But you already have a fully working visual programming design through the engine or even 2D engine if you want to produce just in 2 dimensions. Well, for augmented reality 2D isn't very useful. But anyway, you can only play with the physics of the game without even having to code. On my first hackathon, in 2012 or 2013. The guy who arrived second at the hackathon and it was quite nice - he won 1500 dollars. So he didn't code the game at all. It was just using the physics of the game, which was key, due to the game being a labyrinth navigated by the player's movements. The goal of the game was to get a ball rolling through the labyrinth and into a key location. This project was created as a game with a specific target: to create games for disabled people. True, it wasn't leisurely gaming, it was used for education and rehabilitation. And it was done using the Kinect camera...

Nojus M: Oh, really? So sorry to interrupt you, but the Kinect these days has so many resources behind it. You can utilize the Kinect for so many different things because it's old tech by now. It's pretty crazy. It's being utilized in so, so many places.

Sebastien de B: Yeah. At the time it was still the Kinect 360. There was a newer Kinect for the Xbox One I think, but it was not compatible with the computers. The hardware was organized by Microsoft. That's why I had access to all of these gadgets, which was great. And yeah this game was just

as developed as a standard game without inputting any line of coding. This was pretty impressive for its time.

Nojus M: Even for someone who's not yet a pro programmer or a serious developer, you need an engine for 3D so you can run it super fast. Well I'm actually learning Unreal at the moment and it's a pain in the head, but it's worth it in the end because like it or not, it's very powerful. But I need to learn to code better in general, like I'm really in the beginning stages and as you said it is composed of a lot of various separate segments of knowledge.

Sebastien de B: Yeah. Unreal is made for you if you want to make something that looks really good, if you want a good graphical detail, definitely it's the way to go but you have to master more concepts definitely to do it and but you can do it without the code. You have this blueprint-style visual editor with wires connecting certain functions. It's pretty clever if you don't know how to code or you don't want to write code. Well if you are serious in the end you must know how to code. But because it's more visual, it's still a programming language, just visual programming, instead of text programming. But it's pretty great overall. And in the end if you master that, you essentially know how to code.

Nojus M: Today since we're quite limited by the covid regulations, we can't really go outside that much. We can't really hug people that we know and might not even be able to visit the ones we love. All of our social interactions are limited, especially face to face interaction with people. Could augmented and virtual reality help with this issue, maybe even provide a new way for socially interacting with people?

Sebastien de B: For that, it's I think not a question of technology, but how you use it, I think the current players on the market haven't yet found a way to make it nice and better to have an interaction in AR than it is with an actual monitor. Because, of course, we have all of these novel things going on with augmented reality where you can play with your friend and you can put a mask, or filters, or whatever you want on yourself, just like Snapchat started doing. In the end it's also augmented reality, and well maybe there is one feature that is really useful, the one that you are using right now: having a virtual background during this conversation. Especially for professional calls more than personal calls.

Nojus M: Oh yeah, definitely. Especially the background blur. Maybe not an entire replacement like right now, but a black background blur, eliminating distractions without really hiding things, but eliminates distracting elements and keeps our attention targeted towards the person talking.

Sebastien de B: Yeah precisely!

Nojus M: But I was thinking: we see a lot of hardware that is specifically used in these technologies, for example smartphones, like the iPhone Pro Series and the iPad Pro Series, as well as certain Android manufacturers have implemented these things called LIDAR sensors, basically light detection & ranging. Basically, it emits a laser that's not visible to the human right, but it can detect the range at which the object is from the lens, therefore it makes calculations and it can instantly place virtual objects really accurately in the real world as well as do measurement tasks and simple things for now. But for example, could this be implemented in the future, maybe to extend monitors converting them into large displays, for example, or adding background to an actual speaking person? Having more variations of implementations, is it down to the developers to implement or is it down to the consumers to require these things?

Sebastien de B: Well, I think it's more up to the designers than the actual developers, because you have to really understand what is the need of the person who is using it. I think, technically speaking, it does not seem to be that hard of a thing to develop. The question is more, how would you make it user friendly? How would you make it fit the needs of the person who will use it? And I think that we are coming back to what we were saying earlier about generally, what can virtual reality, augmented reality and all of these new technologies help with, for people to communicate and create new ways to do so. It's not a question of do we have the technology to do it? How should we do it? To make it so this technology enters into our everyday life. Back in 2011 or 2012, maybe those years, did you know the company OVH?

