



Developing and evaluating AR game from consumer behavior perspectives

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Abstract

Who would have guessed digital games could make the average gamer to jump up from their sofa and run around in urban environment, but now it is happening. This influence on players is something new as traditionally players control the games, not vice versa. Augmented reality games opened a new world that needs to be studied. Games are a big business and their business models and monetization have been studied a lot except related to augmented reality. Augmented reality games can be used to influence human behavior, but what this new and still evolving environment augmented reality provides for business is largely an open question. At the verge on new Metaverse this study is needed even more.

This study examines the potential for augmented reality games to influence player behavior and monetization strategies within the rapidly evolving digital gaming industry. Utilizing a "In the wild" field trial and a specifically designed augmented reality game, the research explores how augmented reality game environments can be used to indirectly and directly influence player purchase behavior. A group of 11 test players was used and interviewed on their experience and feelings during different scenarios of the game.

Results seems to indicate that players are willing to use money for physical products as part of a game story, for advancement in a game and for reasons that are not directly related to the game itself. Just by placing players in suitable locations they tend to use money and get interested in the services provided, creating possible future customers outside of the game. Study also found out that when immersed to an augmented reality game, in comfortable environment and while having fun the players are more willing to use money and that they create a positive attachment to the businesses encountered while playing. These findings have important implications for the development of effective business models and monetization strategies within the augmented reality gaming industry.

Keywords

Augmented Reality, Augmented Reality Games, Consumer behavior, Game Design, Interactive technologies

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Foreword

I would like to thank Professor Harri Oinas-Kukkonen for helping me getting started and finding the research topic and guiding me to the more specific research question. I would also like to give thanks to PhD, postdoctoral researcher Paula Alavesä, for guidance, help and support during making the game and the thesis, without the technical tips and advice I would have been in lot of trouble and this thesis would never have been finished. Another additional thanks go to PhD, University lecturer Leena Arhipainen for helping to push the last final steps of the thesis. Friends and family and all the test players and contacts who I consulted during this process. Separate thanks go to Jarmo Stoor and the Tähtitornin kahvila Cafe employees and Jani Huhtamela and VR Heaven for taking part in the game sessions and providing the premises.

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Abbreviations

3D	Three-dimensional
AI	Artificial Intelligence
AR	Augmented Reality
GPS	Global Positioning System
GVW	Game Virtual World
LARP	Live Action Role Play
MMORPG	Massively Multiplayer Online Role-Playing Game
NPC	Non-player Character
PA	Physician Activity
RPG	Role Playing Game
SDK	Software Development Kit
SVW	Social Virtual World
UI	User Interface
US	United States
VR	Virtual Reality
VW	Virtual World

Contents

Contents	5
1. Introduction	7
1.1 Background and motivation	8
1.2 Method & research questions	9
1.3 Authors contribution	10
1.4 Structure	10
2. Prior research	11
2.1 AR technology	11
2.2 AR application areas	11
2.3 Commerce in AR and games	12
2.4 AR pervasive games	12
2.5 Motivation from immersion and value of items	13
2.6 On the Importance of the game character	14
2.7 Enjoyment factor in games	14
2.8 Rules and risks	15
2.9 Metaverse	15
3. Research Game	16
3.1 Design progress	16
3.1.1 Game idea	16
3.1.2 AR technology for games	16
3.1.3 Game development	17
3.1.4 Game Locations	19
3.2 Gameplay	21
3.2.1 Start location	21
3.2.2 Game Arcade (Place of the indirect influence)	21
3.2.3 Park (finding clue to move forward in game)	22
3.2.4 Oulu Castle basement	22
3.2.5 Cafe (Place of the direct influence)	22
4. Research setup	23
4.1 In the wild research	23
4.2 Game session	23
4.3 Participants	25
4.4 Materials	26
5. Findings	27
5.1 Questions defining the participants	27
5.2 Game questionnaire	30
5.2.1 The background story	30
5.2.2 First half of the game	31
5.2.3 Second half of the game	34
6. Discussion and implications	39
6.1 Startup questionnaire on the players	39
6.2 Game session Questions	40
6.3 Ethical Issues:	46
7. Conclusions	47
7.1 Research results and contributions	47
7.2 Limitations	48
7.3 Future research paths	49
References	50
Appendix A: Info for test candidates	55

Appendix B: Background story for players 56
Appendix C: Consent form 58
Appendix 5d: Norwegian menu 59

1. Introduction

New technology is born fast. Its effects and opportunities should be understood. The rapid advancement of augmented reality (AR) technology has created new opportunities and challenges within the gaming industry. While AR games have already demonstrated the ability to influence player behavior, there is a lack of research on consumer behavior within this emerging platform (Rauschnabel et al., 2017). Players in AR are in totally new environment between two worlds, and we do not know what this implies. This thesis aims to address this gap in knowledge and explore the connection between consumer behavior and AR games. By examining the unique environment created by AR gameplay, this study seeks to provide new insights into the potential of AR games as a business model and the implications for future developments in the gaming industry.

AR is a technology that enhances the real world with virtual objects. AR is used in a range of displays, including pilot helmets, car windscreens, and mobile phones. Some AR devices, such as AR glasses, are wearable and provide a more immersive experience by creating a link between virtual and physical reality. AR devices combine both “worlds” (Rauschnabel et al., 2015). Various AR apps for mobile phones are nowadays available for consumers (Rauschnabel et al., 2017). Mobile phone apps that use AR technology are commonly available and often used for enhancing selfies with virtual objects.

The characteristics of AR include elements of virtuality that are synchronized with the real world (augmentation), mobility and geolocation (meaning it is portable, you can move and use GPS or similar) and it is interactive (Javornik, 2016). The technology is advancing rapidly, and the development of AR glasses, such as the Nazare Glasses announced by Mark Zuckerberg of Meta, calling them “first full augmented reality glasses”, is expected to further enhance the AR experience (Oberoi, 2021).

The growth of online shopping has opened up new marketing opportunities for businesses, such as the use of gamification to influence consumer behavior. Gamification, which involves the use of game elements in non-game contexts (Deterding et al., 2011) can be used to influence human behavior, for example customer loyalty can be increased by gamification and persuasive technologies (Shevchuk et al., 2020). From the perspective of businesses AR game can be a business model using gamification. AR games are one big area where augmented reality is used, some of which have become extremely popular, such as Pokémon GO (Niantic, 2016), which was reported as the biggest mobile game in US history (Lovelace, 2016). These AR games, which can influence human behavior, are played around the world. They can also promote physical activity (PA) (Wong, 2017; Xian, 2017) and have been widely accepted as valuable for educational purposes (Duh & Klopfer, 2013). Using AR in lessons can motivate young students to learn (Wojciechowski & Cellary, 2013), and linking personally-relevant content to the learning experience can enhance their motivation and perception of the material (Bujak et al., 2013).

Games are also a huge business and there are many different approaches to make money with them. The study of purchasing behavior in games has been a longstanding area of investigation, and the ways in which game design affects this behavior have been well-documented. The obstacles and limitations that designers put to the games and the social interactions have to be considered as they seem to guide the players spendings in a game (Hamari et al., 2017). Purchase behavior of people has changed with Interactive technologies (Javornik, 2016) and AR games are now introducing and totally new purchasing environment. Why and how consumers are playing AR games has not been

studied much yet (Rauschnabel et al., 2017). Traditionally consumer uses real-world money to buy a real-world item and in games virtual or real-world money to purchase virtual items. In AR games, this all gets mixed and both money and items can be virtual or real and they can be useful virtual in game items like weapons or some mundane item like a cup of coffee in the real world. Playing AR games seems to increase the probability to consume money where the playing takes place (Zach, 2017). Motivations to purchase and the consumer behavior vary due different factors provided by the AR environment. The studies to such consumer behavior in AR gaming are still limited (Rauschnabel et al., 2017). What drives the players of AR games, and the ways consumer behavior can be influenced is still largely open. According to Javornik (2016) Consumer responses in AR may differ from web applications. As AR games get more popular there is growing need to understand how the different business models work when motivations to use money get mixed between the virtual and real world. Javornik (2016) calls for future studies in their findings and the need to investigate to which extent the immersion defines AR consumer experience, and this study aims to answer some of those questions.

1.1 Background and motivation

Traditionally, players control a game character or avatar in video games. However, the use of AR in gaming has begun to change this dynamic, with players often taking on the role of the main character themselves. These games also require players to engage in physical activity outside of their homes, moving around often outdoors (Rauschnabel et al., 2017). AR is also utilized in shopping, allowing consumers to see a superimposed representation of products on themselves, similar to try-on technology (Yim et al., 2019). This shift in gameplay and the purchase environment has led to the emergence of new monetization strategies in the video game industry. AR games like Pokémon GO (Niantic, 2016) have emerged that removed the character the player controls and started to influence the players in various ways, some of which are obvious and some more hidden. New ways of getting money from the players have also emerged and the business is booming. The economic value of video games has shifted from a niche industry to a blockbuster business (Marchand, 2013), with AR games representing the new wave in the field.

AR games are often free to play and, in such games, the monetization happens only during playing by purchasing game features (Hamari et al., 2017). These games also provide a new field for players to use both real and game world money, with the willingness to make purchases potentially increasing if players see value in the items. If people see value in the items, they are more likely to purchase them, and this applies also to online games (Park, 2011). In the study Park (2011) defines “integrated value of purchasing game items”, but in AR game the game item can be a real-world item which has a value in the real world and in the game and it can be paid both in the real and in the game world money. The motivation for the purchases could come and the items could also exist in both the real world and/or in the game world, which makes its value a more complex thing to understand. Maybe purchasing clothing for your avatar in a game gets you the same clothing in real world and then the buyer gets items in both worlds at the same time. For spending money in games, alteration of looks is one important social factor (Hamari et al., 2017) and the idea of using it in augmented reality is an interesting one. Maybe by using AR the players could see other players wearing different costumes, items or even totally looking something different. Maybe players of future AR games can buy new skins and alter their looks (Park, 2011).

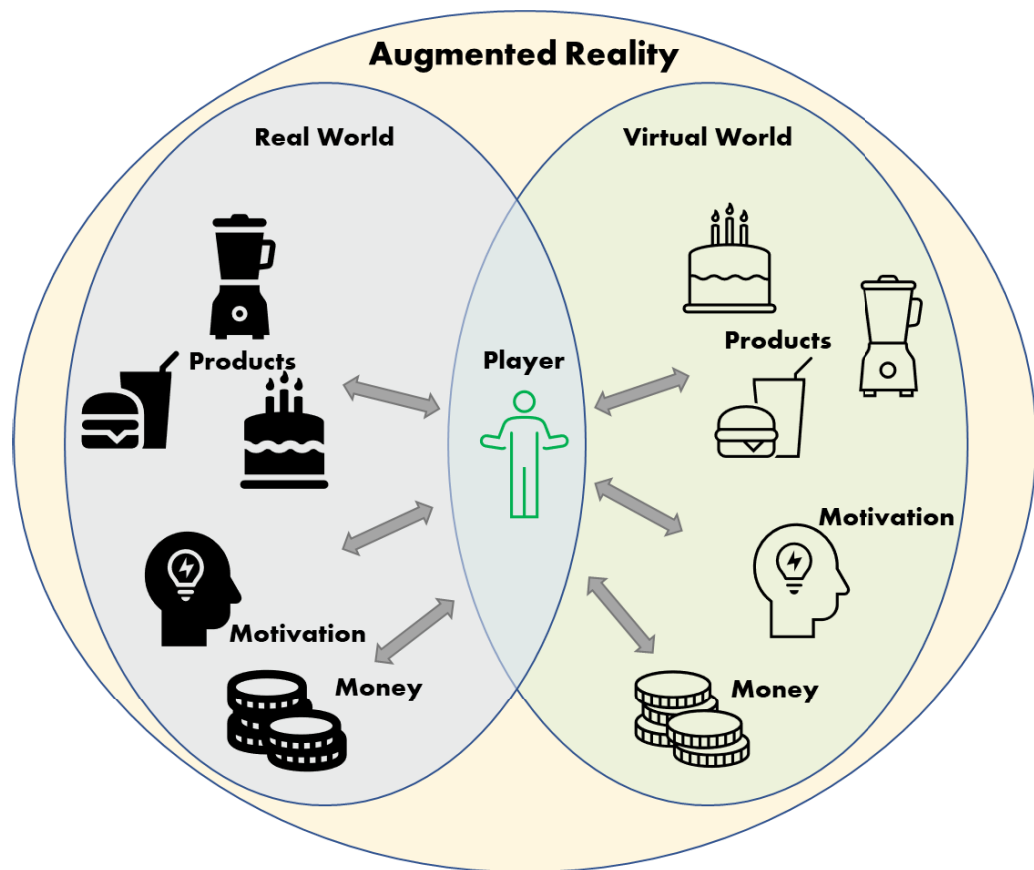


Figure 1. Player in AR, products, motivation, and money (© Author)

This situation is new and interesting. Motivation to buy can come from the virtual world and game story, but it could be also that the player needs to use money in real-world to move, proceed in the game or just gets thirsty while playing. Products can be any kind of traditional game items, rewards, boosts, add-ons or real-world services or products. Money can be virtual or real and all these get mixed, get affected by and affect the player. (Figure 1) New type of games might emerge, and new business models might be invented as this technology gets more common. The importance to understand the situation grows as big companies race towards the metaverse. It is said metaverse is here when more than 1 billion (US) use virtual or augmented reality for 4 hours daily. Facebook investments to Metaverse are huge and they are not alone, Crypto currencies and companies like Metamask are also interested in the metaverse and the business there. Crypto currencies will in future add a new dimension to the equation of AR and business.

1.2 Method & research questions

The objective of this study was to investigate the potential for AR games to influence players' purchase behavior. This study also aimed to identify any emerging ways in which this influence may operate. A key question addressed in this study is the extent to which players are willing to spend money on AR games and when the level of spending becomes excessive or burdensome. The question where is the border between paying happily and not enjoying playing anymore is a complex one (Hamari et al., 2017). In general, when customers are happy, they tend to return and spend more money. If they are unhappy, they go somewhere else (Bearden, 1983; Cronin, 1992). The aim was to gain understanding on how players are influenced in Augmented Reality games and analyze the effects of this influence on the player feelings and the world around them.

The research is "In the wild" (Rogers & Marshall, 2017) field trial, with a research game developed for this purpose.

Research questions (RQ) are:

RQ1: How can we directly influence players and how they feel about it in AR games by introducing real world purchases in games as part of the game story?

RQ2: How can we indirectly influence players and how they feel about it in AR game to become customers of businesses just by placing them in suitable locations?

In the wild research takes the researchers out of the laboratories and controlled environment to the streets 'in the wild' and to the real and original place of the phenomenon within the communities or homes. The aim is to understand how new technology impacts everyday life in the real environment and to lead us to learn how technological inventions work and impact people. (Chamberlain et al., 2012.)

While previous research methods observe existing practices, the "In the wild" research focuses in interaction design on creating and evaluating new technologies in-situ. New tools have emerged that enable augmenting both users and their surroundings and researchers can easily create prototypes for studies that are highly functioning. (Chamberlain et al., 2012.)

This approach is particularly well-suited to the study of AR, a new technology that allows for the creation of novel situations in everyday life and locations. This also enables situations where the technology can affect the behavior of the people experiencing it. According to Chamberlain et al. (2012) there is a move towards experimenting with new technological possibilities that can change and even disrupt behavior and this is what in the wild research is about. How people integrate and adapt the technology and how they then behave is the key concern.

1.3 Authors contribution

The idea for the game, its background and story were entirely developed by the author. The author also programmed and tested the game, as well as creating all of the graphics and technical solutions for the AR aspect of the game. The idea to study player behavior in AR and the research questions were also developed by the author. The author also planned, arranged, and executed the test setup for the study.

1.4 Structure

The structure of this thesis begins with a review of the prior literature on AR and its use in gaming. This includes the psychological and immersive aspects of AR games, as well as the ways in which these games can generate revenue. The current state of AR technology, including the potential for the development of a multiverse, is also discussed. The section after that focuses on the game used in the research, including its background, creation, and use in the study. The game locations, materials, test players, and findings are then described and discussed. Finally, the implications of the research and potential future directions are explored.

2. Prior research

This study focuses on several key questions related to the influence of AR on players' behavior and attitudes towards spending in gaming. This chapter reviews the current state of AR technology and its applications, as well as the concept of pervasive games and the use of AR in commerce. The different motivations for playing games and using money in these contexts are also discussed. Finally, the current state and future potential of AR technology and the development of the metaverse are briefly explored.

2.1 AR technology

AR glasses and similar devices can create augmented reality and experience by establishing a link between virtual and physical reality—they combine both “worlds” (Rauschnabel et al., 2015). In practice this means we put a layer of digital information on a screen on top of the real-world image. Augmentation, the synchronization of the virtual and the real world, mobility, geolocation and interactivity are characteristics of AR (Javornik, 2016). This means that users can move around and have their location mapped, interact with their environment, and maintain synchronization between the digital and real world. Further divisions of augmented reality can be made, such as in the context of pervasive games. In this perspective, Alavesa (2018) identifies five layers of AR: mind, physical environment, social space, physical and digital location layer, and virtual environments

The first early forms of AR were created in the 1950s and 1960s (Sutherland, 1968), and research in this field continued throughout the 1970s and 1980s. It was not until the 1990s, however, that the term AR was coined by scientists Caudell and Mizell while developing an AR assistance system for workers in the aviation industry (Javornik, 2016). Since then, AR has evolved and become more widely adopted in a variety of fields, including medicine, industry, gaming, military, art, navigation, education, tourism, and architecture (Javornik, 2016). The increasing ease of use and accessibility of AR technology has contributed to its widespread adoption in these fields.

2.2 AR application areas

AR has seen a variety of applications across different industries. A range of AR apps for mobile phones are available for consumer use (Rauschnabel et al., 2017). For example, companies like IKEA offer apps that enable users to visualize how furniture would look in their living space (Scholz & Smith, 2016). Other apps allow users to augment their own appearance with digital content, such as virtual clothing or hairstyles (Javornik, 2016), while others enable users to add digital graffiti to their physical surroundings (Scholz & Smith, 2016). The technology behind AR devices is also becoming increasingly advanced. In 2021, Meta CEO Mark Zuckerberg announced Project Nazare, the company's "first full augmented reality glasses" (Feltham, 2021).

As AR technology can be used to create and sell products, many companies are incorporating it into their business practices. Companies such as McDonald's, Coca-Cola, and General Electric have all embraced AR in their marketing efforts. This technology is used in a variety of ways, including interactive advertising, enhancing the retail experience, and incorporating AR games into marketing campaigns. (Scholz & Smith, 2016.) The adoption of AR by such a wide range of companies highlights its potential for generating value and increasing engagement in the business world.

2.3 Commerce in AR and games

AR technology can be used to sell both digital (virtual) goods and real-world items. Using AR, marketers can leverage any digital screen, from a customer's phone to projection-based holograms, to display digital information, such as pictures, text, or videos, over real-world objects or spaces (Scholz & Smith, 2016). This allows customers to view and purchase real-world versions of digitally created items, as well as virtual goods themselves. In addition, AR can be used to provide information about a product by adding a digital overlay to the product packaging (Scholz & Smith, 2016).

Virtual goods and assets come originally from game worlds (Lehdonvirta, 2009). Virtual worlds (VWs), are computer created environments (Animesh et al., 2011) and the popularity of multiuser virtual worlds where people represent themselves with avatars has been growing (Jung, 2011). Avatars are digital representation of people (Animesh et al., 2011) and can take on any form. Virtual worlds can be divided into two categories: game virtual worlds (GVWs) like World of Warcraft (WOW; www.worldofwarcraft.com), and social virtual worlds (SVWs) like Second Life (www.secondlife.com). (Guo & Barnes, 2009; Jung, 2011). The popularity of these virtual environments has increased, and shopping within them has become a common and even one of the most popular activities (Animesh et al., 2011). However, purchasing behavior within virtual worlds can vary greatly (Guo & Barnes, 2009) and users of these environments commonly engage in the trade of digital items, known as virtual goods. These can range from game characters to different currencies, items, or tokens from the game worlds or virtual hangouts. (Lehdonvirta, 2009.) These virtual goods or virtual assets intangible and exists only in the virtual world (Guo & Barnes, 2009). They constitute a distinct category and should not be confused with information goods, such as mp3 files (Lehdonvirta, 2009).

The trade in virtual goods originated in 1999 with the advent of massively multiplayer online role-playing games (MMORPGs), in which players traded items with one another. Over time, the trade shifted more toward game operators selling goods directly to players. (Lehdonvirta, 2009.) The purchasing behavior of users in virtual worlds is of interest to operators because these environments typically do not require subscription fees or fees to purchase or enter them. Instead, users are offered exclusive features and benefits, or they are sold virtual items or property. (Mäntymäki & Salo, 2013.) Virtual goods are commonly used for social, emotional, or functional purposes (Lehdonvirta, 2009). Additionally, virtual goods are increasingly being sold on online services outside of virtual worlds and games (Lehdonvirta, 2009). For marketers, AR offers a new opportunity to sell real-world items using images of virtual items (Scholz & Smith, 2016). This technology can provide a unique and engaging way to showcase and sell products, potentially leading to increased sales and customer engagement.

2.4 AR pervasive games

The concept of pervasive games has been around for decades. Pervasive games expand traditional games and are played often in physical world with added digital content, they are games where the physical world overlaps with the boundaries of gameplay (Alavesa et al., 2017). What the AR content is, who is using it, what is it used on, outsiders who can see the usage and the background where the AR is used are all things that need to be considered when planning AR marketing (Scholz & Smith, 2016). Alavesa (2018) lists two dimensions of pervasive games, mobility and sociability and add third, the synchronicity (Figure 2).

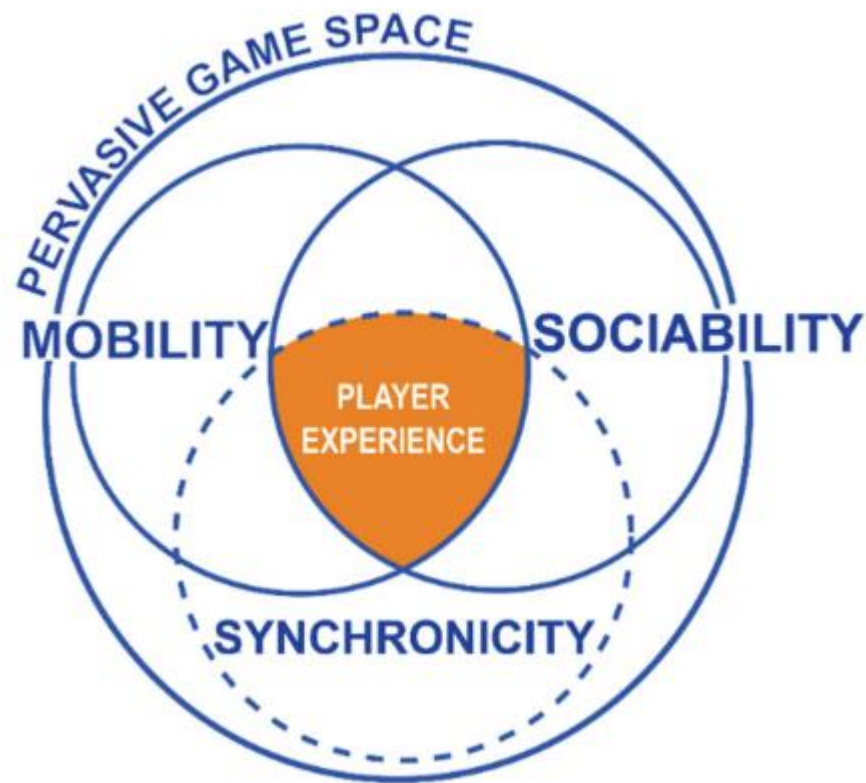


Figure 2. Pervasive game space with permission of Alavesa (2018)

Players of such games can move around; they are influenced by social factors and the whole experience with digital and real is synchronized. This player experience should be understood in AR game marketing. One example of AR usage in marketing is to place virtual items on top of real-world image to show how they look. Clothing or hairstyle can be added on the user or furniture to a physical room (Javornik, 2016). According to Javornik (2016) such augmentations of a person (Virtual try-ons) where the users face, head or hand is enhanced on a mobile device screen with virtual addons, such as glasses, make-up and clothes are used widely by cosmetic and apparel brands and are one of the most popular AR use cases. Still some users might not like using such experiences depending on what the background is. If other people can see their ‘strange movements’ while using AR, they might not use the service at all (Scholz & Smith, 2016). This kind of AR usage does not really immerse the person to a new reality like AR games do. Adding pervasive game aspect to the equation changes the setup of AR usage for commercial purposes. Considering what Scholz & Smith (2016) discovered about AR the sociability aspect affects the way marketing should be approached in AR pervasive games. Immersion in AR games is interesting part of this experience as the players cross the boundaries world and gameplay in person.

2.5 Motivation from immersion and value of items

In gaming it has been shown that immersion influences the players willingness to buy (Yim et al., 2017). Immersion also helps in making people become paying customers in games (Hanner & Zarnekow, 2015). It has been shown that the flow of the game, the image and social norms are drivers for in-app purchases (Rauschnabel et al., 2017). True sociability and mobility are characters of AR, Pervasive games and can be complemented by metaphor of synchronicity (Alavesa, 2018). Even though mobility is a characteristic of AR pervasive games the specific environment where the AR is used has importance. The background, objects and ambient conditions, of the AR layers shape the meaning of

the AR content (Scholz & Smith, 2016). Even if people start playing games, they won't become paying customers or immerse themselves into the game if the game is not working well and they are not attracted by it (Hanner & Zarnekow, 2015). In free-to-play games the design is such that players are enticed to buy in-game content as often as possible (Hamari et al., 2017) and this can have a negative effect on motivation to play. This in-game content differs from traditional games when we enter augmented reality.

Compared to classic in-app purchases AR games are in a new situation where the player does not just use virtual money to purchase virtual items but can use also real money to purchase virtual or real items and the motivation for the purchase can come from the game or from the real world. These things can include in addition to game items for example eating or using public transport. Difference in the attitude between purchasing virtual and real items exists as the value of the item varies for the player (Paavilainen, 2013). As VWs have their own virtual economies (Lehdonvirta, 2009) and real world has its own, AR games put us to a new situation and to a new environment. It has been shown that the environment in VWs both technologically and spatially influence the purchase behavior too (Animesh et al., 2011). Even though the economy and environment changes when using AR the virtual and real-world items in general are valued for same reasons (Lehdonvirta, 2009). While immersion to the environment is important the digital content used in AR must be also fit it. One example is Kringle app, where parents can show children a video of Santa's visit in the night. The digital Santa image can be scaled and the brightness level set by the parents to fit the real-world background. (Scholz & Smith, 2016.) Selling things to people using gamification has been shown to work. It can influence the relationship with the brands and companies increasing the loyalty (Shevchuk et al., 2020). In gamification the elements of games are used to engage people and create fun by applying them to activities and real-world (Chou, 2016). Once players do spend money in the game, they are prone to return to the game and spend money again (Hanner & Zarnekow, 2015).

2.6 On the Importance of the game character

Another way to increase the immersion in games and influence purchasing behavior is the character the players play. Player's attachment to the character is described as Character identification (Lewis et al., 2008). Character identification is a thing that has been studied a lot. When you identify with a brand you tend to stick to it (Oliver, 1999). You often see people arguing about brands online and some people really stand for some brand, they are even called fanboys sometimes. There is this positive attitude that is created for the brand you identify with (Graeff, 1996). People want to identify with the character (Hoffner & Buchanan, 2005), they want to be like the character and act like it. Hoffner and Buchanan (2005) mention also gender and characteristics which seem to point that the more like you the character is, the more you identify with it. Narrative is also mentioned by Hoffner and Buchanan (2005) to increase this identification and immersion to the character and the game world. Use of real life characters helps with identifying with the character and immersion to the game world and this again increases the value of the game items for the players (Park, 2011).

2.7 Enjoyment factor in games

Bostan (2009) states that one of the primary concerns of game designers is to maximize player enjoyment, but interestingly Park (2011) found that satisfaction with the game did not create such a link to in game purchases. Player can be happy with the game but not buy anything if it is not mandatory. We can make it mandatory to pass an adventure to purchase something or try to use other ways to lure people to spend money, maybe even

by accident or maybe in future in some other way. Gaming must be fun and keep players happy, so they stay and spend money (Bearden, 1983; Cronin, 1992). Forcing the player to spend money can maybe be used in a more subtle way if it is part of the story, for example in an AR game the player would need to adapt the role of a private detective jumping in a taxi and saying to the driver “follow that car” or maybe in more AR game style “follow this signal”, passing the phone to the driver. Creating such scenarios is challenging as AG game development is hard (Wetzel et al., 2008). Immersion to the role of the detective could make the player ignore such spending of money. Such a thing would not be possible in a traditional video game or role-playing game (RPG). How players feel about playing AR games is linked to how much they enjoy it and what image playing that game gives to others. Positive feeling is increased also by moving while playing and how smoothly the game flows (Rauschnabel et al., 2017). It is not simple to find the border where enjoyment ends and players are not happy to pay anymore (Hamari et al., 2017). At the same time that AR game immersion can help, the environment and other people in it can change the behavior of the players to avoid playing at certain location. The users might not be willing to engage the AR game experience when the social context of bystanders is added to the equation (Scholz & Smith, 2016).

2.8 Rules and risks

In addition to the social pressure the urban environment and moving around it introduces new problems for the rules of behavior. Games have rules and according to Alavesa et al., (2017) games like Ingress (Niantic, 2013) and Pokémon GO (Niantic, 2016) show that it is not enough anymore to suggest that players simply ‘play fair’. Placing players to various kind of places poses challenges for such rules. How to specify rules that might vary on each place and how to implement them to the game? It is not as simple as in the traditional video games where the rules are part of the game mechanics and don’t need to be mentioned separately (Alavesa et al., 2017). Movement in the urban environment poses also dangers to the players and the fear of injury work as a negative feeling towards playing AR games (Rauschnabel et al., 2017).