Nojus M: I've heard of it, yeah,

Sebastien de B: So I was at their big event, the CEO of OVH said: "We are in 2012. During the last few years, we have developed a lot of great technologies that are amazing, but we don't know yet how to properly utilize them." They had a lot of new features for smartphones, since the smartphone was already out for a few years and already quite well adopted and utilized. But still questions were constantly coming up about augmented and virtual reality, drones and blockchain and other forms of technologies that were already there. And as the CEO said right now we have these technologies, now we have to find out how to use them to make it better people's lives. And that's actually been happening during the years. Well, we have been learning to use these technologies and to make them useful for us. And I think, well, augmented reality and virtual reality are kind of an exception to these technologies, because we are not yet there, we still need to find a way to best portray the AR and VR experiences.

Nojus M: So in your opinion it's a lack of an appropriate format for actual mass-consumption, rather than the need for actual innovation and technology.

Sebastien de B: Yes, and maybe also because we are stuck with the smartphone age right now. So for many years, the main device to use technology was a computer. And we were kind of limited to that. So all the technologies were built around computers. And if a technology was great but just didn't fit in the usage of a computer it was its own separate thing, for example, mobile technology. Then we had these items like the I don't know if you remember the PDA and similar devices...

Nojus M: I actually had a PDA.

Sebastien de B: Yes. But certainly, this kind of attempt to have something as simple as a digital notebook and make it portable was truly fascinating. But it was not a great success, even when it was working, as long as the computer was the center. And then the smartphone became the center, which allowed us to do some other things, and I think the virtual reality and augmented reality are suffering the existence of the smartphone, and maybe later we will have another devices that will be more helpful for us and that will actually fully embrace these technologies and help us be in what we call "the future", which was maybe the attempt of Google Glass.

Nojus M: There was this idea of uniting the smartphone and augmented reality display technology by using the smartphone as a computer unit. Instead of like your phone being a smartphone, for the moment, it would cease all of that activity and utilize all of its hardware to basically simulate the experience with an added graphical accelerator in the headset itself to make it as sleek as possible with only one sleek unit and no battery needed. It would run purely off the smartphone, although there are still limitations because most do not have a powerful smartphone. Do you think this is a viable integration?

Sebastien de B: Well, there are a lot of limitations because even if you have the best smartphone in the world, well, it will still overheat. And even if it is working, it's only kind of working. You can use it and it will work. But, um, well, for the moment it's not that polished. What ARE needs is an experience like Google Cardboard VR. It's simple and isn't expensive either, something that's very cheap, actually. You can order a unit composed of building paper and the lens. It will cost, you know, three or four dollars or euros and you will have a rudimentary virtual experience. But yet the smartphones are literally not ready for that. And still, it's something else that you have to add on the smartphone. It's not that ideal factor that we are seeking.

Nojus M: Well, thank you so much Sebastien, this was highly informative!

Sebastien de B: I am happy to help, can't wait to read your thesis!

#7 - VIKRANT SINGH

Nojus M: Hello, Vikrant.

Vikrant S: Hey there! How are you?

Nojus M: I'm really well. How are you?

Vikrant S: I'm good, although it's the toughest time, you know, pandemic and everything, so it's not that easy for everyone.

Nojus M: Difficult times.

Vikrant S: Yeah.

Nojus M: Could you quickly introduce yourself?

Vikrant S: Yeah, I am Vikrant Singh, a former GBS student in Barcelona, now a software developer and professional gamer. I am very competitive and take certain games very seriously. I am currently in the top 500 players of Apex Legends according to my game wins.

Nojus M: OK awesome, let me get straight to the point. Do you know what augmented reality is?

Vikrant S: Yes, I do know what AR is and... Thing is, people generally tend to mistake augmented reality with artificial reality, which is a fact, and like 90 percent of the people just do this thing on a regular basis. But it's just completely two different things: augmented reality, it has digital elements to a live view by using, for instance, a camera on your smartphone, digital camera, on your TV camera, on your gaming console, and also cameras in your cars for navigation and everything. And for example, since we are heavily emphasizing here on the gaming industry, examples of augmented reality experience include Snapchat lenses where you can see different animals and everything. And the game called Pokémon Go, which is a really intriguing game. And it has like more than one hundred million user base worldwide.

Nojus M: Speaking of Pokémon, go, I see you have encountered augmented reality yourself, but do you see it being applied in the gaming industry?