2.9 Metaverse

Metaverse is the big thing at the time of writing this thesis and greatly linked to the AR and how will it be used in future. In January 2020 Matthev Ball (Ball, 2020) wrote an essay to identify metaverse. It shares many of the characteristics of AR games. Metaverse’s characteristics are, according to Ball: “it has to span the physical and virtual worlds; contain a fully-fledged economy; and offer “unprecedented interoperability” — users have to be able to take their avatars and goods from one place in the metaverse to another, no matter who runs that particular part of it”. According to Casey Newton’s article in Verge the social media and other companies are interested and investing on AR (Newton, 2021). AR is developed fast, and investments are high. In 2021 The Verge reported that almost fifth of Facebook employees were working on VR and AR, having some 10000 people working in the Reality Labs division (Byford, 2021). Still in 2021 the Verge interviewed Facebook CEO Mark Zuckerberg on why the social network company is becoming ‘a metaverse company’. Zuckerberg stated that Facebook would strive to build a maximalist, interconnected set of experiences straight out of sci-fi — a world known as the metaverse. Zuckerberg described metaverse that: “it will be an “embodied internet,” operated by many different players in a decentralized way. (Newton, 2021.) Later in 2021 Facebook was named Meta to reflect the change.

3. Research Game

This chapter presents an overview of the game that was utilized in the study. The game's design, background, technology, development process, and locations are discussed in detail. The chapter also covers the gameplay mechanics and how the game's locations were integrated into the overall gaming experience. Overall, this chapter provides a comprehensive look at the game and its features.

3.1 Design progress

Major part of the research involved creation of an AR game that would be ideal for the study of the player behavior. Unity engine (Unity Technologies, 2005) was selected as the game engine as it provided needed functions including image recognition and AR support. At the time when game was programmed no other tool seemed to offer the required functionality. In the game the players are investigators using the mobile phone game app as the magnifying glass of a detective. The game world includes our real-world and a parallel dimension that can be seen with the game app and the phone camera. The players walk around the urban environment looking for clues from that other dimension that lead them on through the adventure.

3.1.1 Game idea

The idea for the game was first conceived around year 2004, when the author was working as an engineer at Nokia and testing their camera phones. At the time, camera technology and phone screen resolutions were not as advanced as they are today, and GPS devices had to be attached separately to phones. However, the author recognized the potential of AR technology and anticipated its future growth and widespread adoption. With the continued advancement of camera and screen technology and the integration of location systems into phones, the author had many ideas for potential AR games, but the technology was not yet ready to support their development. In the game the player acts as a detective in a world where a parallel dimension has collided with our world. These two worlds are almost identical and an app in a phone can be used to communicate between them and with “your twin on the other side”. The version of the game used in this study was simplified to fit the research purposes.

3.1.2 AR technology for games

AR technology itself has been evolving fast and is offering new solutions for developers to create new content. The background story of the game evolved in my head for years and finally the success of Pokémon GO (Niantic, 2016) showed that the technology was ready. After witnessing what Pokémon GO did, I estimated we can push forward the ways AR is used in games, especially in the ways players can be influenced. I wanted to study what we already know to be happening and try to find new ways of influence. The technology has developed so that now much more is possible already. Technology has evolved, phone cameras have improved, and GPS is available in every modern smartphone. The game I had in mind was ideal for testing the possibilities of augmented reality. It was time to combine the ideas of the game to the modern technology and see what could be accomplished.

Monetization in games has been extensively studied, and this study sought to compare the existing knowledge on the topic to the findings from an AR game and a group of

players. On a technical level, the game added graphics to the phone camera image and used this data as clues for players. This approach was similar to early innovations such as Nokia City Lens (Nokia City Lens for Lumia Windows Phones, 2012), which added information about landmarks, restaurants, shops, and public transport to the camera view, and Google Street View (Google Street View, 2022).

Many games use a similar approach to AR, but some game mechanics require image recognition and may incorporate GPS location information as well. This type of image recognition is readily available to developers using the Unity game engine (Unity Technologies, 2005). The research game utilized the Vuforia (PTC Inc, 2011) Engine, a software development kit (SDK) for creating augmented reality content, which was integrated with Unity. Vuforia is easy to use and allows developers to replace real-world images with images, 3D models, or videos. At the time the game was developed, Unity and Vuforia were the only solutions that met the game's requirements

3.1.3 Game development

During the development of the game, some features, such as GPS, were dropped, and the game was made simple and easy to use. In parallel to the coding, the game narrative and background story were developed. The background story required extensive work as the original idea had become quite complex and needed to be modified to fit the needs of the study. The background story was written to increase immersion in the game, as immersion has been shown to encourage players to make purchases (Hanner, 2015). The study also aimed to determine whether immersion influences players' experiences in the game. People tend to identify with characters in games (Hoffner & Buchanan, 2005) and want to act like them, and the study game facilitated this by allowing players to play as themselves. Hoffner and Buchanan (2005) also note the importance of narrative in games, and the background story was designed to increase players' identification with the game world and their character, as well as to enhance immersion. Story of the game had to be created so that players can be placed smoothly to suitable places and situations. The game scenarios were carefully planned to test two types of influence: indirect influence, which sought to determine whether players could be influenced to become customers of a business simply by spending extended time in the premises, and direct influence, which aimed to test whether players could be directly influenced through the introduction of real-world purchases as part of the game story. The game session plan (Figure 3) was updated multiple times to create a functional version. The game plan chart shows different locations in the game and what the players are asked there. The same content is covered in detail in the chapter 5.

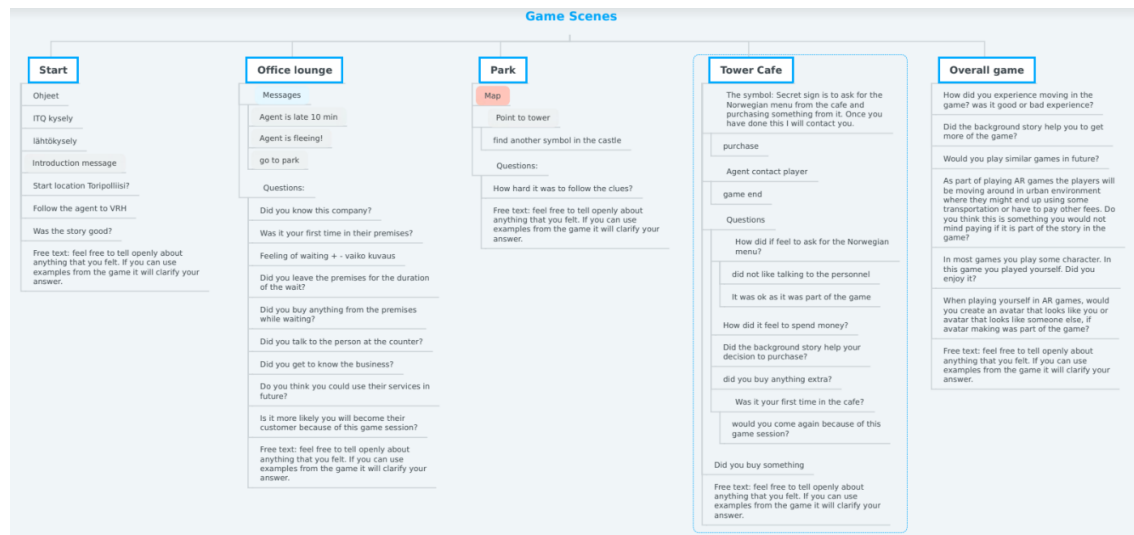


Figure 3. Example of early version of the game session plan(© Author)

When designing such scenarios for AR things that need to be considered are the user (in this case the player), the target items (objects used for clues in the game), locations (background), bystanders (random people and Non-Player characters (NPCs)), and the augmented material itself. As the game takes place in public spaces and sometimes outdoors, it is impossible to control variables such as random people and weather. The digital objects, or target items, must be designed to fit the environment in terms of size, color, and brightness (Scholz & Smith, 2016), which can be challenging.

Once the game plan was finalized, several locations in the city of Oulu were scouted for suitable spots for the game. The technology was tested in the field, and some initial ideas were discarded due to technical challenges. Image recognition presents many challenges, and in some places, it did not work as intended. It is not only important for the digital content to look convincing to users, but the image recognition technology must also function properly.

Once suitable solutions were identified, photos of the locations and objects were taken to be used as data in the game. Some locations required the involvement of public places, businesses, and external people. The businesses that participated were contacted, and plans for the game sessions were agreed upon. The business owners agreed to take part in the game as NPCs. In addition to programming, a detailed background story was written for the players to help them identify with their character and immerse themselves in the game world. Since the players played as themselves, it was hoped that this would also facilitate identification and immersion. Once the game was programmed, the location data was added using Vuforia, and the game was test-played. The game app was installed on two Android phones, which were tested before the actual research game sessions. Despite the test game sessions, a few bugs remained and were only discovered during the real game sessions with test subjects.

3.1.4 Game Locations

Game took place in selected locations where the players could be tested for the influence. (Figure 4)



Figure 4. The game area. Map CC by OpenStreetMap Foundations (@Author)

Scenario 1: Indirect influence

The player was located in the lobby of a shop offering virtual reality game experiences, waiting for the next event in the game to occur. (Figure 5) The aim of this scenario was to test the player experience and determine whether the player can be indirectly influenced to become a customer, either immediately or in the future. Will they speak to the person at the counter or make a purchase, such as a soda, or will they be more likely to use the services provided by the shop in the future?

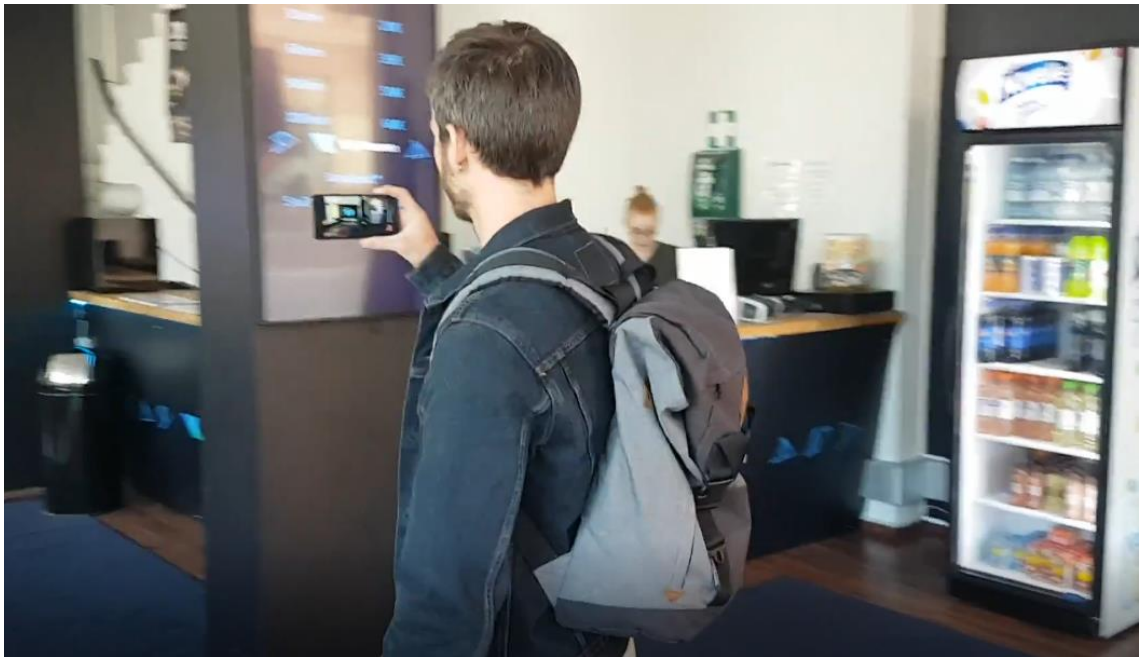


Figure 5. Player looking for clues in the lobby service provider (© Author)

After the players found the hidden clue in this location, they were informed that they must wait for approximately 10 minutes as part of the game story. What will the players do and how do they feel during this time? The employees of the shop were aware of the game and were instructed to play along with the gamers as NPCs.

In this scenario, the player had the freedom to do whatever they want, but the direct influence scenario was designed differently so that the player must make a purchase in order for the game to continue.

Scenario 2: Direct influence

In this scenario, the employees of the cafe where the test was conducted were also aware of the game and were instructed to play along with the gamers as NPCs. The employees were provided with a special menu of products and a secret password that identified the players. The game story lead the player to the cafe, (Figure 6) where they were asked to make a purchase from the special game menu in order for the game to progress. This was planned as part of the story, in the hopes that the immersion in the game would influence the player's feeling when they were forced to spend real money. The players must use the secret password while talking to the waiter. What will the players do and how do they feel?



Figure 6. Player interacting with employees of the café (© Author)

The password code asks for the specific menu and once the player purchases something from it the game moves on. The story of the game describes this as a signal/message to a “secret agent” in the game. Will the player buy a product from the special menu, refuse, or even buy something extra? Aim is to study how players feel about such a direct way of forcing them to use money as part of a game story.

3.2 Gameplay

Game was installed on 2 Android phones (Pixel II) which were used by the players. The UI was made very simple, giving textual hints and tips how to proceed and alarms if something sudden was happening. Main function of the Game UI was the camera view that was used to scan for AR content for clues. The AR content included texts and images that appeared on top of the real-world objects. In the start the player got a written background story, one phone and verbal instructions. The background story described a parallel reality that can be contacted and viewed with the app on the phone. The player will be given information and clues from that dimension via the app to proceed in the game in addition to the information the player gets while scanning the environment with the app. In the instructions players were told they are playing themselves and can use anything in the real world to advance in the game. The game starts by a plea of help that the player must answer.

3.2.1 Start location

The game story was tied straight to the background story and the player could jump straight into it. First task of the player was given on a note on the phone screen where the player is asked to spy on some secret agents in a location nearby. These agents are visible only by scanning using the app as they are also in the other dimension. The players get only the name of the location and as they are playing themselves, they need to use any tools available to move forward. At this point players were still given some hints if needed, but they all quickly understood the game mechanisms and googled or asked strangers for the location, finding it just few blocks away.

3.2.2 Game Arcade (Place of the indirect influence)

In this location the players scanned the area using the game app and found a clue, but to their surprise the note told them that there were no secret agents there at that moment, but one was about to arrive in 10 minutes. After waiting for 8 minutes the app suddenly alarms

the player that something is wrong and the secret agent is fleeing, giving the player the location of the agent. Now player must move to the other location and search for clues there. The whole point of this location was to make the player to stay there with nothing to do and see if they chose to do something and what it was.

3.2.3 Park (finding clue to move forward in game)

Searching in the park was planned to be a smooth and fun transition to the next place of the study. Finding anything takes some time, but in the end the players can find that in an information signpost of the park the area map changes when scanning it. The map changes to show a line leading away to the next location with a text informing that the agent is still fleeing, and that the player needs to follow.

3.2.4 Oulu Castle basement

There is a Café located in the place of an old castle of Oulu and has a basement displaying some archaeology artifacts. No real study content was included here, but this was created as part of the adventure to make player more immersed to the game. The clue was hidden in the basement and informed the player that the agent wants to meet but is scared. The player needs to enter upstairs café and find another clue.

3.2.5 Cafe (Place of the direct influence)

The clue is found in the tower of the Castle Café. The player is given instructions to use a secret code when purchasing something from the café, so the agent knows the player is “the right person”. When players use the secret code and asks the Café employee to see the “Norwegian Menu” the players are given a special menu by the café employee. Once the players purchase something from the list and sits down the rest of the adventure is revealed to them and playing is over.

4. Research setup

There are several studies available about the effects of Pokémon GO on the PA of players and this information is used as the base hypothesis that AR games can be used to influence players in real world. Studies about game monetization are also used to provide information on business related influence of players. Studies about using augmented reality games in education are also available but this study investigates more the emotions of the players rather than if they learned some information during the game session. Some studies already success that AR games can influence how consumers act and this study continues to add to that knowledge and dig deeper to two ways customers could be influenced.

4.1 In the wild research

The field trial was done in “In the wild” (Chamberlain et al., 2012) approach to study the impacts of technology in the real world. “In the wild” was used to evaluate AR game usage and how it integrates to people’s lives and real world. “In the wild” offers offer in-depth insights in the technology as human interaction with technology can not be replicated in laboratory because they are highly dependent on contexts and on external factors (Javornik, 2016). The field trial used a custom AR game developed solely for this study with a group of test players.

4.2 Game session

Game sessions were organized on two days in Autumn 2019 in Oulu. Players were given the background story and phones with the app pre-installed. Players followed the clues in the real world using the game app. (Figure 7, Figure 8, Figure 9, Figure 10)

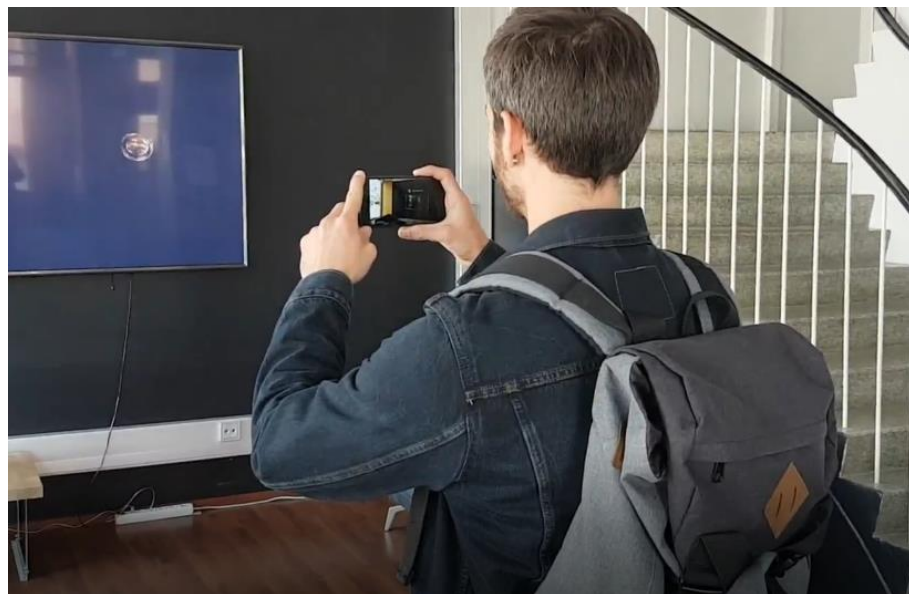


Figure 7. Player looking for the clues using the game app and camera indoors. (© Author)

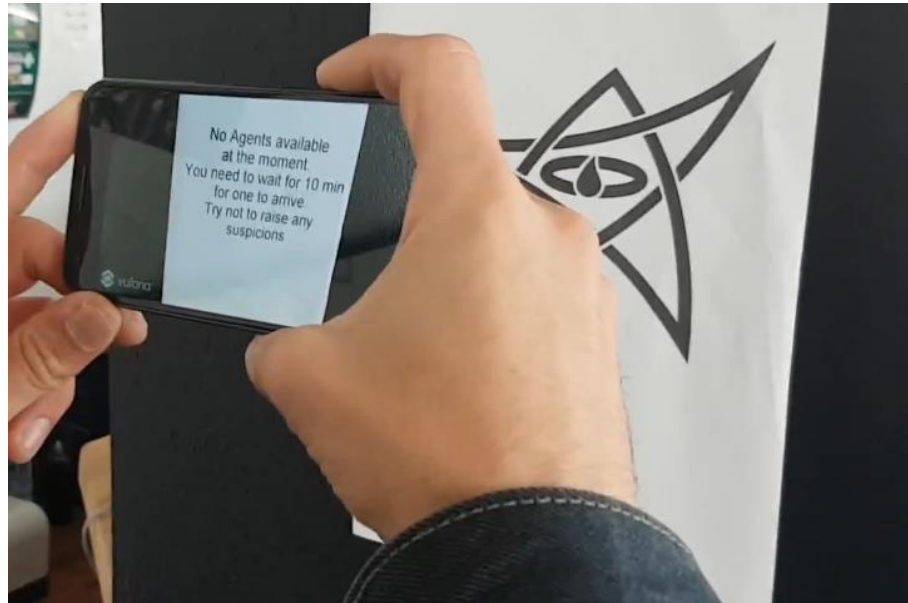


Figure 8. When image is recognized from the camera view it is replaced on the screen. Here a symbol from the wall changes to a text clue for the player and the game proceeds. (© Author)

Game session placed the players in different scenarios where their behavior and feelings were studied. Players had to follow the game story and find clues that led them from one place to another. Figure 10



Figure 9. Outside the sun can cause problems in the image recognition or visibility. Here player tried to block the sun, but still missed the clue the first time. (© Author)



Figure 10. Another player gets close enough and an area of the map changes on the display to show a route and a clue text. (© Author)

After each player had finished the game session, she/he was given a questionnaire. The questionnaire had both open-ended question and fixed questions. These were used to both collect some data on player preferences, but mainly to get an understanding on their feelings on the times of the influence. The players were told beforehand the study is about AR games, not their behavior and feelings. This might have some ethical issues, but true knowledge at that point would have affected their answers. Players were told the truth in the end, and they were also returned any money they spent in the direct influence part of the study if they wanted.

4.3 Participants

11 players were selected for the study. No minors were used in the tests. The style adults and minors use money might vary, the opportunities and the amount of available money might also vary and for the purposes of this study it was safer to use adults. As this study is about consumer behavior in the real world it was also a safety measure to use only adults. Players were selected so they represent wide range of adults. Both women and men were used from different education levels. Players were also varying between active gamers to those who play games only sometimes.

Players were found by using social media. For the results more players would have been good to have, but on the practical side testing such thing on the field requires lot of time and arrangements and having a large group of people would have been impossible with the resources at the hand.

Once the players were selected, they signed a consent form and were informed on the data used and their rights. Players were also asked if they can appear in the photos in the thesis paper.

Large part of the work was the game used. Idea, story, location, tools and coding of the app and creation of the adventure in such a way it provides good data from the players had to be planned and done before testing. Background story was created to increase the immersion and to fit smoothly to the game story. Locations had to be selected so the game story could be played while the player would be going through urban environment smoothly. Target was to find at least two businesses and some parks that would fit the purpose and the story. Several locations were scouted beforehand to fit the test sessions. Business owners were contacted, and it was agreed in meetings how the games should work in their premises and the game was modified to fit their requirements. All locations were photographed, and suitable image recognition spots tested on the software several times. The character players play was considered to fit the purpose of the tests. Idea of an avatar was initially used but removed for technical and practical reasons. In the final version the players are playing themselves on purpose to increase the character attachment and immersion.

4.4 Materials

A questionnaire was used to gain new data from a small group of players in the concept game session. Questions were given to players in paper format, in English. Some base information was gathered before the game session and the main questionnaire was done when the players finished the game. Players were also observed while playing. The questionnaire provides both quantitative and qualitative data directly related to the research questions. Seven-point Likert scale (1= good experience/hard; 7=bad experience/easy) was adopted for quantitative questions. Main goal was to find out how the player felt during different points of the game session. To really understand the purchasing behavior, open ended questions were used on each location of the game. Purchasing behavior in games is best mapped with qualitative ways as they are more successful (Hamari et al., 2017).

The concept game app was designed so that the players are put to situations where their behavior during the game can be studied. The game itself is a detective style adventure resembling live action role playing games (LARP).

There are points in the game where the players interact with other people and the surroundings of the real world in addition to the digitally created artifacts. (Figure 8) The questionnaire asks questions related to these unique situations in the game. Not only was the questionnaire asking about the ways the player is influenced but also about the feelings the player had during the attempted influence. Part of the influence was direct and other indirect, for example the player was put to a situation where he or she had to wait in lounge of a game arcade shop which offers some services including beverages or just information about the business. The questionnaire then checked if the player used the services or got familiar with them during the time spent there. In other studied scenario the player was asked directly to purchase something as part of the game story. Goal is to study were they willing to purchased anything and did they feel comfortable with the purchasing. The data should show differences in the players and give understanding on how easy it is to influence the player to do different things. This understanding should then help game developers to setup guidelines to the ways players can be influenced. Game app was reduced to a simple concept game and many initially planned features like GPS were skipped from the final version. In the end the app was designed to have easy UI and to use the camera and image recognition.

5. Findings

Due to small sample size and the style of the questions that reflect the feelings of the players, there are no statistical analyses of the results. The first part of the questionnaire was constructed to give an overall idea of the players, their background, traits, attitudes, and mood that could be then reflected against their answers about the game itself. The latter parts cover the game session itself divided into different sections of the study. On some rare occasions some players did not know what to answer and they left the answer empty, on some cases they answered both yes and no.

5.1 Questions defining the participants

Immersion to games and character identification of the players were mapped before playing the game to get a general idea what kind of player they were. The questions varied from mild immersion to players losing themselves in the games. Most players felt they immersed well to games, losing the track of time, the awareness of things around them and felt that people around them had hard time getting their attention. The attachment to the character and losing themselves totally to the game world was not that common.

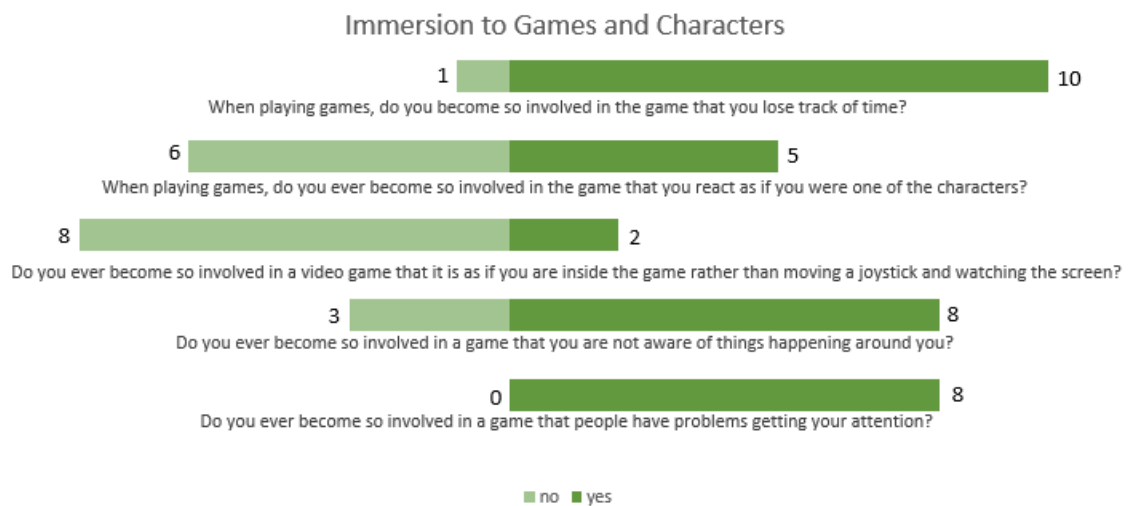


Figure 11. Immersion to Games and Characters (© Author)

Just like there was no clear identification with characters for all the players, only some of them seem to sometimes react on specific moments in the games as if they were the character they are playing. While the strong immersion to games seem to happen only to some players, losing the sense of time seems to happen to almost all players. Here some players did not find suitable answer and skipped some questions leading different numbers for total. (Figure 11) Players were also asked to estimate their immersion using adaptation of Seven-point Likert scale. Figure 12

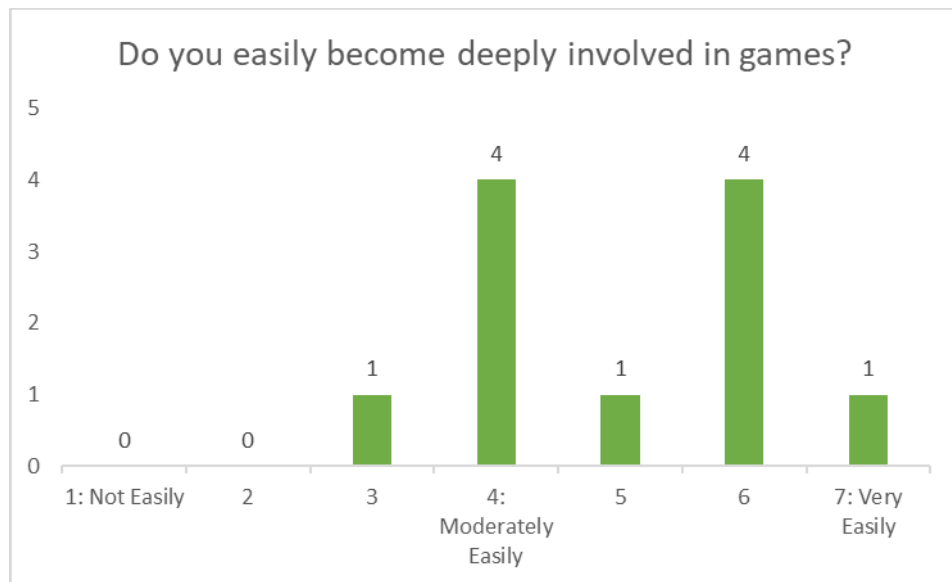


Figure 12. Most players feel they get deeply involved in games (© Author)

None of the tested felt it is hard for them to get involved in games and clear majority of them experienced it to be easy to become deeply involved in games. (Figure 12)

Identifying with the game character divided the group almost equally. (Figure 13) Character identification / attachment seemed to vary from nothing to strong identification averaging mainly in the middle.