Vikrant S: Yes, I mean, looking at the current situation that we have in the gaming industry right now and with regards to covid and everything, things

were on high in twenty nineteen. But since twenty twenty, things have been torn down because there have been a lack of instruments which would be used in order to facilitate AR into video games. For instance, recently they launched AR based guns and guns preview in Call of Duty, which is a first person shooter game highly popular among everyone all around the world, especially gamers. And you can expect spectacular weapons with AR visuals. So, for instance, the gun can also be played as a guitar, which was never possible like 10 years ago, because we were just given the stock stuff which was provided by the developers. But they are just adding a bit more so that they could differentiate the market from the other gaming companies.

Nojus M: And how about augmented reality being implemented into gaming as a community building or like even a client attraction tool?

Vikrant S: I see it as a community based tool, because right now the companies are more focused towards just selling you the concept, not the real product. They just want to give you the flavor of what their augmented reality is, but they do not want to give you the freedom to implement your ideas into the game because that goes against the embargo that they have set up against each and every one to use their platform in order to change their gaming sessions. As a community base you can do a lot of things, for instance, the recent game Resident Evil 8 Village that just came out on May seven. It had potential where you can add AR modifications into the game and you will never get banned from it because it was an open source platform given to the users in order to add mods and characters to the game.

Nojus M: And do you see the usability of, as you mentioned, Instagram filters and other implementations of augmented reality that are not necessarily gaming related? Do you see them having a trickle down effect into the gaming world because, for example, filters are specifically meant as a marketing or community tool? I mean, people generally generate filters for them to be shared and used by other users and then take pictures with them and continue the sharing cycle, basically. Do you think this can be applied into gaming?

Vikrant S: This is actually a pretty tricky question, because if you remember the most award winning or most popular game among all the teenagers back in 2013 and still this is Grand Theft Auto Five, and you saw uses of artificial reality during the campaign, which was like 20 hours long. And then you also saw that if you there's an app called GTA Stack Stats Tracker, if you place it in the front of the game, you can also see light projections of your details about your achievements in the game. You just need to point towards the bar code and it projects pictures of Franklin into your phone. It was just an extra service added by Rockstar, which was pretty niche but was pretty clean and pretty subjective, but it was loved by the community. So I think it has brought

positive influence among gamers. And also by doing this, what brings more to the gaming community is people are given the opportunity to be more flexible towards how they play the game or how they experience their journey within the game, because they can import their own side of things into the game and see how it looks according to them, and let the world know about it by posting it on social media and by making it a chip into making it into their own play format.

Nojus M: That's a very interesting point that you brought up, like the point of like every user, he has his own perspective on things so he can also have his own perspective on the game itself. He can have his own image and how the game or whatever program would be in its perfect-for-him state, therefore with the rise of modding in the gaming community, can augmented reality coalesce with the modding community to bring augmented reality to games that normally don't really implement it or haven't really thought of implementing it yet?

Vikrant S: Yeah, I have a pretty long answer to this question, because actually, if you remember, Half-Life one and Two was basically a game made for PC only. It wasn't never meant for artificial reality or even VR. But guess what happened? They added the functionality of VR into the game, so the time when you are pursuing any sort of things into the game and life motion and time differences, like, for instance, if you're playing something within the game, you can see your body movements or see the movement of your hands. And also you can see the movement of your projected bullets, which we've never seen in games before. So it's not necessarily done on a large scale, but yet there are some games that have already done it. And it is something that for now it is pretty small in terms of community that it latches on to. But I would say in the upcoming four to eight years, I think it's going to be a big thing in the gaming industry because we are currently seeing a high tide of gaming because of pandemics and everything going on. And what it has done is that, which people are inclined towards - having fun. Me, instead of going to play outside, because I cannot just hug anyone or just can't experience communal life, so I just want to experience something that relates to that, at least in a virtual format I can.

Nojus M: And do you think that throughout covid times that since our social life has been inhibited by rules and regulations and just like the common sense not to go outside if you don't really need to... Then, is augmented reality the next step for social interaction?

Vikrant S: Yes, but up to a certain extent, because the problem that we have right now in terms of implementing AR into everyone's life is like 90 percent of the people don't have capable devices that run AR on a full scale. For instance, Android can run 3D generated AR maps in the Google Maps app

that is already included in the phone. But if you want to do the same thing in Apple Maps and navigation software, you have difficulties because the population is heavily emphasizing on using Android because it's cheaper, it gives you all the functionality, and it doesn't skimp on AR. But at the same time, Apple has its own security apparatus. It is a security node where they want to keep everything tight, packed and everything encrypted. That's why they do not want to implement AR right now. They just want to keep it for future products. It's about safety, but it's just something that we need to talk about as a community.

Nojus M: So you would say that it would still take some time before augmented reality is implemented on any grander scale, specifically into the gaming market for customer engagement and generally like the community based approach: content sharing, content creation, communication?