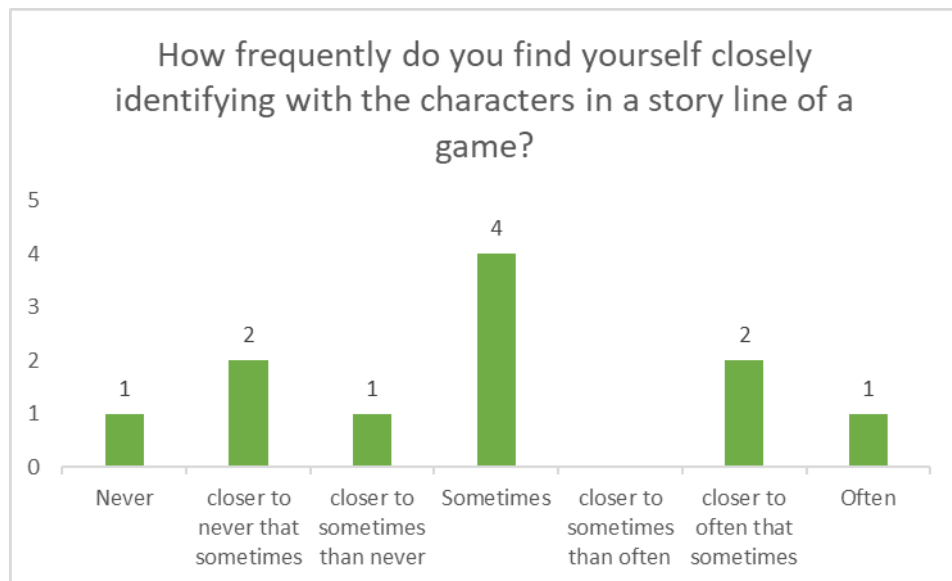


Figure 13. Identifying with character seems random (© Author)

Blocking external distraction seems to go with the depth of involvement in the game averaging just above medium. (Figure 14)

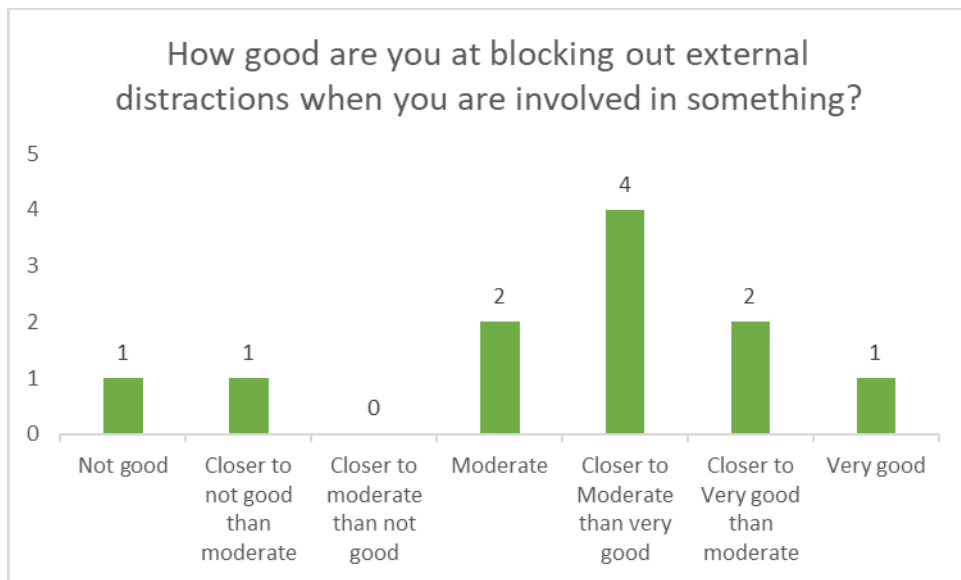


Figure 14. Most players feel they can block distractions moderately (© Author)

Of the test group clear majority felt they have no problems concentrating to activities they like. (Figure 15) Playing AR games puts them to a unique gaming situation where external distraction might have a negative effect in the experience.

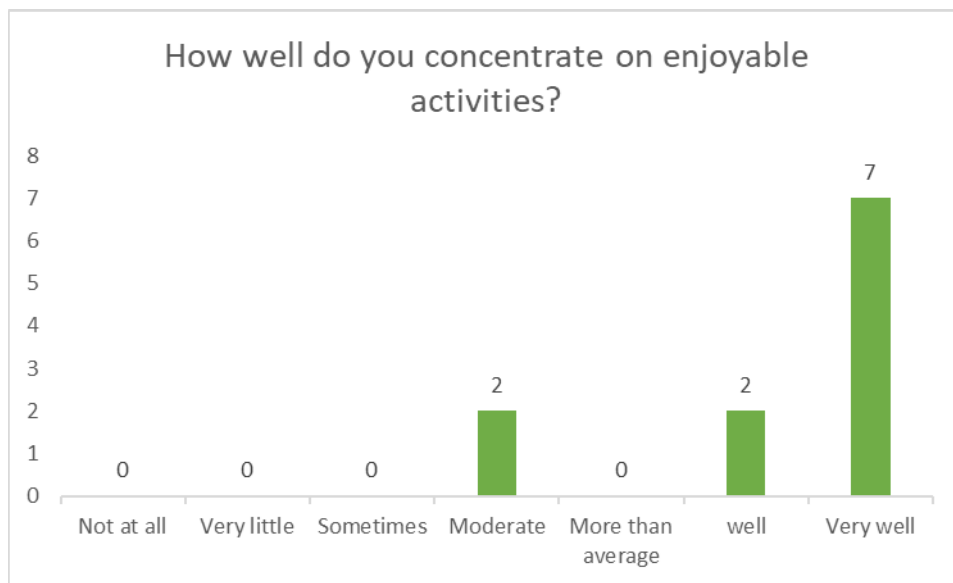


Figure 15. Concentration skills are good in the group (© Author)

Test group varied from active players to few very casual players. (Figure 16) The test persons identify themselves as people who play games quite often and concentrate in them strongly. The fact that most test persons were active players should give more useful information as the aim is to study players.

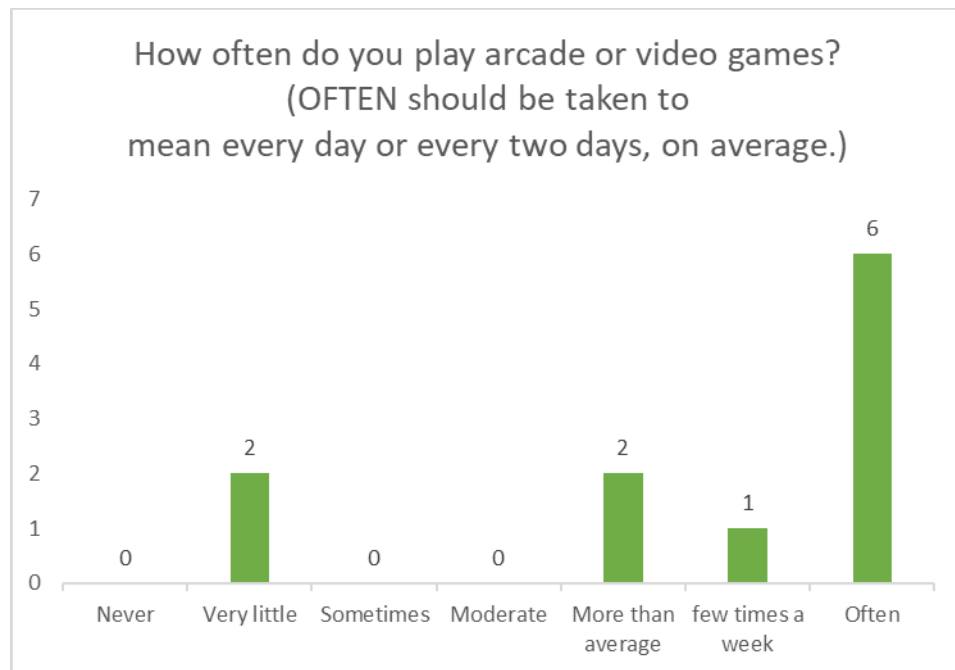


Figure 16. Most of the test persons are active gamers (© Author)

5.2 Game questionnaire

The questions so far give idea of the test group. The rest of the answers were from the questionnaire done right after the game sessions ended and the playing was still fresh in the player's mind. These questions aim to answer the research questions.

5.2.1 The background story

Background story for the game was created to increase immersion and to fix the fact that the game was just a short session where the players just had to jump in without prior attachment to the game world or the character. The story did not seem to have strong affect, but most felt it somewhat helpful. (Figure 17)

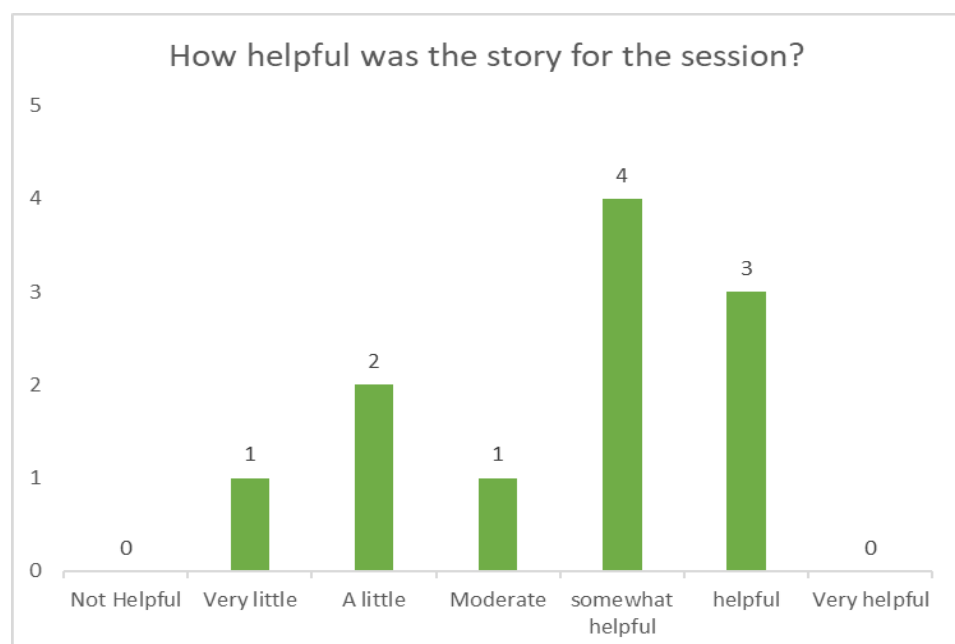


Figure 17. Background story helped the players (© Author)

5.2.2 First half of the game

Initially the players had to use clues and their wits to find the first encounter in the game. The players seemed to enjoy this part and one commented

“The start scene was easy and clear. It is nice to combine the game with other apps like google maps to reach the goal. With the combination it does not feel like using an app to play, it feels more like using the real life for playing”.

The first real study item in the game was the indirect influence by placing the players to the lounge of a virtual reality game arcade. The idea was to see what happens. Will they become customers now or maybe in future? Will they get to know what the place is? For the study purposes the location selected was good as most players did not know the company at all or were there for the first time. (Figure 18)

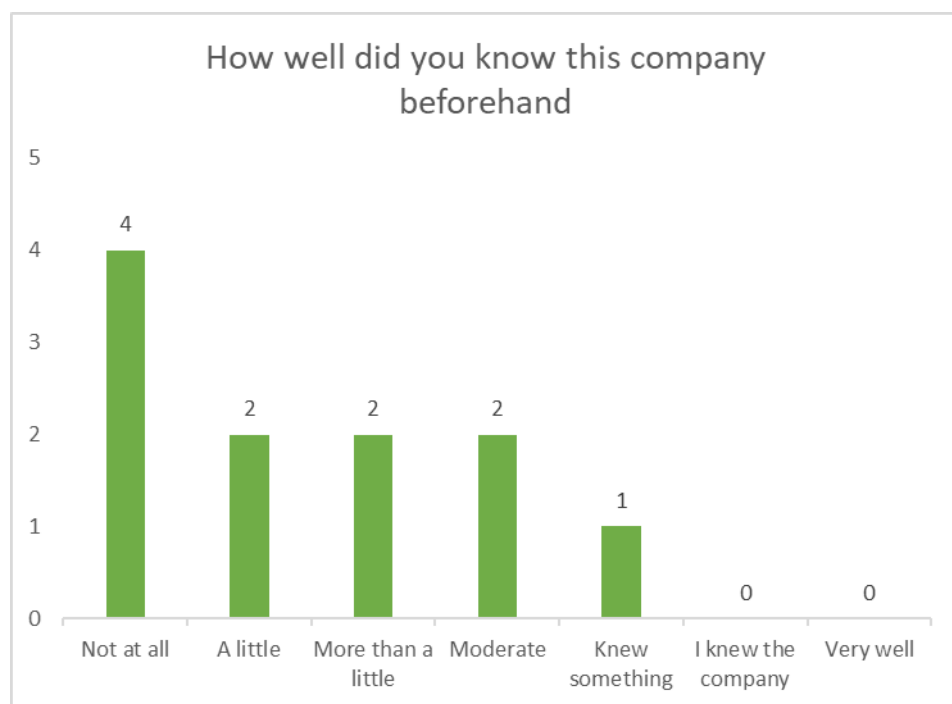


Figure 18. Company was not known to the players (© Author)

Only two players had visited the place before, which makes the questions about feelings in the premises more interesting and useful. (Figure 19) Playing such games could be initially scary as this is a new thing to do, as one player wrote

“It is strange to go to a place where you don’t have real business at the time”.

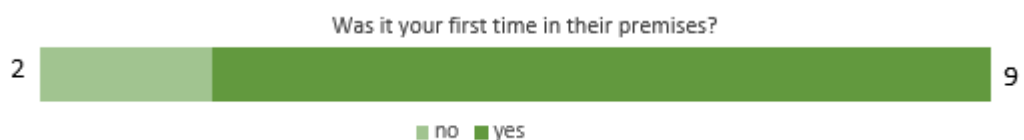


Figure 19. Two players had visited the place before (© Author)

Feeling of waiting was one of the most interesting questions. (Figure 20) How annoying is it to be forced to wait in the middle of the game? This seems to divide the players.

Some players feel strongly annoyed, while others seem to like it. One player made it very clear

“I wanted to play the game and 10 min of waiting felt wrong- if I get in contact with the person at the counter, I am out of the game”.

This player felt the people working in the place were not part of the game, so talking to them would be outside of the game and the player just wanted to play the game. Same player also did not care for the story at all indicating maybe lack of immersion to the game and the game world. Another player told the opposite stating

“The place in question was very good for this type of wait: they had couches and calm environment”.

Another player did not like the waiting, but proposed ideas how to make it work

“10 min wait felt too long, visually seeing more of the other dimension, like agents etc would help get into mood”.

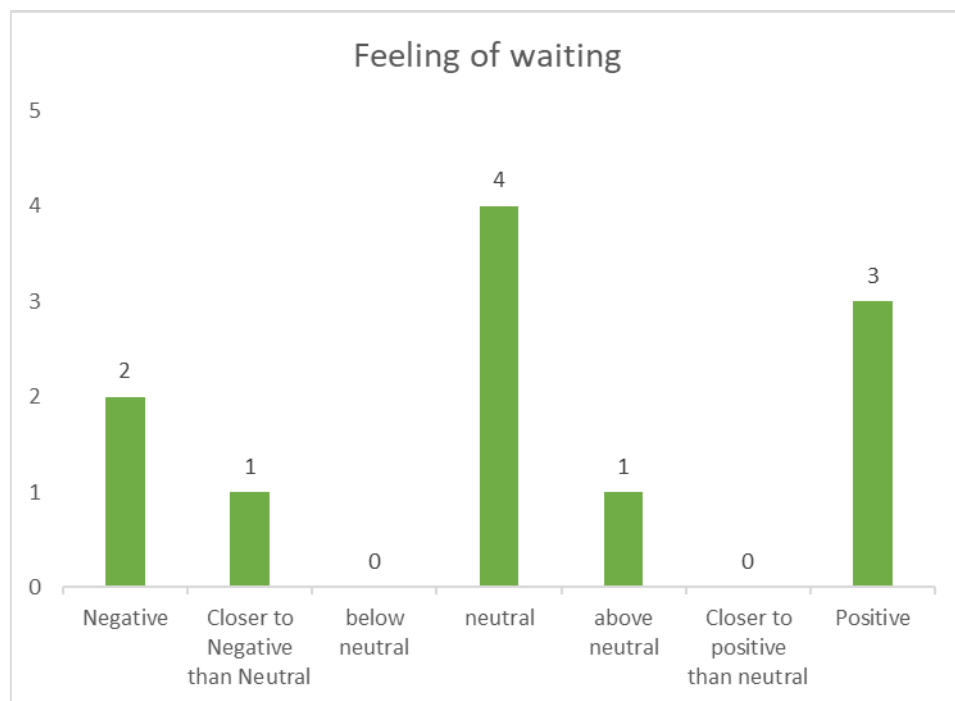


Figure 20. feelings about waiting were divided (© Author)

Most players did not leave the premises. (Figure 21) One player commented about the area where the wait was happening in a positive way and gave idea that if the place is beautiful, calm and pleasant, then waiting works well.

“The 10 min wait was actually surprisingly pleasant. I’d imagine that sort of thing works extremely well with calm, beautiful environments like parks and gardens”.

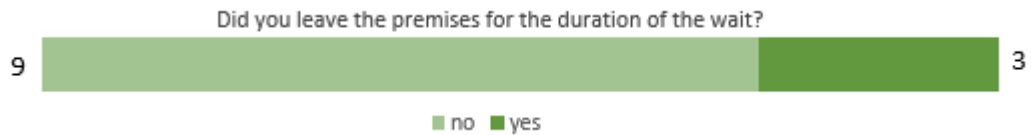


Figure 21. The players had time, but only 3 exited the premises (© Author)

Only one player purchased a soda from here, and as this is something extra and not part of the game it shows that just placing the players in the premises can create some direct usage of money. (Figure 22)

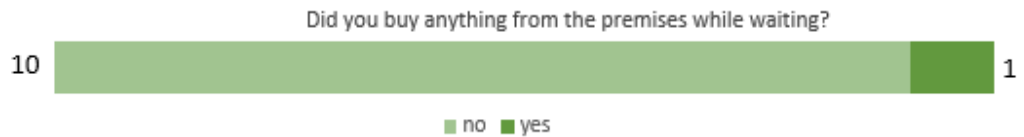


Figure 22. Even though only one bought something it is a good indicator (© Author)

While some players felt wrong about the waiting and that talking to the person working there was outside the game others felt that it was natural part of the gaming session. One player wrote,

”The person at the counter was very friendly towards me so I did not feel like I’m trespassing”.

Roughly half of the players ended up talking to the person on the counter. (Figure 23) How willing the people are for social interaction affects the usage or money and those who are willing also seem to use more money for in-game purchases (Hamari et al., 2017).

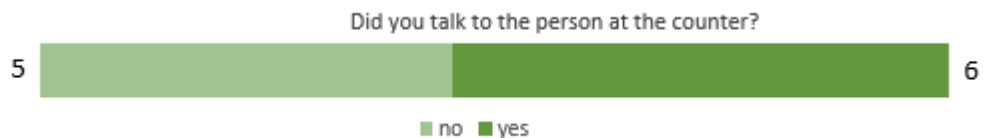


Figure 23. People seem willing engaging conversation while playing (© Author)

For most player the company was unknown and most of them showed interest and got to know the business on some level. (Figure 24) One player wrote:

“Only because of this game I know what the company does. If I only would have passed this shop or saw an advertisement on the street, I would have ignored it”.

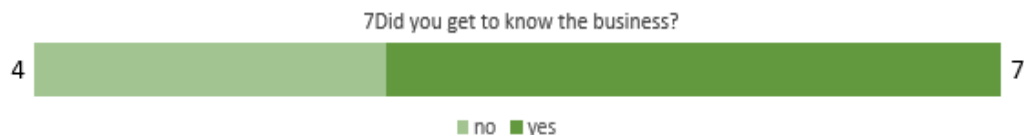


Figure 24. Over half of the players learned something about the business (© Author)

Just by placing players in the premises gets them to know the business and can increase the chance they return (Figure 25) as one player answered:

“Visiting the premises maybe makes it easier to visit the place and use it’s services in future even if I did not do anything there this time”.

Only one player answered no, but added text “maybe”, when asked if they think they could use the services there in the future.

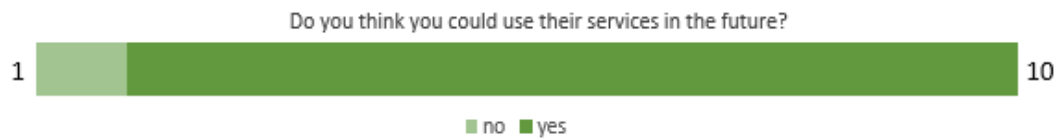


Figure 25. Almost all players felt they could use the services in future (© Author)

Almost all were feeling positive to become future customers.

“I got interested to try this with friends”

Told one player, while other wrote:

“I had visited them once before but did not use their services that time. I feel like there’s less hurdle for that now”

When specifically asked if the game session had affected the likelihood of becoming customer one player had clear answer “no” and another answered no with text “maybe”. (Figure 26) One person did not answer this question and rest were thinking that just because they played the game they will more likely become future customers.



Figure 26. Positive association through the game seems to be clear (© Author)

5.2.3 Second half of the game

Where the players moved through the city streets and parks to the second place of interest.

The game and the technology used have lot of challenges and placing people in the urban environment to play adds a new dimension to it all. How hard did the player feel playing the game was varied from really hard to easy. (Figure 27) Finding the clues varied, some found them easily and others had difficulties. The environment has an effect on it and during the game sunlight and rain causes problems that should be considered when creating such outdoors games.

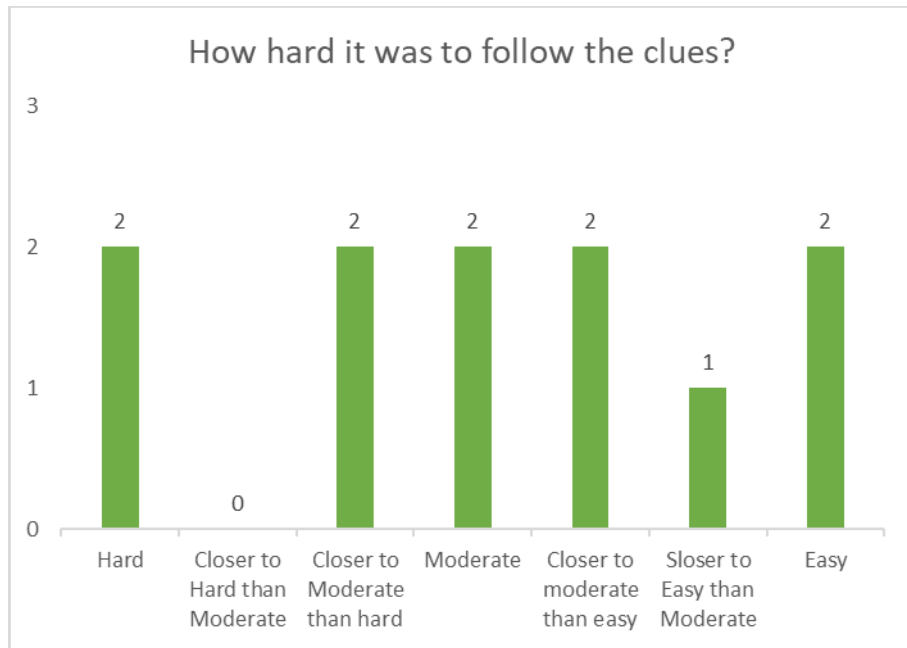


Figure 27. Nothing clear could be learned on the difficulty (© Author)

Clear majority of the player felt good in the encounter where they had to talk in “secret code” to the employees of the café. (Figure 28)

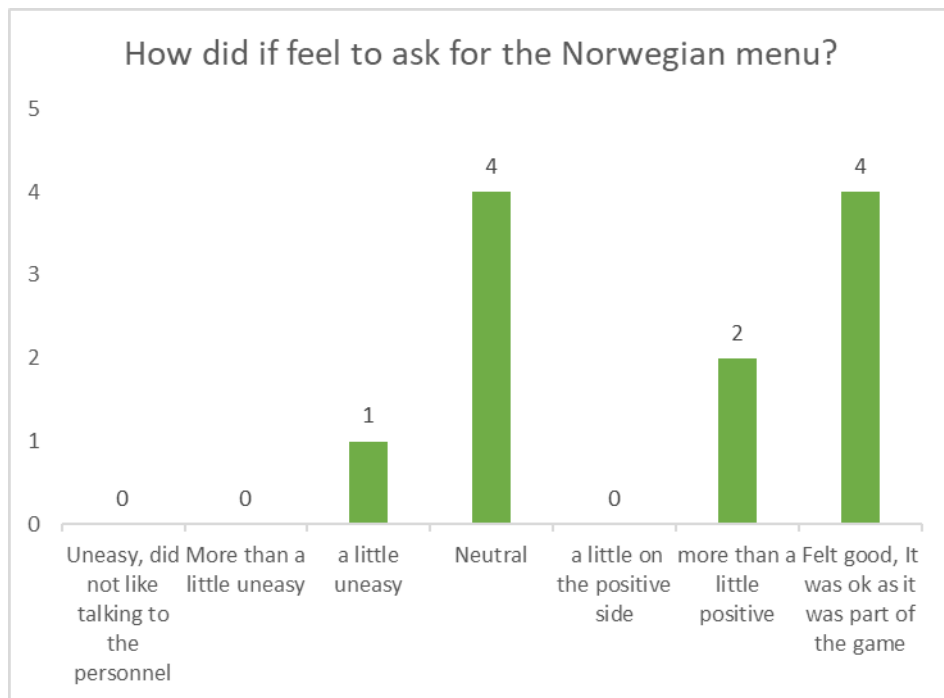


Figure 28. Seems using secret code while talking to café employees was fun (© Author)

Spending money as part of the game was the second important study topic on this research. Paying small fees as part of such game is ok for majority of the players. (Figure 29) Even though majority of the players did not feel bad about the purchases, some of them recognized the problems in it stating,

“Paying for something to continue the game could be a game stopper -> it depends on how deep you are in the game”.

Only one player seemed not to accept such payment, stating

“There should be warning about such payments”.

This player did not like the mandatory payments but mentioned enjoying finding new areas of the cafe not visited before.

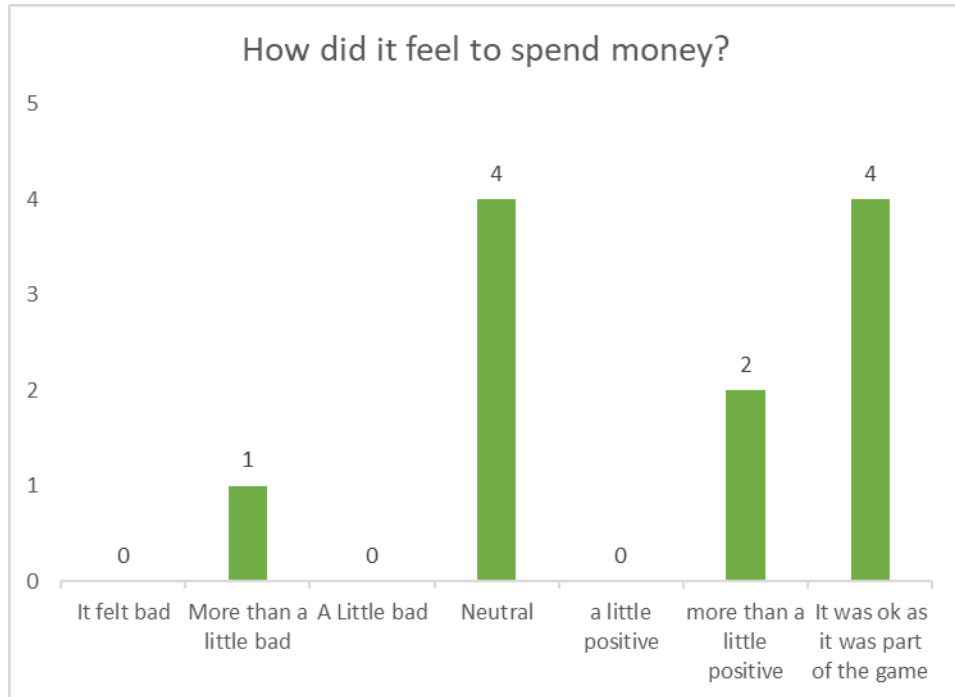


Figure 29. Only one player felt it was a bit annoying to spend the money (© Author)

Background story and its effect was again tested. Two players did not answer, and 3 told that background story had affected their purchasing decision. (Figure 30) This might indicate again that the immersion to the story helps people becoming more willing to use money.



Figure 30. It could be the background story added some immersion (© Author)

While in the first study location only one person bought something, here four persons bought extra things ranging between 2 and 4 Euros. (Figure 31)



Figure 31. If players need to buy something they are likely to buy more (© Author)

The café is a famous place in Oulu and most players were familiar with it, which could help them feel more comfortable there. (Figure 32)



Figure 32. Café was familiar to most players (© Author)

Majority of the players told they are also more likely to return to the café because of the game session which is interesting. Even though they were familiar with the place they still increased the positive association to the place. (Figure 33)

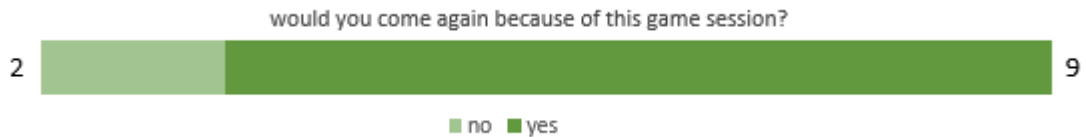


Figure 33. Having fun playing seems to increase likelihood of returning (© Author)

The players had the chance not to pay the required things, but all players paid the money. (Figure 34) This was planned to the end of the session, so even if the player would not have paid and the session would have ended the game was already at the end.

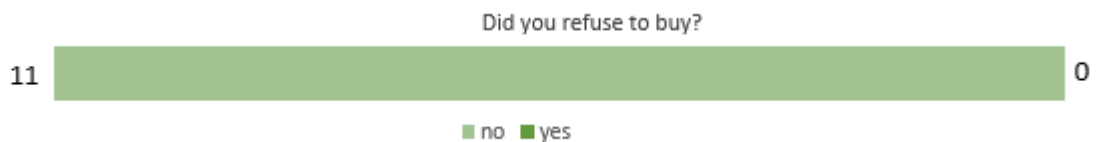


Figure 34. None of the players refused to pay (© Author)

Most players found the background story helpful. (Figure 35)



Figure 35. Background story helped players enjoy the game more (© Author)

All players felt the game was a good experience and some gave ideas where to have such games, for example in a new place as a way to learn about it. One player wrote:

“I would play such games in future as If I’m new in the city and I want to see new places”.

Another confirmed the same by saying:

“I think the game is a good tool to learn more about a city or a place. It’s an easy and better way than google. It is also a nice way to put advertisement in a game, if some company’s place is part of the game.”