Vikrant S: Content sharing and communication - yes, I remember an AR chat app coming out, but it was banned in several countries and also in New Zealand where they had to ban this because people were exploiting teenagers and they were trying to get personal information out of them and expose their relocation so that they could just prank them or do something more seriously bad. But when we talk about the positive side of things, it could be used in order to educate children about societies and also about the historical events that happen. For instance, some of the games like total war, total war games that teach you about the history of all the British Empire, the colonial empire and also the African Empire. These could be never taught in a span of 30 days. But if the kids are able to experience that through AR by playing the game and also experience all the augmented reality interaction by just seeing the objects float in front of the screen or onto the mobile phone, I think they are going to learn it quickly and this will be really beneficial for them because they are processing the information more quickly as compared to what they will write on the piece of paper. So it reduces the time required from six months to just 30 days.

Nojus M: Amazing, yeah, gamification of knowledge like it always works great.

Vikrant S: Indeed, it does!

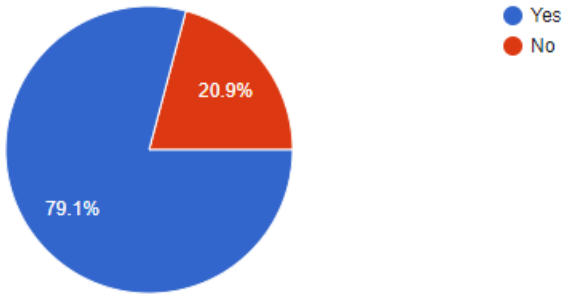
Nojus M: Well, so thankful for your time, it was a great time talking to you!

Vikrant S: Thank you for this exciting opportunity!

Questionnaire Results:

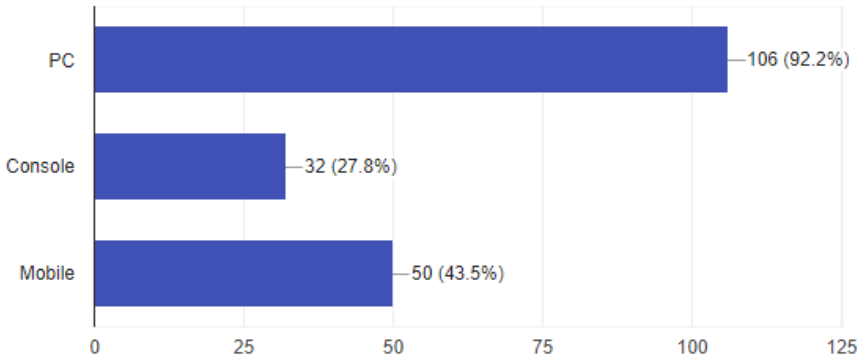
Do you consider yourself a gamer?

115 responses



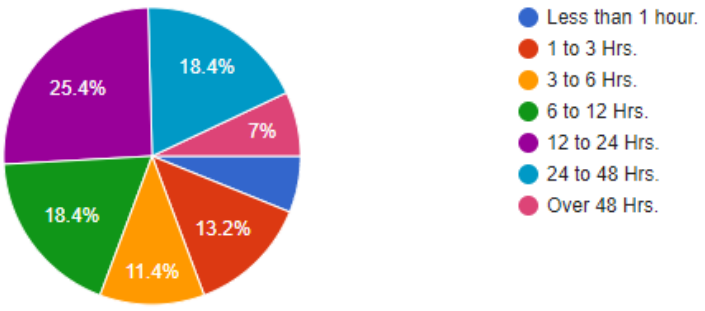
What gaming platform(s) do you utilize?

115 responses



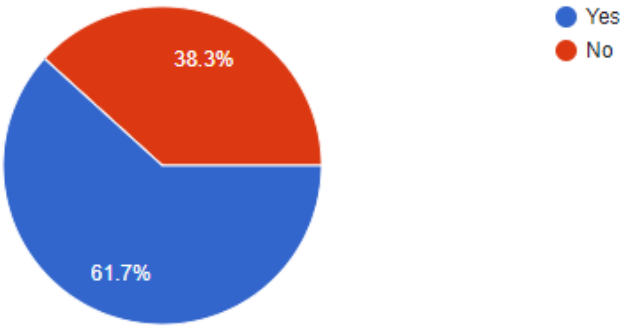
How long do you play per week?