All players felt they would play such games in future. (Figure 36)



Figure 36. Seems there is demand for this type of games (© Author)

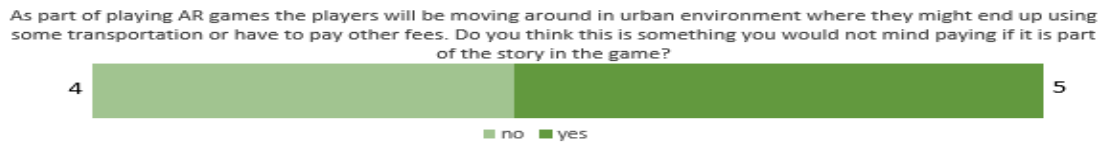


Figure 37. Players would be willing to pay for transportation during playing (© Author)

Pushing forward the positive feelings the players had, they were asked about more complex possibilities in such games. One interesting part of moving in such environment is the usage of transport and roughly half of the players felt they would not mind paying for transport while playing AR games if it is a part of the game story. (Figure 37)

In this game session the players themselves were the characters of the game. This is not common in games, but quite easy solution in AR games. All players enjoyed playing themselves (Figure 38) and this confirms what Hoffner and Buchanan (2005) found. More the character remembers the player the better as people want to identify with the character they play.

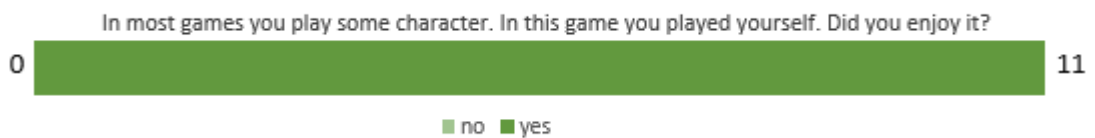


Figure 38. Players enjoyed playing themselves (© Author)

The last question had lot of unclear answers. The players were asked when playing themselves in AR games, would they create an avatar that looks like them or avatar that looks like someone else, if avatar making was part of the game. The question gave lot of answers with conditions and comments, most liked the idea of playing themselves or a version of themselves, but also commented that this depends on the game. Only one person answered clearly wanting to play someone else.

There was still one extra question after the players had finished. They were offered the money they spent in the game back and asked if the return of the money changed their minds about any questions. All players answered that the return of money had no effect on their answers.

6. Discussion and implications

In this thesis the player's attitudes towards using real money while playing AR games and chances of creating new business just by placing player to points of interest were studied in an "In the wild" experiment. The research questions, how can we directly influence players and how they feel about it in AR games by introducing real world purchases in games as part of the game story and how can we indirectly influence players and how they feel about it in AR game to become customers of businesses just by placing them in suitable locations, were studied using an AR game designed to this experiment. Target was to find if players can be influenced and if they still enjoy playing such games while under such influence attempts. Players were provided a questionnaire in two parts, where first part targeted on the player and the second on their feelings during the game session.

6.1 Startup questionnaire on the players

Based on the questions related to the test player themselves seems some of them sometimes react on specific moments in the games as if they were the character they are playing. While the strong immersion to games seem to happen only to some players, losing the sense of time seems to happen to almost all players. Of the test group clear majority felt they have no problems concentrating on activities they like. It seems players feel that sometimes they do get so immersed that others can not get their attention. Not only did majority of them feel that others might have hard time to reach them, but clear majority of them felt they themselves were missing what is happening around them while they play games (Figure 11). Playing AR games puts the players to a unique gaming situation where external distraction might have a negative effect on the experience. Tendency to immerse to game-world and character and skill to ignore distractions should work as a positive force to any influence attempts. When asked does the player easily become deeply involved in games most players felt they get from average to rather deeply involved quite easily which should also make influencing them easier if previous research is correct (Figure 12). None of the tested felt it is hard for them to get involved in games but identifying with the game character divided the group almost equally. Character identification and attachment seemed to vary from nothing to strong identification averaging mainly in the middle (Figure 13). This supports the later findings of the "feeling that you are the character" in the game did not seem to happen for most of the players during the test game session. Group seemed to be also good in concentration and not distracted easily (Figure 14 and Figure 15), so the test results seem to support the initial opinion of the players related to themselves. The amount the test persons are playing games varies, but most identified themselves as active players which might have helped in orientation to the research game (Figure 16). In general, the test persons identify themselves as people who play games quite often and concentrate in them strongly. The fact that most test persons were active players should also give more useful information as the aim is to study players. One limitation to test immersion is that only a small majority of the players felt the background story was helpful. Still for some of them it seems the story was really an important thing as one player wrote:

"Story was really good from the point of view that it gave right mood for the mission",

while other player had the opposite experience writing:

"I had hard time concentrating on reading the story".

This could indicate such story might be not as effective than a real gaming experience and for some players just reading some story does not work. Luckily in modern games such backgrounds are usually told using videos. Considering this the results might not tell exactly how well the story immersed them during the game. This could still indicate a real background from longer game would help the immersion more (Figure 17). The overall understanding on the test players was such that they were quite varying group of people and could therefor maybe give varying kinds of answers which indeed was the case in the end.

6.2 Game session Questions

Not only was the group very different from player to another, but the fact they did not know the first place of the real study, opened up more opportunities for interesting answers. (Figure 18) One player “knew something” and only 2 had been to the premises before. (Figure 19) A new place “where you have no business” can cause stress and as some players were stating in their answers. Still in the end most described this as an positive experience. Feeling of waiting was one of the most interesting questions. How annoying is it to be forced to wait in the middle of the game? (Figure 20) This seems to divide the players. Some players feel strongly annoyed, while others seem to like it. One player made it very clear

“I wanted to play the game and 10 min of waiting felt wrong”.

This player felt the people working in the place were not part of the game, so talking to them would be outside of the game and the player just wanted to play the game

“if I get in contact with the person at the counter, I am out of the game”.

Same player also did not care for the story at all indicating maybe lack of immersion to the game and the game world. Another player told the opposite stating

“The place in question was very good for this type of wait: they had couches and calm environment”.

Another player did not like the waiting, but proposed ideas how to make it work

“10 min wait felt too long, visually seeing more of the other dimension, like agents etc would help get into mood”.

This could mean that such waits would be ok for some if they are somehow entertained during that time. Story could include more details or some visual stimulation. Best of course would be that the players were helped to get to know the business or service where the waiting is taking place. Most players did not leave the premises and their comments seem to indicate a pleasant place with sofas etc. can help with keeping the players in the location. This should be also considered when planning similar scenes in AR games. If we want to keep players in a position, make it such that the players enjoy it (Figure 21). Even though only one person spent money while waiting, this already proves that using extra money while playing is a working concept. The place did not advertise the purchases, but sodas that one player bought were visible (Figure 22). Some comments reflect the situation

“I haven’t bought something because I had another important appointment and not the time to buy something in the cafe (no time to wait). But I’m not sure if I would have bought something because of the game”

Hinting that they could have purchased something just for fun if they had the time. Another comment was weighting the balance between negativity of waiting to usefulness for exploring

“Long waiting time is bad for the use experience of the game, but it is good for exploring a place / company”

Another commenter gave a possible solution

“Maybe the game should be more direct to the user and tell him to explore the place”.

It also seems having the employees as part of the game made the situation less uncomfortable for the players. Roughly half of the players ended up talking to the person on the counter. How willing the people are for social interaction affects the usage or money and those who are willing also seem to use more money for in-game purchases (Hamari et al., 2017). Social interaction with salespeople or service providers while playing is another thing and area that could be studied more (Figure 23) One player wrote:

“Only because of this game I know what the company does. If I only would have passed this shop or saw an advertisement on the street, I would have ignored it”

which seems to indicate quite clearly that such games can be a great way to introduce people to a business (Figure 24) This finding is very positive as it quite clearly indicates the feeling of the players changing to more positive towards the business and increasing the likelihood of future business actions (Figure 25)

The game and the technology used have a lot of challenges and placing people in the urban environment to play adds a new dimension to it all. How hard or difficult the players found the game to play varied from really hard to easy, so clearly some aspect should be tuned or made in an easier way in future AR games. Still it is hard to say where the limit of too hard or easy is. (Figure 27) Social pressure and technical problems can affect their mood to play (Rauschnabel et al., 2017) as one player mentioned.

“This was a place with other people so I felt a little watched while scanning for tips. That made me a little impatient”.

Same player did continue saying

“I think this is not an issue for most people”.

Some answers clearly indicate an unease while moving around in real world and playing something rest of the world cannot see.

“I felt little pressure from bystanders as I was scanning for clues. I imagine them thinking why the hell is she taking photos of a trash can”.

Game itself had limitations that were discovered only during the game session. Localization of the game must be thought over for example. For a local person it is easy to move between familiar places and the names and language of the places are easy, but for a stranger this might cause a lot of problems and decrease of motivation to play.

“As a foreigner it is hard to keep the name of the places where I need to go in mind, It would have been helpful if I would have the option to see the instructions/text again”.

At the same time locals seem to have enjoyed the experience, indicating the game locations could be used to educate the players about the locations.

“It was fun and got to know new things about your hometown. Moving distance between places was ok.”

Even though some players felt the distances used were perfect, others felt they were too much. Motivation should be kept up with game action in the game. If players gets stimulation they can manage even longer distances as one player stated, he/she had nice moments, even though walk was a bit long.

“Nice AHAA! moments . bit long walk between locations when alone”.

Comment also seems to indicate playing such game in a group could help. One player even mentioned doing such game session with a group of people.

“If you could get such short session of such game for example for a work team, it would be super cool”.

Social AR games played in groups could be opportunity for new games of research. For some the walking distances were so long they came up with alternative solutions.

“I thought of getting a city bike for moving”.

In general players commented positively about moving around, several times mentioning immersion.

”Moving in game was: It was great, really helps the immersion”

and

“Immersion was great, clues were well hidden, felt a bit like playing watch dogs 1 (Traditional PC/console open world RPG game”.

Finding the clues varied, some found them easily and others had difficulties. The environment influences it and during the game sunlight and rain causes problems that should be considered when creating such outdoors games. One player mentioned that

“Rain was a problem for visibility”

another that

“Sun was glaring in my eyes, so I had hard time reading the sign with my phone”

one even mentions negative feelings associated with such experience

“Sunlight affected the ability to see the clue. Too hard to find the clue causes a negative feeling”.

Such environmental challenges can make the image recognition hard or even impossible. Player needs to get very close to the hidden clue for the technology to work. One trick in such game would be sounds or haptics as one player commented

“Using haptics on the phone when close to the target would help”

which makes perfect sense. In general players had, as one player wrote

“Positive feeling of moving around and see places”.

One player wrote

“It was totally different kind of excitement that for example Jurassic world alive, when the clues there is real environment and you could do investigative work while finding the clues”.

It seems motivation and fun were part of the experience, and this should improve the willingness to use money. One player even stated

“For anyone interested in RPG:s this is an amazing concept”

The game took the player to businesses where the employees were playing their part as NPC:s of the game. It seems this works well and could be used as an example for future games. The employees were not interviewed for their experience, and this could be an interesting thing to study. Will playing as an NPC increase work happiness could be topic of a future study. It seems that when player gets immersed to a game and know the surrounding world is part of the game, they feel more comfortable in such encounters as one player wrote

”This was nice! I have a bit social anxiety but as I knew the staff would know what I am talking about. It felt easy to approach them. It felt like i’m part of some sort of conspiracy :)”.

Another player confirms

“interaction with the cafe workers was very pleasant”.

One challenge for AR games is that how the players can identify game content and characters. In this game the players knew the employees are taking part in the game and that made it a nice experience, but in a large AR game this might be impossible. (Figure 28) Maybe some technological solution for this is possible, for example face recognition of NPC players. Comment mentions immersion and confirms that immersion plays important part in using money while playing. Only one player seemed not to accept such payment, stating

“There should be warning about such payments”.

This player did not like the mandatory payments but mentioned enjoying finding new areas of the cafe not visited before. Maybe uncomfortable feelings can be also tolerated if they are balanced with fun experiences. Café is an old building with basement where one of the game clues was hidden. The basement has an exhibit talking about the history of the place that used to be a small wooden castle. Final clue was in a small tower of the café building. People that have visited the café might have missed these places and the

game lured them to investigate them in a fun way (Figure 29). Some comments of the players seem to indicate the type of the business also matters to the players.

“It is always good to buy something small from small businesses”.

This might be a preference and style thing. It could be such preferences go hand in hand with game types and could be investigated more to better target the certain style players to correct places. Still some players saw no problems at all stating

“I am happy to pay small amounts while playing games”.

We can see that in some types of places like in a café it is possible not only to sell the item related to the game, but extra things or upgraded versions of products. Also, it seems to indicate that once money is used, it increases the possibility to purchase something extra which previous research also mentions (Figure 31). Interestingly majority of the players told they are also more likely to return to the café because of the game session, even though they knew the place before. Could be the fun experience associated with the place makes them feel they want to return (Figure 33). The players had the chance not to pay the required things, but all players paid the money which suggests that players are willing to pay small amounts to advance in a game. Several factors can make same situation in a real game different. Here the players were playing the first time and knew it is a test game, but in a regular game the situation is different.

In general immersion to games helps to enjoy playing games. In this study, it was shown the background story created to help with the immersion really helped some of the players and they felt it helped the majority to get more of the game. The players seem to be divided into two groups where one cares about the story and enjoys immersion and the other just wants to play the game (Figure 35). All players felt they would play such games in future which seems to indicate good future for AR technology. (Figure 36) Comments related to this were really positive telling for example how this would be a great way to learn about new places. Clearly there would be possibilities for tourism. One player stated

“Really interesting! Felt like I was really investigating something”

The last question had lot of unclear answers. The players were asked when playing themselves in AR games, would they create an avatar that looks like them or avatar that looks like someone else, if avatar making was part of the game. One player commented that

“I’d like to play a pseudo me: like in live action RPG: I might be partly looking like me but I can still play in different character or a fraction of me. Overall pleasant experience”.

The question gave lot of answers with conditions and comments, most liked the idea of playing themselves or a version of themselves, but also commented that this depends on the game. Only one person answered clearly wanting to play someone else. As there were so much unclear answers no graph is provided. Still, it seems this is an interesting topic and players had lot of ideas about it. Another interesting topic to study in the future and could ask for example is it easier to spend money when playing yourself or someone else. The money after all is players own money.

There was still one extra question after the players had finished. They were offered the money they spent in the game back and asked if the return of the money changed their

minds about any of the previous questions. All players answered that the return of money had no effect on their answers. A player wrote:

“Getting the money back was positive, but I did not feel bad buying something”

Creating such AR games have lot of challenges (Wetzel et al., 2008). Placing clues and using image recognition outdoors is a big risk as the environment can change causing image recognition to fail. This happened in few cases during the game sessions. Even though players reported enjoying good weather outdoors, there was also rain which players did not like. One player wrote

“Good entertainment in good weather”.

On few occasions changing conditions caused difficulties finding the clues, but every player found them in the end. If created wrongly the recognition could fail totally. Direction of the sun and weather conditions and even damage to the environment can cause failure. Tools are evolving while this technology gets more common. Unity and Vuforia were used in this study to create the image recognition. Vuforia is part of Unity, which is a common game engine that offers several ways to use AR. Games will most likely be one of the key areas where AR is used in future and as tools evolve and become more common new ways of AR usage and influence on the players can emerge.

Many studies available studying AR concentrate on games like Pokémon GO (Niantic, 2016) and how people can be made to increase their physical activity or how the game could be used for educational purposes. Pokémon GO participation was associated with a significant increase in PA among young adults. Incorporating PA into gameplay may provide an alternative way to promote PA in persons who are attracted to the game. (Xian, 2017.) This seemed to be also the case for the test players as they mentioned moving around as fun activity. One player stated

“Moving felt good! It feels like playing a real-life game”.