114 responses



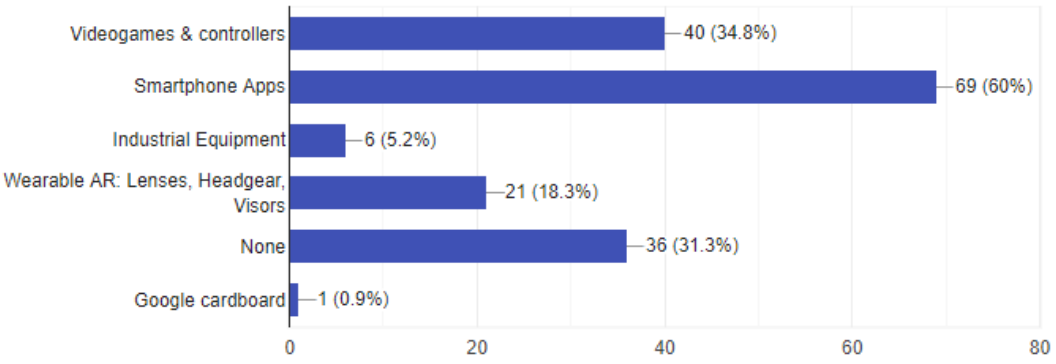
Have you encountered AR in video-games?

115 responses



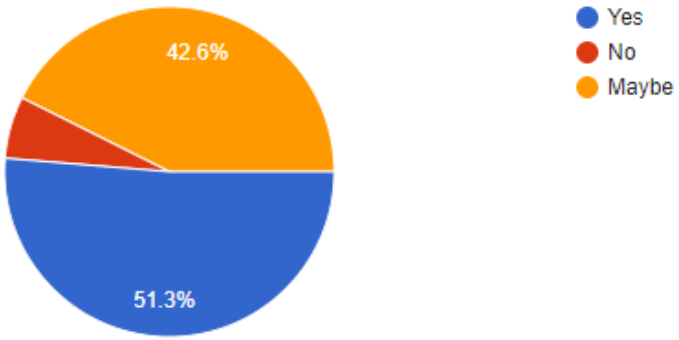
What type of AR have you utilized?

115 responses



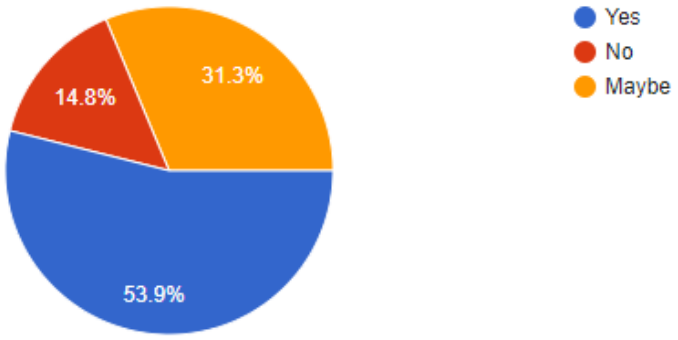
Do you believe video-games can implement AR for community building?

115 responses



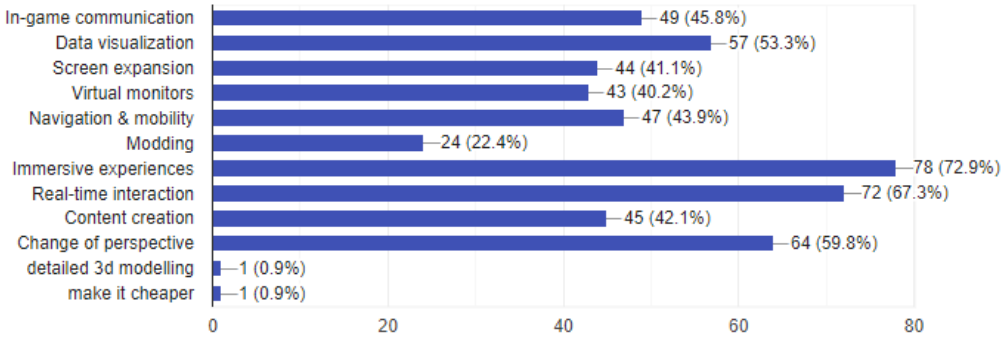
Would you partake in AR gaming if it was affordable and easy to use?