The clues could have been used in educational way also, but already the fact players entered new places was seen as good way of learning about the town. Playing the game while other people were around caused some discomfort in some players while others experienced it as fun as one player put it

“I had fun playing normal”.

The whole industry of gaming is growing, and augmented reality seems to be a big trend inside the gaming phenomena, but it's possibilities or risks have not been yet studied fully. Where augmented reality games lead to is also still a mystery. Will they stay as they are currently or will they become something even bigger will be seen in near future. Pokémon GO has been the topic of several studies that seem to show the physical activity of people increase because of playing the game. The game can be a starting point to an active lifestyle for people (Wong, 2017). These earlier studies concentrate on the physical activity, health benefits, education and on monetization. Free to play games introduced a radical change in the videogames industry as a new way of monetization (Hanner, 2015). Monetization in augmented reality games could have new unexplored ways that will emerge only when the use of augmented reality becomes more common. There are already inventions where real world items can be reviewed by usage of augmented reality. The digital versions of the possible purchases can be placed on top of the real world (Arrasvuori, 2008). This technology is pushing through with success in some areas like

games, but in others AR's current technological status seems still insufficient to appeal to a broad population of consumers (Yim et al., 2019). Adding the change to view items in augmented reality to the attachment to a game avatar could open interesting new ways of monetization. The purchasing behavior of game items has been studied, but items bought in real world in Augmented reality games is a thing that has not been studied before.

6.3 Ethical Issues

Age, sex and education are interesting facts in the study, so anonymity is important. A consent form was used, and players were informed about the questionnaire in the beginning before they signed into the game. Players were initially told the study is testing AR games, not the players behavior. It is not a good practice to trick the people who take part in studies, but in this case small amount of trickery was needed to get truthful results. Detailed information about the study was provided after the game and after the questionnaire was held. The players were also informed that they can withdraw from the study at any point they like, and their personal data will be then deleted. This research involves human behavior and influencing the players, so it is interesting on ethical side. Hopefully the study provides ethical guidelines to game developers when making games where the goal is to influence the human behavior especially the parts where business issues are important and where players are put to situations where they might use money. How far can we push the players and how difficult it is, is another interesting factor. The use of avatars might require another study in the future as the relationship between the player and the avatar might be strong. Is it ethical then to use the Avatar to modify the behavior of the player.

7. Conclusions

7.1 Research results and contributions

AR gives us new experiences and puts people to situations where human behavior is still largely unknown. Can the players of AR games be guided towards different types of consumer behavior while still keeping them engaged and enjoying the game? The goal of this study was to find answers to the questions this new technology raises. By using a game that was specifically designed for this purpose, the players were put to situations where the research questions were studied. The research studied how can we directly influence players and how they feel about it in AR games by introducing real world purchases in games as part of the game story. Secondly it studied how can we indirectly influence players and how they feel about it in AR game to become customers of businesses just by placing them in suitable locations?

The conclusion of this study is that AR games can be used to influence players to spend extra money, develop a positive feeling towards a business, and potentially become their future customers. This study found that enough players are willing to use money and do not become too annoyed when purchases are a part of advancing in the game. Although the results of this small-scale study provide only limited knowledge on the topic, they suggest that the use of AR games for influencing consumer behavior is mostly positive and opens many opportunities for further research, as well as for game companies and businesses. Small businesses could create AR games to promote their premises, cities could use AR games to influence tourism, and game companies could develop new business models using AR technology.

The results of this study indicate that both tested scenarios are possible to some extent. Players show interest in businesses and service providers when they are placed in their premises, and they are willing to spend small amounts of money to progress in games. It remains to be seen whether this level of interest and spending is sufficient for businesses to make a reasonable profit or how far it can be pushed. Although some players did not like the idea of purchasing items or waiting for items to become available, many had no problem with these aspects of the game. In fact, many players felt positive about the experience and indicated that they were more likely to become future customers of the businesses after the game session. This could be seen as a good way to advertise the businesses and attract future customers.

Future games should be designed with specific locations and businesses in mind, and new business models could be developed that would benefit both the game companies and local businesses. There are endless possibilities for how to design games and business models, as there are countless locations and businesses in the world. For example, a clothing company could create an adventure game that links the player's avatar to purchasing clothing for both the player and the avatar. A restaurant could create a murder mystery adventure or include an encounter in a larger adventure game. By placing players in different locations, they not only learn about new places, but also become potential customers. Even small purchases can be included as part of the game story, which can further engage some players and encourage them to become paying customers.

As AR technology continues to grow and evolve, it is impossible to predict where it will lead. At the same time, other technologies such as artificial intelligence (AI) and virtual reality (VR) are also advancing, and the potential for these technologies to be used in combination with AR is significant. Virtual realities are also moving forward and

becoming more and more realistic. New technology that enables use of VR with higher and higher resolution is also under way.

As social media merges with all these technologies we might see some interesting things happening with game like Avatars. We already have several profiles in different platforms and maybe they merge in the metaverse. Maybe game avatars will be part of this as AG games mix the avatars to ourselves and the real-world. We could use big data and have Avatar that has all our information from all the tools we use. Once we add AI to the avatar we could have it doing things for us. Already now google assistant can make phone calls for you and book a time to barber for example, but the avatar could buy you food or clothing without you even asking for it. As the avatar has all the right information about the player, measurements tendencies etc. the player could just tell the avatar his/hers needs and send the avatar shopping. AI could also soon create the VR worlds we visit and the AR content we see.

As we wait to see what the metaverse will be, where the virtual reality goes, what new better models of hardware and AI enable us in future, the results of this study are very interesting. Results using the game created for this study do show that people are open for adventure and business in the coming new world that mixes the real and the artificial. As AR technology continues to advance, the potential for it to be used to influence consumer behavior in new and innovative ways will only increase.

7.2 Limitations

All players enjoyed the experience, but one limitation to this study is that playing AR games the first time could be fun only due to the novelty effect, because it is a new and exciting technology (Wetzel et al., 2008). So it could be the players would not be so happy to play or to use money if they played longer. In future research, it may be useful to use participants who are familiar with AR games or to conduct multiple gaming sessions to mitigate this effect. In the same time of novelty effect it has been also shown AR games increase player retention (Alha et al., 2019), so these things might balance out each other on some level.

The sample size was relatively small, consisting of only 11 participants. This may limit the generalizability of the findings to the larger population of AR game players. Further research with a larger sample size is needed to verify these results.

Additionally, the game used in this study was relatively simple and may not have fully captured the immersive potential of AR technology. It could be the findings would be more accurate and deeper with long game where player get more attached to the story and the character. Not only was the game short, but due to technical challenges the game used in this study was very simple, and the immersion as such might have been influenced. Using a commercial full game in research might increase immersion and enjoyment.

Another limitation is the technical challenges associated with conducting an AR game outdoors, including varying light and weather conditions. This may have impacted the player experience, player feelings and then the accuracy of the results. Additionally, the questionnaire used in this study was self-designed, which is a limitation in terms of its validity and reliability and could also introduce bias in the results.

Execution of such tests introduces problems. Doing this scale research without a team, programming and finding right solutions and the executing the test session proved to be hard. Image recognition is tricky outside, and it took time to get everything working and

some solutions had to be simplified which also might affect the playing experience. First day of testing was full on challenges and the second with experience a little better. Basically, it was a learning experience how it should have been done. Having different start and end locations forced the author to drive with bicycle between the spots taking care of setting up the start for the players and arranging the questionnaire to those who were finished with the game. At the same time looking after the players playing the game, solving technical problems, and documenting the gaming sessions. While moving in the game area proved to be a challenge it did enable monitoring of the game and making sure players were not encountering problems and that the experiment proceeded according to the plan.

Due to small sample size, there is not statistical analyses of the results. There is therefore interpretability and uncertainty in the findings. This is complemented by detailed description of the study setup and additional observations from the field.

In future research, it may be useful to have a larger team to assist with these tasks and to mitigate technical challenges. Overall, these limitations highlight the need for further research to fully understand the potential of AR technology to influence consumer behavior in AR games.

7.3 Future research paths

This study represents a preliminary investigation into the potential of AR games to influence consumer behavior. Further research is necessary to better understand the impact of AR technology on player engagement and purchasing decisions. In particular, there are several potential avenues for future research, including the use of avatars in AR games and the involvement of company employees as non-player characters (NPCs) in the game.

This research suggests that players are willing to spend small amounts of money while still enjoying the gameplay experience, but it is unclear where the limit lies. Further study could examine this phenomenon in greater depth and analyze the types of in-game purchases that are more likely to be accepted by players. Additionally, the indirect influence on players' likelihood to make purchases, both in the immediate term and in the chance of becoming future customers, could be explored in detail. This could include studying the most effective locations for promoting in-game purchases and determining the optimal arrangement for such promotions and ways to make the players return later.

This study provides initial evidence that employees enjoy participating in AR games and raises the question of whether AR games could be used to improve employee happiness and business performance. Additionally, future research could examine whether players are more likely to spend money while playing as themselves or as an avatar, and the ethical implications of using avatars to modify player behavior.

To address the limitations of this study, future research could be conducted with a larger sample size and more robust statistical analysis of the results. In addition, new technologies, such as AR glasses and see-through headsets, as well as improvements in game design and technical capabilities, such as GPS tracking and haptic feedback, could be incorporated to enhance the player experience and the accuracy of the results. Finally, the potential role of emerging technologies, such as cryptocurrency, in the intersection of AR and commerce warrants further investigation.

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9. APPENDICES

Appendix A: Info for test candidates

Appendix B: Background story for players

Appendix C: Consent form

Appendix D: Norwegian menu (handout to players)

Appendix A: Info for test candidates

Are you interested in testing Augmented Reality (AR) games? I am hosting game sessions as part of my thesis study.

The game is a single player game, where the player takes the role of an investigator who moves from place to another in Oulu central area guided by the clues found using a phone app.

The player is provided with an Android phone with the app preinstalled and with some background information. Player can use knowledge of the area or any tools like google on personal phone. Player can also call Janne Kallio (xxxxxxxxxx), if stuck in the game.

The game will take about 30min for each player. The game is programmed by Janne Kallio.

Please understand this is not a full game, but just a very short slice of a game testing the AR possibilities. Playing the game is not as immersive as playing a real full game, but read the introduction story (provided before the game sessions) and try to get to the feeling for the best possible experience.

Date for this is 5 - 6.9

5.9 15 - 19

6.9 12 - 19

Before the game each player is provided with a consent form informing the players about the study and how the information is handled. They are also asked to answer some general questions.

After the game session the player fills a questionnaire, which provided data that is used in the thesis study.

So if you are interested and have the time, please let me know so we can start arranging the time slots for each player.

Appendix B: Background story for players

During the game you are free to use your own phone, google etc for help

Use the phone to find clues. They can be on walls or statues etc.

Read the background story and if you don't understand something ask Janne, before starting the game

The story so far:

You are trapped. The last thing you remember from before, well it does not matter. All that matters now is that you are trapped and have been for a while. It has been roughly 6 Months since you woke here and for a long time you did not understand what "here" was. What has happened? Am I dreaming or dead? You can still remember the first thoughts of mixed horror. Is this heaven or hell? Closest thing to describe it all would be saying it is quite like putting the one ring from the Lord of the Rings movie on your finger. Distorted and ghostly world with warped vision and sound. It was soon after you noticed the others. You were not the only one trapped in this ghostly place, but it was impossible to communicate clearly with these ghostly apparitions. Slowly you started to make sense of your surroundings. It became clearer what had happened and where you were.

It was a place between worlds that you could sometimes see like through a distorting window or like the surface of a mirror that distorts the reflection sometimes missing parts as if they were trapped somehow on the surface of the mirror. You could see two worlds sometimes at the same time, the one you were somehow ripped from and another almost identical, a parallel dimension. You found out there were areas here between where the worlds almost overlap where you could feel strong tingling energy. In these places the vision to the two dimensions were clearer and you could hear and sometimes sense things. At the same time it was also hard to separate the worlds from each other. It took time to make any sense of anything at all. Later you learned you could even interact with the dimensions.

When you saw yourself in the other world it became clear these two dimensions had collided for some reason. You started to spy the worlds and more clues of what had happened poured in. You found out some groups of people were investigating what had happened. Some governments and private companies or organizations. There were agents working on both worlds who clearly had something to do with the collision or at least some of them starting to understand what had happened. There were agent of several different factions and you witnessed them even fighting each other. Then on one of your "spying trips" you learned some agents had created tools to interact across the dimensions and the plan started to form. For some reason your dimension was affected more by the collision and more people from your world were trapped here. The people trapped look like dim lights floating in air or ghosts of sort gaining more human like shape closer to the places where the energy between the worlds was stronger. During the collision of the worlds other things happened too, places changed and items disappeared on both dimensions. Conspiracy theories seem wild on both worlds. You have seen the agents using tools and software to interact with the place between and the opposite dimension altering reality. You need to get your hands on them and you need help.

It is time to contact yourself from the other dimension. You now know software the agents use and you have spied the location from where one could download an early version of

it, forgotten there by an accident. In one of the energy concentrations you have been able to access a computer in the other dimension. It is time to send yourself a message. The old version of the software will enable your “twin” to sometimes see through and between the dimensions with the phone camera. You can even leave tips to your “twin” in the other dimension to help on the quest of helping you. Your twin needs to download the software and use it to find access to the later version of the software that has more features, including a way to release you or any other trapped in the place between.

Today, this world:

So you got a message from yourself from your own email address.. Sounds mad, but the content did explain some of the weird things that happened half a year ago. As long as that app does not have any viruses or spyware it should not be too much trouble to check it out and confirm this is not just some weird prank...

Game starts here:

You have installed the app, use it to scan the symbol below



Appendix C: Consent form

INFORMED CONSENT FORM FOR PARTICIPANTS OF AUGMENTED REALITY RESEARCH

Thesis study on Augmented Reality Games organized by Janne Kallio

Full name of participant _____

Date of birth _____

I hereby give my consent to participating to collecting research data from the Augmented Reality game session organized by Janne Kallio and as part of his thesis work research. I also grant permission for the abovementioned person to store and use the data for research purposes. Before signing this consent form, I have got acquainted with the attached research description, its goals and the procedures related to collecting research data. I am aware of being able to withdraw my consent at any time by informing the Researcher about my wish.

 _____ Place and date
 Signature of the research participant

I hereby confirm that the Researcher will use the data according to the good practices of research ethics and the regulations stated in the privacy protection law. The research participant will be given a copy of the consent form, signed by the researcher responsible of the research effort.

 Place and date Janne Kallio

The use, protection and storing of data

Janne Kallio in University of Oulu will be responsible for the protection, storing and use of the research data collected during this research effort. The research data will be utilized only in academic research. In publications and scientific presentations, the data will be used respecting the participants' privacy maintaining their anonymity. The research data may also be stored as such for longer-term use in research and teaching. In such a case, the data will be archived by the Research Units, using appropriate archiving methods and techniques. Responsible person for the research is Janne Kallio.

Appendix D: Norwegian menu



Norwegian Menu

- kahvi/ tee/kaakoa 2,8€
- limppari 2,5€
- jätski 3,0€
- pulla/munkki/cookie 2,90€
- Kasvispirakka 5,80€