115 responses



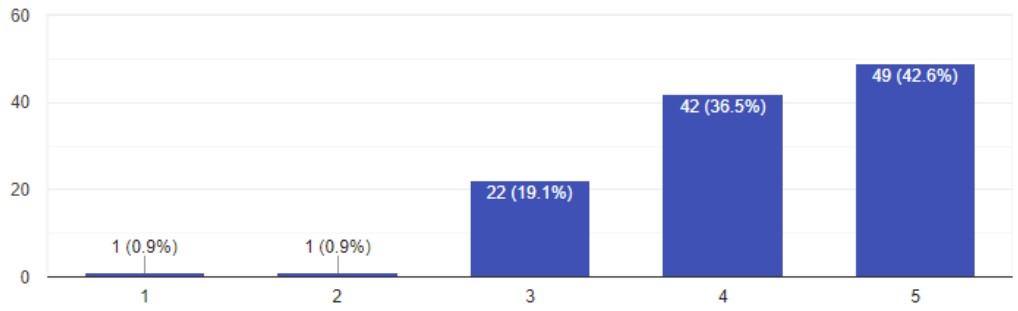
How can AR help gaming communities?

107 responses



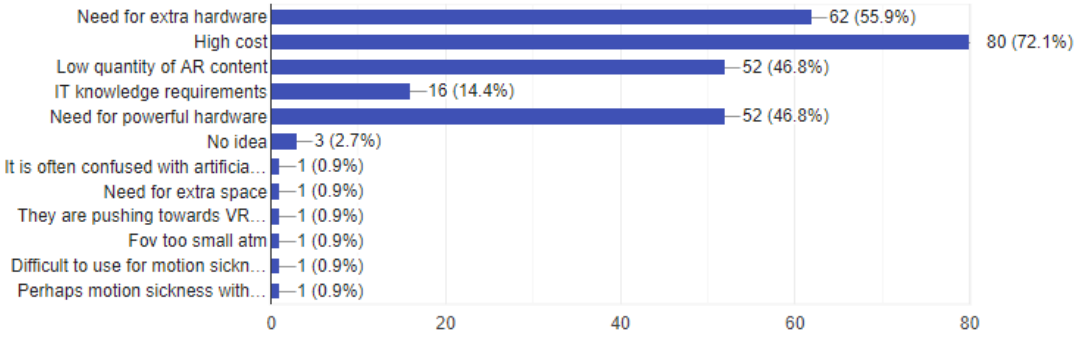
How important is innovation in the gaming industry?

115 responses



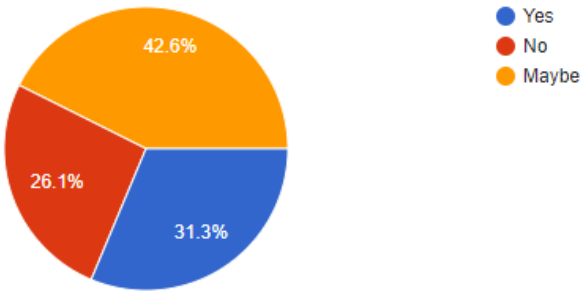
What are the main limitations of AR?

111 responses



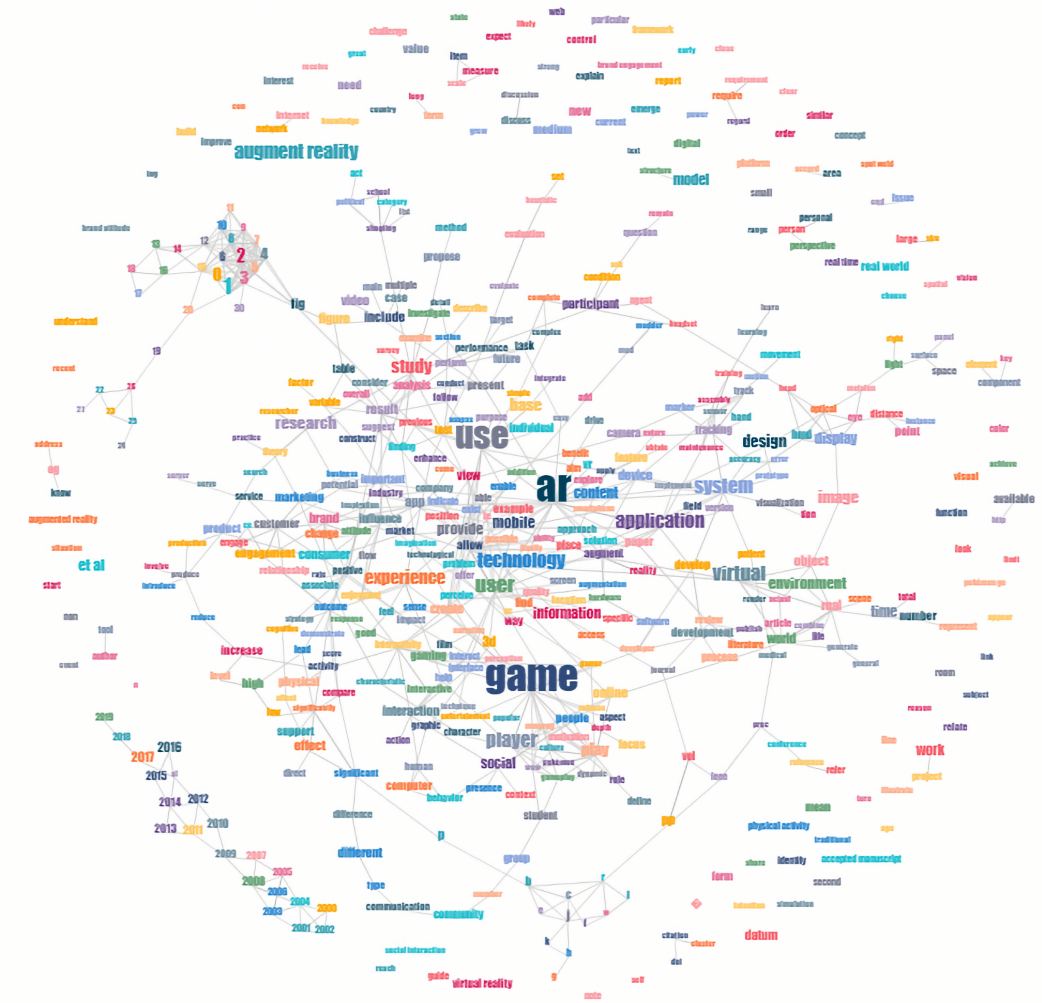
Do you see yourself playing a game with a social implementation of AR, such as VR Chat?

115 responses

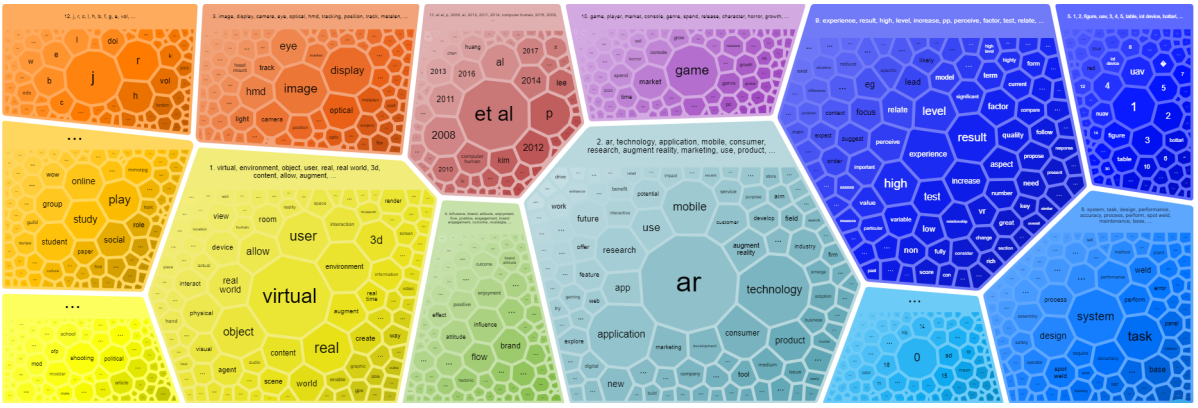


Visual Literature Material Analysis:

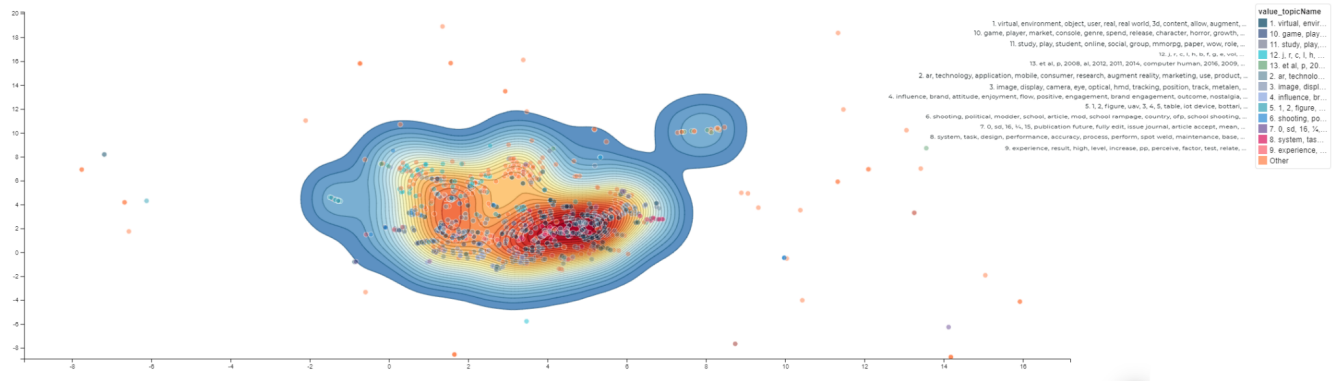
Bubble Chart:



Foam Chart:

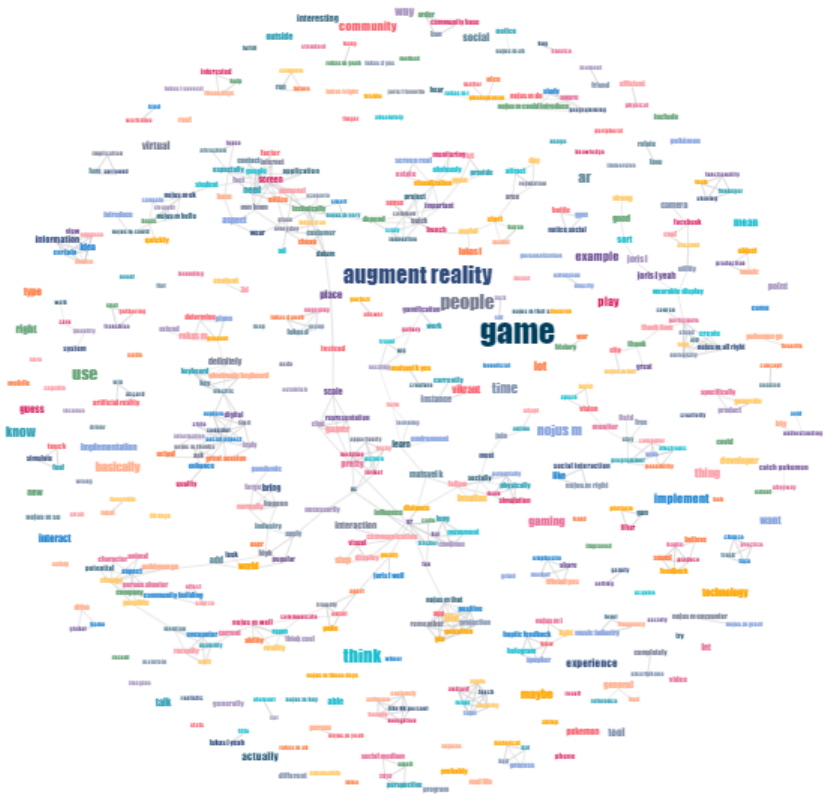


Scatter Plot:



Visual Interview Analysis:

Bubble Chart:



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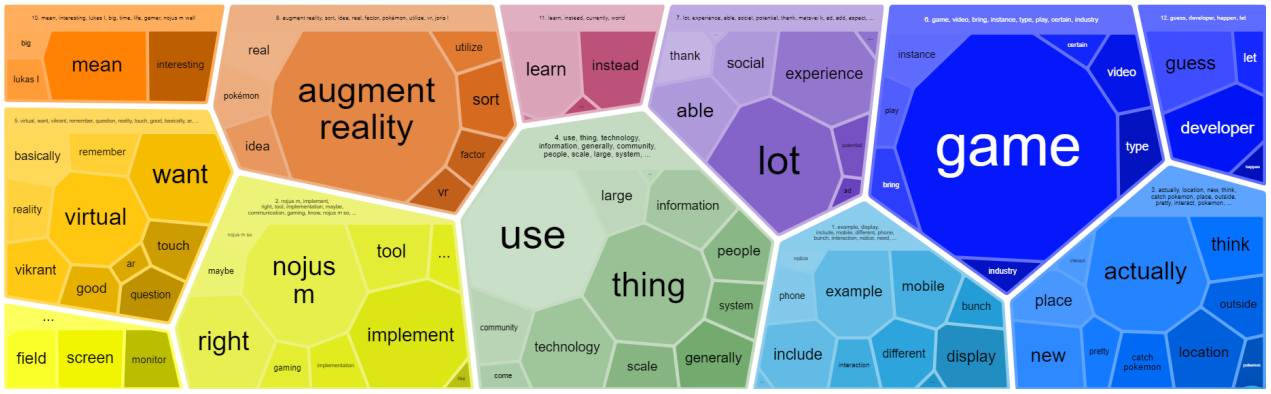

Scatter Plot: