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THE NEXT STEP OF VIRTUAL REALITY IN BARCELONA

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Index of abbreviations

AMB: Àrea Metropolitana de Barcelona

HDMI: High-Definition Multimedia Interface

HMD: Head mounted display

HP: Hewlett-Packard

MP: Multiplayer

PC: Personal computer

PSVR: PlayStation VR

TV: Television

URV: Univeristat Rovira i Virgili

VBA: Visual Basic for Applications

VR: Virtual reality

WWII: World War II

1 Introduction

Virtual Reality, I think, is the future of entertainment, among other new exciting technologies, of course. But with no doubt, it will be very present, in one way or another in the ways we will recreate in the future.

It is a study of virtual reality as a recreation option in Barcelona, to learn about it and to define a suitable VR project for Barcelona. For starters, it defines the context and definitions. Then it analyses the current VR recreational supply of the city and diagnoses its problems. With that, it proposes a VR leisure project for groups of children, adults and families. Specifically, a virtual reality park focused on VR experiences like paintball. A VR headset allows you to cover your entire field of view with digital images. And it is set in a warehouse where you can run, jump, shout and practically live in a virtual world with your friends and family. Then it analyses the competitors and the target public of said project to generally guess its viability.

I decided to choose this topic for my final degree work because it is something that fascinates me. I have always been an avid computer games consumer, but the limitations of a screen have always bothered me. When I learned about the Oculus Rift, back in 2012, I saw the future of digital entertainment. A technology that does not bring the game to you like a screen, but it offers you to the game, forcing you to live in it.

I started gathering information, cultivating an eager want to try it and my imagination soon started to fly, to create possible scenarios where this technology could make an impact. And of course, videogaming was the first and most logical scenario. It occurred to me then, that maybe I could build a virtual reality paintball or something similar. In my mind it was a dream that could be true.

Then, some months later, energy and passion started to drive me to, at least, try to discover the entrepreneurship world so I could start the path of creating a company like that in Barcelona. After a while, I talked with a friend I really complement with and we started doing a draft of the business plan. We went to URV entrepreneurship division and they loved the idea. But everything reached an end when my friend decided to leave and the beginning of the academic year was just around the corner, I just could not drop my degree.

The final degree work offers me an opportunity to delve again in the virtual reality world and try to rescue that motivation that is now dormant. This study will help me figure out, partially, if my idea is

viable. And it turns out to be viable according to my findings. Maybe I will use this data for a bigger study and business plan to carry out my idea and bring a new VR world to the people.

2 The leisure industry

The work focuses on recreational uses of virtual reality. This part explains what exactly the work refers to as leisure and recreation.

2.1 Definition of leisure

Freedom provided by the cessation of activities; especially: time free from work or duties. (Merriam-Webster, 2017a) and is also defined as time spent with freedom of choice, without being forced by work or domestic chores, among others (Trucot, 2016). So essentially, free time that a person can use for whatever he wants.

Leisure and leisure activities differ in that a leisure activity is an activity done using free time, and leisure is just the time. For example, if someone is completely idle, without doing any activity, he is still using his free time (leisure). But he is not doing any leisure activity.

2.2 Definition of leisure activity or recreation

Recreation is the same as saying leisure activity, they are synonyms. The definition doesn't always imply that activities done with leisure have to be necessarily fun or enjoying, depending on the source.

Recreation in Leisure and Recreation (2010) is defined as an activity that implies having a good time, having fun while doing some pleasurable and enjoyable activity. But on the other hand, other sources like the dictionary Merriam-Webster (2017b) just defines it as a means of refreshment of strength and spirits after work, more like an activity that helps physical and mental recovery in a person. This definition doesn't imply enjoyment at all. But another dictionary, Cambridge Dictionary (2017), defines recreation as an activity that implies enjoyment, happiness or fun. There is no consensus, apparently.

Since we usually refer to recreation as something that makes the individual happy, in this work leisure activity is defined as the following:

Activities that are done because the individual seeks fun, which makes him achieve some degree of happiness. Enjoyment activities done using one's free time (being free from commitments to physiological and social needs). There may be other motivations to do a leisure activity besides fun or enjoyment, but the main motivation should be to have a good time to be defined as recreation or leisure activity in this work.

For example, someone who goes jogging because he feels he should because he doesn't want to be unhealthy, even if the individual enjoys the activity, it is not recreation. The main reason to do it is not the enjoyment of the activity itself, but the associated health benefits. Had the individual be in good health, he would have chosen another activity to spend his free time.

The problem with the concept of fun or enjoyment is that is entirely dependent of one's perception of the activity. One may enjoy chocolate and go to a specialty store, but another individual may not like said food. It is not an absolute truth what is joyful and what is not. But we can use common sense and literature definitions to assume what activities usually lie in the recreation definition and what not.

Also, another problem is that recreation stands for a lot of types of manifestations of itself. It could be said that there is one type of recreation for every citizen of the world. Standardising recreation is difficult because you can do it from a lot of different points of view and perspectives ('Recreation and Leisure', 2017). It includes travel, clubbing, videogaming, listening to music or concerts, playing, etc.

Tourism is considered a form of leisure. A complex one, because sometimes it is not directly considered recreation. It is more a type of leisure that involves different leisure activities that form an experience away from home (Meeras, 2010). The following shows this definition graphically (Hall, & Page, 2007):

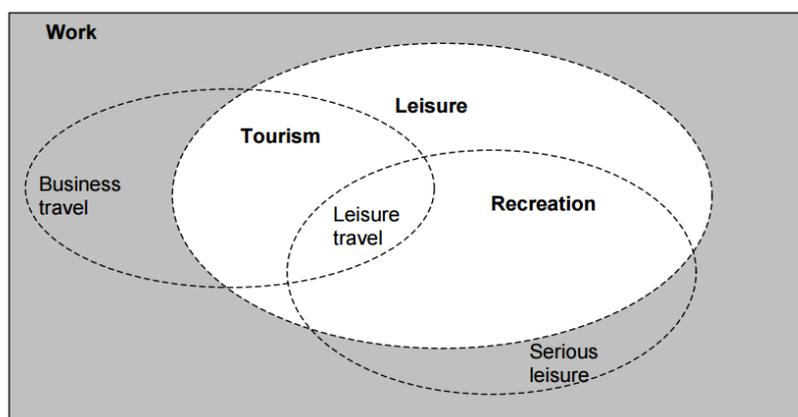


Figure 1. Graphic showing the relationship of leisure, work, recreation and tourism. Indicating they are not the same concept, very similar. It is useful to know exactly what type of leisure is considered recreation.

3 Virtual Reality

3.1 Etymology

The technology that this work is based on is called “Virtual Reality”. It is a compound name that combines the word virtual, which it is defined in computing as:

Virtual objects and activities are generated by a computer to simulate real objects and activities.

(COBUILD Advanced English Dictionary, 2017b)

And the word reality, which it is defined in as:

You use reality to refer to real things or the real nature of things rather than imagined, invented, or theoretical ideas.

(COBUILD Advanced English Dictionary, 2017a)

These two words have nothing strange by themselves. But if we compare them we notice that are approximately opposites. Virtual is something that tries to simulate the reality, but of course, it is not real, otherwise it would not be a simulation, but the reality itself, because it is assumed that perfection does not exist, therefore a real simulation is impossible. We can define something as virtual or as real, but not both. The same happens as imaginary and real. It could happen that a computerized simulation (virtual) is very close to the reality, that in practice it could be called real, but it cannot be real at 100%.

Going back to the original focus of the chapter, we have an apparent incongruence in the name of the technology. Virtual reality is an impossible concept. It is like saying that you have a short tall brother, or a fast slow car.

The meaning of virtual reality according to a dedicated source is:

Virtual reality is an environment which is produced by a computer and seems very like reality to the person experiencing it.

(COBUILD Advanced English Dictionary, 2017c)

[...] The term 'virtual reality' basically means 'near-reality'. This could, of course, mean anything but it usually refers to a specific type of reality emulation.

(Virtual Reality Society, 2017b)

We can see that the meaning of virtual reality is a computer simulation close to reality, so much, that it is very resembling to the reality if done right. This definition implies that the user is capable of determining that is a virtual environment, and therefore not real. But something that is very similar to another thing can lead to confusion.

The name of virtual reality is a very good name. It describes an incongruence, confusion, the same feelings a person can feel when interacting with a good VR system. Some users, if a VR environment is very real, cannot distinguish it from the reality at first glance. They realise it is VR some time later, but even knowing that, they are left with a sense of disconnection between reality and themselves because the brain is confused distinguishing what is real and what is not (Searles, 2016).

What it is currently understood by virtual reality is the medium that allows someone to fill their entire field of view with virtual images, like his own eyes would have been replaced by someone else's. He is transported to a new world, that has new sounds powered by speakers playing 3D sound effects, and new virtual images, powered by a head mounted display (or HMD) resembling a bulky pair of sky glasses. His hands are also in virtual reality thanks to a pair of controllers that serve as a way of interacting in VR. Some examples of VR experiences range from living in an alien water world, diving to survive and constructing a home underwater, to experimenting a ride in a spaceship.

3.2 History

Virtual reality, in this work, implies the use of a computer, since a virtual creation is computer made. But before computers, there were experiments with different kinds of visors and photography tricks to simulate environments in three dimensions like VR does.

3.2.1 Before current VR (1838 - 1987)

In 1838 Charles Wheatstone discovered that people can generate 3D images in their brain if they see two 2D images shifted a little bit, and one eye can only see one image. Thanks to his invention, a name was given to this 3D effect: The Stereoscopic Effect (Oculus VR, 2017a).

The invention allowed people to view a photograph in 3D. He invented a visor, called The Stereoscope, that is the first object that resembles the current VR HMD (Virtual Reality Society, 2017a). The second memorable VR-like device from the past is the View-Master, which displayed 3D video instead of photography. (Sell & Sell, 2007; Virtual Reality Society, 2017a).

All of the previous inventions were fixed but The Telesphere Mask was the first VR-like device that was mounted on a head of a person, thus creating the term Head Mounted Display or HMD. It was invented by Morton. L. Heilig. It was a visor the user put on his head with straps like a head mounted flashlight. Then he could plug in a pair of headphones. Just a year after the Telesphere Mask, the Headsight was invented by Philco Corporation. It was a device very similar to the previous one but with motion tracking, the first in the world (Virtual Reality Society, 2017a).

In 1987, after some more trials with HMDs and technological advancement, the term “Virtual Reality” was coined by Jaron Lanier, giving the research field its own name.

The same year, the first commercial VR goggles that a normal citizen could buy launched onto the market. They were invented by Visual Programming Lab and cost 9.400 \$ per unit, and of course, they couldn't display very good experiences because computers were much slower than today. This event triggered the launching of more VR devices and started the investigation in the field. VR arcades appeared and more consumer grade HMD launched onto the market.

Companies like SEGA in 1993, Cybermaxxx in 1994, Nintendo in 1995 with its Nintendo Virtual Boy, were trying to get a good VR device. Sadly, this was impossible. These devices were built with 90s technology, and that means they were not capable of delivering a compelling experience for entertainment. They had poor visuals that were not close to reality, therefore not being good virtual reality (Betters, 2013; Virtual Reality Society, 2017a; VRRelated, 2015).

3.2.2 The first HMD of the current VR (2012)

The VR hype nearly died and settled down, until recently, when a young boy named Palmer Luckey decided that VR had to change, and become the new trend of the current decade.

He and bought some VR google from the past and quickly saw how inefficient the 90s technology was. Then he decided to put an end to that VR phase and create his own VR headset. He bought all previous HMD he could find to study why they failed and how to improve them.

Eventually he created The Oculus Rift, defining the foundation for the current VR. He launched a Kickstarter campaign back un 2012 to see if the consumer market liked his idea (Oculus, 2012). It was

an astounding success, getting 2.437.429 \$ in funding. That led to a connection with John Carmack, an experienced entrepreneur and programmer, that would be a very valuable partner to Luckey's endeavour (Oculus VR, 2013). Immediately they officially funded the now active Oculus company, the major consumer VR company in the world (Riftinfo, 2015).

The device he created was not anything radically new, in fact it was in the same line as previous HMDs. But it used current technology, and that is what made the difference. Before, people put on a VR HMD and noticed it was a low-quality device, because images were very far from realistic. But today that does not happen, you can achieve good virtual reality that starts to fool you if it is real or not. Even though the first version of the Oculus Rift, the Oculus Rift Development Kit 1 (or DK1), was still far from real, it was good enough to blow people's mind when they tried it (Guideconsole, 2015; Wawro, 2013).

3.3 The current state of Virtual Reality

Virtual reality has experimented different states since the beginning, this will continue in the future and the technology will improve year by year, going through better and worse periods. Nowadays, virtual reality is in a new phase, experimenting an increase in popularity and new software and hardware innovations. This chapter explains the current state of virtual reality and its importance in the current world to show that virtual reality projects.

3.3.1 Current applications, projects and companies in the leisure industry

For starters, one of the main applications of VR is the original goal of the Oculus Rift: offer high quality VR entertainment in private homes. The idea is to be another computer peripheral to enhance videogames experience (Oculus, 2012), like PC steering wheels or controllers try to do.

3.3.1.1 Videogaming

Videogames have been enclosed in a TV-like screen for a long time, but today VR companies are creating many games exclusively for virtual reality. The main companies promoting this are Oculus with the Oculus Rift and its store, the Oculus Home, and Valve partnered with HTC, with the HTC Vive and Steam VR (Hamilton, 2016). They are creating a lot of content and funding external developers to create games, apps and tools to be used with their products (Volpe, 2015). They want to kickstart the mass adoption of VR as soon as possible (Oculus VR, 2017c).

This type of VR works by connecting the HMD to a PC via HDMI cables. Then the user starts an experience (usually a videogame) in his computer and the machine sends the monitor image the HMD.

It has two screens, so a duplicate of the computer image is displayed on these two screens, but a bit shifted, so it generates the Stereoscopic effect, creating a 3D image in the user's brain. The user is now experimenting VR, but only visually. The sound comes from a pair of headphones that sometimes are integrated with the HMD (Davies, 2016).

If a person wants to play VR at his home, there are different commercial products available to use.

First there is the HMD, which divide into three models for household VR as shown in the picture below (Davies, 2016): The Oculus Rift from Oculus VR, The HTC Vive from Valve and HTC and the PlayStation VR (or PSVR) from Sony.



Figure 2. This picture shows the three major brands and models of VR HMD that are available to the general consumer. From left to right: The HTC Vive from HTC and Valve, the Oculus Rift from Oculus VR and the PlayStation VR from Sony, all in their latest versions.

The Vive and the Rift are designed for regular desktop computers, and the PlayStation VR can only be used on the PlayStation 4 and its variants. They technically differ in many ways but nothing significant, since they are using the same principles to create great virtual reality (Davies, 2016).

Each of them can be used with a different set of controllers, they are proprietary and unique to every HMD. These controllers serve the same function, serve as input controllers for the user, allowing him to interact with the virtual world by simulating a pair of hands (usually, depending on the game). With them the player can simulate that he is picking up an object, or hitting a box with his hand or basically doing any interaction a person could do and the game allows. They differ in their capabilities and technical specifications, but they behave similarly (Davies, 2016).

As an example, the end result of using Valve's VR is like the image below (Tech Radar, 2016). The way of using VR in other brands practically is the same, and although this person is standing, he could be seated as well.



Figure 3. A person playing an experience in VR using the HTC Vive HMD with the bundled controllers. It is an example of someone using current VR, as the representation is very close to any other person using any other brand.

Apart from the controllers, there are many other accessories for VR to enhance the gaming experience.

The first accessory type are real life weapons and tools imitations. Some VR games are focused on shooting enemies with a pistol, machine gun or similar weapons. Even if they are from a futuristic world or from historic scenarios, a model of a generic weapon could improve the gameplay and immersion substantially.

One of the simplest examples is the PSVR Aim Controller developed by Sony. They want people to experience this accessory with the exclusive game Farpoint (Sony, 2016a, 2016b).



Figure 4. A photograph showing the PSVR Aim Controller being held by a person. It shows the correct way of grabbing it.

As showed in the picture above (CNET, 2016), this hardware accessory is not very similar to a real-life gun except that it has a trigger, but the way of holding it and moving around with it tries to imitate how it would feel the futuristic weapon that the character of Farpoint videogame is holding.

According to Sony (2016a), the presence that this accessory can add is considerable. Mainly because the gun not only allows for shooting, it can be rotated, observed, reloaded and more. The player can be more immersed in his VR experience because he can do real movements that are reflected in the virtual world, simulating the feeling of having a real gun (much lighter though).

Several companies have also created different VR guns models, some of them more advanced than the PSVR Aim Controller. The problem is that it seems they are not ready yet, and cannot offer a compelling experience. Maybe in the near future we will start seeing more custom controllers that truly enhance VR experience.

Another accessory that seems to substantially boost VR experience is a VR walker, or VR platform. These are also under development but at least it seems there are two major companies with more than 2 years of experience developing them: Virtuix and Cyberith.

A VR walker is a platform that the user stands on and walks on it simulating a traditional treadmill but without being mechanized. It allows for 360° movement direction and some of them also allow crouching and running. A picture is a better description than words (Cass & Doc-Ok, 2015):



Figure 5. On the left, the Virtuix Omni it is displayed while being used by a person holding a possibly VR tracked gun controller. On the right, a third prototype of Cyberith Virtualizer is also displayed with a person and a controller.

Two of the main products are the Virtuix Omni and the Cyberith Virtualizer. They enhance gaming experience in VR by providing a solution to a problem, movement. Players in VR cannot move more

than the size of their room, and if the virtual world is kilometres long, they cannot reach practically any part of the game without using joystick or teleportation movement or other tricks that games are currently using, like Arizona Sunshine, a first-person shooter (Jackfrags, 2017).

Every people can purchase any of the accessories mentioned before, except VR walkers, which is more complicated because the manufacturers currently does not allow private purchases, only corporate ones for arcades or research. Very few videogames use this hardware nowadays, but it is good to know about them to learn about the current situation of VR as a recreation option.

Regarding videogames, there are different kinds of games that people can play at home with their VR equipment of choice. The best examples of what videogaming has to offer are explained in the following paragraphs.

Nowadays virtual reality is still in its infancy. This gets reflected when we observe the VR videogame catalogue, there are very few complete games that have the duration and complexity of traditional computer and console games. Most games are short in hours of gameplay, or with a very simple mechanics. It seems that they wanted to be the first to release VR games and released a short product.

Regardless of this trend, there are some VR games that can offer a very compelling experience and show the best the technology has to offer. Below some examples of different games are explored, to illustrate the possibilities of VR in videogaming, some in development and others already finished.

The first game is Raw Data, a combat focused game that puts the player inside a sci-fi universe where he must combat enemy robots using different weapons, superpowers and tools. It is still in development but the public has embraced it with a lot of good reviews.

The player can play alone or with a friend to form a pair of players playing the same level at the same time, with a powerful VR equipment it can seem like if they are in the same room in real life, battling enemy robots (Survios, 2016).

This game shows that VR can generate tense environments, immerse a player in a history, make people move physically while playing and socialise with another person at the same time. It is a clear example of a potential popular VR game.

Another game, Star Trek: Bridge Crew is about commanding the USS Aegis starship (very similar to the famous USS Enterprise) from Star Trek universe. It basically allows to a group of players to be the crew of the ship, each one in a specific position that, coordinated, they have to survive in space.

The main crew members of the ship can be controlled by humans in VR. They have to coordinate themselves to accomplish goals. Each member is in charge of a section of the ship, for example, one controls energy management, another the piloting and the other one defensive and offensive systems.

This game really immerses players in a collaborative environment where they need to focus, work together and enjoy an amazing experience on board of a Star Trek ship. The potential of VR as a social platform is crystal clear in this game (LetsPlay, 2017; Ubisoft, 2017).

Another different example of VR is racing games. One of the prominent examples is Assetto Corsa, a game not designed for VR but that could be adapted and it runs really well with it.

With VR the user can impersonate a racing driver and feel like he is in a real race with the help of a driving controller set for computers (a steering wheel, a gear shift and a set of pedals). With a powerful computer, Assetto Corsa can also have realistic graphics and physics simulation, favouring the sense of presence in VR. All these factors make this game a very good example of what VR is capable of in terms of simulation games, because the same could be done with planes, boats or other vehicles (Kunos Simulazioni, 2014).

There are many other games that explore the capabilities of VR, but the examples provided in this work show a general picture of different possibilities of the technology applied in videogames. If hardware and software advancements are combined, it seems like thousands of different experiences could be created, like actual videogames.

3.3.1.2 Virtual Reality parks

Virtual reality next step from videogaming in the recreation industry is VR parks. VR videogaming at home which offers a huge improvement over traditional videogaming, is still in development. But furthermore, VR theme parks which offer a huge improvement over VR videogames at home, are in development as well. It is odd. Maybe it is not “the next step” literally, but apparently it was invented to improve the existing situation and offer more compelling recreation options to the public.

One clear example of a VR park is The Void, located in United States. It is a place where the customers enjoy several minutes great VR content in a space where no object or person is going to disturb him.

Currently they offer one VR experience, a Ghostbusters themed adventure called Ghostbusters: Dimension. The experience begins when the two customers enter into a small room equipped with a proprietary HMD, a small computer inside a backpack, a vibratory vest and a tracked plastic gun used to imitate a Ghostbusters gun.

There are plastic divisors and some objects that can physically interact with the player, but overall, it is a pretty empty room. That does not matter though, because the players enter with the HMD on, already seeing they are inside an old house from the 90s. In ten minutes, the group must find and capture apparitions that lurk inside the house. They can watch themselves and see that they are wearing a genuine Ghostbusters vest and equipment. They can shoot the famous guns and use other gear to capture these apparitions.

The Void it is not only a VR park where one experiences with audio-visual effects. Customers can also touch some objects and feel sensations like wind, heat, humidity and more, they call it hyper reality instead of virtual reality (technically is mixed reality because it mixes real and virtual elements). This is possible because The Void wants to blend VR with real life physical effects create an amazing experience, that is, in essence, mixed reality (Barnes, 2017; The Void, 2017a; VR Source, 2016).

Other projects similar like The Void are also experimenting with their technologies. Another example is Zero Latency, a VR park located in Australia, Tokyo, Orlando, Pocono, Wisconsin and Madrid (Davidson, 2016; Graham, 2016a, 2016b, Zero Latency, 2017a, 2017c). They do not offer any mixed reality experience, only VR, but with ample space to move and interact with more than 2 people. They offer different experiences: A scenario where players must defend a city from the zombies, a sci-fi military station exploring with combat and a non-combat game, where players must advance through an alien planet (Zero Latency, 2017b).

Seems like this company is serious about bringing VR parks all over the world. They already have 6 centres, and when 2018 begins they plan to have a total of 15. Right now, in July 2017, they are investing 2.5 million to open another centre in Lisbon, Portugal (B., 2017).

3.3.1.3 Other recreational applications

Virtual reality may have more purposes than those stated before. Entertaining people can be done in many ways, and different companies have tried many ideas. Below there are some examples about how VR can be used, which shows why it is an interesting technology to invest in.

One of the best applications in this field has been done in Spain, specifically in Warner Park of Madrid. The theme park has created the first VR rollercoaster of the country, called Batman: Arkham Asylum. In there, customers put on a VR head mounted display that has a Samsung mobile phone attached, because it uses Gear VR technology developed by them and Oculus VR (Gilbert, 2014).

A rollercoaster moves, and of course, people feel the wind and sound of it. This makes people believe they are flying through Gotham, the fictional city in the Batman universe. This is possible because the rollercoaster and the virtual content are exactly synchronized. Meaning that when the train turns, the virtual train does it as well, and every movement is the same in the real and virtual world (Parque Warner, 2017). This can create a practically perfect presence and immersion into the experience, practically tricking the brain into thinking he is in the virtual world rather than the real.

Other examples of great projects for entertainment are advertisement campaigns that achieve two goals: advertise something and make people happy while they are doing it, hopefully generating a great attachment from the people to the brand.

HBO created a VR experience to advertise Games of Thrones, the TV show. They put people inside an elevator and make them wear an HMD. The visuals are synchronized with the movement of the elevator and the experience feels real, at least according to Laura Hudson (2014), a Wired reporter.

Another form of advertising comes from the Museum at Prairiefire, in Kansas, United States. They hired a VR firm to help them develop a new experience for their customers. The result has been a success, according to customers that have tried it. It is a recreation of Stonehenge in VR. People can put on an HMD and walk around a room where they can see the monument with very detailed graphics, very close to what they would see in real life (Museum at Prairiefire, 2017; Reid, 2017).

There are many other applications of VR, even outside the leisure industry. It is being applied to research, medical teams, education, design, cinema and many more. VR can revolutionize many sectors, but others will not be affected by much. The important thing is that the technology seems to have acquired a development stage where it is, finally, compelling enough. Hopefully, in the future VR will be an established industry that will bring many different experiences, so we can enjoy while we learn from them.

3.3.2 Public opinion on VR

In the end, what is going to dictate if VR will stay or leave again in disgrace, is the consumer opinion about it. If people like it enough to buy it and make it a profitable business, then it will last until the demand stops. To show that VR has potential to stay, several opinions from different people have been collected from the internet.

The first example of VR reception is a video published in Business Insider's website, called "Watch what happens when kids try virtual reality for the first time". Theoretically this website it is not affiliated with VR in any way, and it should not be biased.

In the video, several kids play VR for the first time (playing games) and later they are interviewed. Many of them liked the experience and say it is a very convincing technology. Of course, there will be always someone that does not like it, but the majority of them do (Protin, Kakoyiannis, & Fierberg, 2017).

Another source of validation of VR are unbiased (apparently) public online reviews of VR recreational services. The first one to stand out is Zero Latency, already covered in previous parts. According to Google Maps reviews, people like it a lot. It has a score of 4.7 stars out of 5, that is a 94% of satisfaction. And to support this score, the average it is calculated from 156 reviews at the moment of this writing. If further evidence is needed, the Madrid has 88 reviews and a score of 4.6 out of 5.

People say that it was one of the best gaming experiences they have ever had. That the technology allowed them to feel very immersed and they celebrate that this group activity exists, because they really like it. And these people are not kids anymore, but adults that review the experience. ('Zero Latency', 2017d, 'Zero Latency Madrid', 2017).

Regarding the other VR park, The Void, there are three major reviews of reputable media websites that went, tried and loved it, seems that reporters also like VR. These articles were written by the actual team that played the game and it is first-hand information, in theory.

The websites behind the articles are The Verge, Forbes and Time. They describe the experience, like guiding the reader through the game, and they state their opinion. Which it is mainly positive, explaining that The Void can offer a compelling experience now, but that it needs improvement to make it truly great. Even though, for now, it is a very good experience for the price. That implies that their opinion is that The Void is following the correct path, that it will succeed (Eadicicco, 2016; Popper, 2016; Porges, 2016)

Also Facebook reviews give the company an astounding 4.8 stars out of 5, that is a 96% of satisfaction. They praise the organization, the experience in itself even though it only lasts 10 minutes ('The Void', 2017b). In business terms, it is so successful that in less than a year they have already generated 900.000 \$ of revenue with 43.000 tickets sold (Barnes, 2017).

People like VR, if done right. The internet is littered with bad reviews of VR experiences, and in any other industry that is expected if the product is bad too. But if done right, VR is something that people love, that they want to repeat it, they like it a lot and that is why they leave these amazing reviews. If companies respect quality, VR will have a very important place in the leisure industry.

Not also the people, but important companies too believe in VR. Some examples are Google, Facebook, HTC, HP, Samsung, Sony and others (Bruno, 2016; Bye, 2016). These companies have the resources to hire experts in the form of consultants, advisors, researchers and any other role they need to make sure they invest their resources on a profitable industry. If they believe in it, no one would be doing anything stupid by checking out if VR is a viable and future proof industry.

4 Current Virtual Reality in Barcelona

The goal of this work is to propose a VR project, but before creating any project, it is advised to study the current state of the industry in the specific place the project is going to be established, because the competition must be identified and it is also necessary to check if a similar company already exists there. In this case, the chosen place is Barcelona.

In this part, Barcelona is justified as a good place for any recreational VR project and its current supply of VR recreational services is analysed.

4.1 Barcelona

Barcelona is the city of choice for starting the proposed VR project. The company needs a good inflow of customers and enjoy the availability of high quality professional services and products. The innovative factor of this project also makes it important to be situated in an environment that promotes and experiences the latest technological advancements, and the city is a good place.

Barcelona is the capital of Catalonia. It is situated inside the Metropolitan Area of Barcelona (AMB initials in Catalan), a group of cities that border with each other and are heavily intercommunicated. The total population in 2015 of the AMB was 3.213.775 inhabitants, and Barcelona itself had 1.604.555 inhabitants, 49,93% of the total population of the AMB (Àrea Metropolitana de Barcelona, 2016). Catalonia had 7.424.754 inhabitants in 2015 (IDESCAT, 2017), therefore the AMB had the 43,28% of total population of Catalonia, Barcelona having the 21,61% of the total. It is the eighth biggest metropolitan area in Europe (Àrea Metropolitana de Barcelona, 2017).

Having reviewed the population numbers Barcelona is a good place regarding the proximity of potential customers. If a lot of people live around the city where the service is consumed, it is usually easier to get sales and raise awareness through advertisement (providing other important factors also favour the company). In fact, one of the main reasons that facilitates tourism (and recreation in general) is proximity, people usually go to places near them to spend their leisure (Calabuig, 2016).

The strategic location of the capital is also a good important factor to consider. Mainly because a good geographical situation allows access to faster and more numerous transport communications infrastructure that facilitate all key transport for every company (like customers, suppliers, etc.). The AMB is situated in the centre of all other cities that conform the metropolitan area, also it has good train, plane and ship access as displayed in the following map (Carte de la Catalogne, 2017):



Figure 6. A simplified map showing the transport infrastructure of Barcelona. It shows air, sea and land major transport routes.

Accessibility, meaning the ease of access to a place, is very important for recreation. The more people perceive it is easier to go to a place, the more they go (Calabuig, 2016). This pattern obeys to a simple law of economics, if something has a high price it has a low demand. In the case of accessibility, it can be interpreted as resources (such as time, money, effort, etc.) necessary to arrive to a place, instead of only the price.

Accessibility has another very strong point in a project like the one proposed in this work. Since a VR recreation company needs very recent technological advancements that usually come from abroad, accessibility and the combination that Barcelona is a capital, makes for a very good place for ordering online because shipments are easier, cheaper and faster. Also, all local materials and specialists required to build the facilities are going to be available in the city for sure.

After considering the points above, Barcelona seems a very good situated place to set up a VR project. But there is another factor to consider, city recognition and complementary recreational supply.

If a city is famous it is very easy to know where it is and how to go there, a lot of people know where is New York and in what country it is, but if someone asks for Locronan it will be more difficult to find someone who knows where it is. Barcelona is already famous (in comparison of other minor cities in Catalonia) and can receive a lot of tourists per year, so much, that is becoming a problem (Zervas, Proserpio, & Byers, 2014).

Therefore, it is a good place because it has some degree of recognition that allows an easier awareness and willingness to visit it, and also has a recreation industry that can complement the proposed VR project. No one has the obligation to come to Barcelona only to try the new VR company, but people can complement their stay with other services that the city offers. This means that people will probably make their decision to come quicker than if it would be set in another place without recognition and complementary recreational industry, and if they come to Barcelona they can come to try the VR proposed project (or the other way around, make it easier to come for the VR project because they can complement their day with other activities).

4.2 Analysing the VR recreational offer in Barcelona

Companies that offer VR recreational services to the general public are analysed in this point to know exactly what is the state of VR in the city and to find information that can help in designing the VR recreational project.

The following companies were visited in person and interviewed to know exactly what they offer and to identify their type of recreation service. The visit then serves various purposes:

1. Know and try what they offer.
2. Interview them to let them explain what they offer and know their target public.
3. Make them fill a questionnaire to know the type of recreation option they are.

This part focuses only on a descriptive analysis of the companies, according to point 1 in the paragraph above. Points 2 and 3 results are necessary for parts further below in the project and its methodology is also explained.

Three of the four VR companies in Barcelona were visited.

4.2.1 VR Companies

As for recreational VR companies in Barcelona that serve the general public, there is only one type: companies that let people rent a VR headset and computer to enjoy an experience. They are similar to a cyber café, where a customer rents the equipment and uses it how he wants, except in one case, where the catalogue is specialised.

As they told us in the interviews, they are very young companies with less than a year of life. VR is getting discovered slowly by customers and owners because it is a very new technology.

Vivevirtual

The first example of these companies is Vivevirtual. It is a place where the customer can go and use the HTC Vive HMD with the bundled controllers powered by a high-end desktop computer that delivers smooth gameplay.

The experience is the same as if he was in his home, but he is in a dedicated place where there is someone watching that everything goes well and there is enough space to play without any worry. In

a private home it is more difficult to create a 2 meter x 2 meter square (or more, up to 4.6 meters for the HTC Vive (Kelion, 2015)) to play in VR. The picture below shows better what this company offers:



Figure 7. One customer using Vivevirtual's facilities to play a game in virtual reality with the HTC Vive and bundled controllers. As it can be seen in the previous picture, the customer puts on the VR gear and starts playing in front of the monitor. There is space for 2 customers playing at once, and a bench for waiting and watch on the monitors what the users are seeing.

The customer pays for a time period that can range from 10 minutes to 60, averaging 0,84 € per minute (50,50 € per hour). Of course, the more the customer pays the price for minute lowers (Vivevirtual, 2017b).

In this time, the customer plays different games if he wants to switch between them, or only one, it is up to him. The catalogue of games includes different options, from action to calm experiences. It is an varied catalogue because it uses the same games that a private customer can buy at his home through Steam, there is not any original content (Vivevirtual, 2017a).

One example of fast paced action is Raw Data, a game explained before in point 3.3.1.1 'Videogaming', that makes the player combat with enemy robots. Another, more peaceful experience is Subnautica. The player is a diver who has to discover the secrets of this alien world's sea. It can use different tools to navigate faster and weapons to defend himself against enemy creatures, but it is mostly a peaceful game focused on exploration. Feeling that you are side by side of a giant whale, or watching immense

beautiful alien coral reefs is the main attractive characteristic of this game (Unknown Worlds Entertainment, 2014).

Other recreational experiences include “games” like Tilt Brush, where the player paints with virtual paint and effects (Google, 2016), or Guided Meditation VR that allow for meditating in beautiful places with a narrator that guides the player throughout the meditation (Cubicle Ninjas, 2016).

Frontera Virtual

Frontera Virtual is a very similar type of company than Vivevirtual. It is even located near it. As same as before, it is a place where the customer can rent an HTC Vive during several minutes and basically do the exact same thing he would do in vivevirtual, because the technology and the game catalogue are the same.

It is not an intentional copy from Vivevirtual, it is just that since they use off the shelf products, they must offer the same if they want to use the HTC Vive. If the Oculus Rift would have been used instead, at least they would be different in a technological level and some games, but it is not the case.

The differences are in the price and the available space. They charge an average of 0,46 € per minute (27,5 € per hour) in fractions of time from 20 minutes to 120. Regarding the space, they have only 2 spaces more, so up to 4 persons can play at once (Frontera Virtual, 2017).

The space is not important, generally, because people play solo experiences. But there are some multiplayer games that would allow the 4 slots of the company to play at the same time in the same game, interacting with each other.

VRMax Centers

Again, a company with the same offer and catalogue than the previous companies. Although this one does not use a typical establishment. They seem to offer a very budget solution.

Instead of having a dedicated establishment they offer their services in a structure composed of metallic parts that hold the VR system, but that is it. The following picture shows better the type of facilities they have (VRMax Centers, 2017):



Figure 8. A child playing in VRMax Centers facilities. Showing they have no more than a simple structure to offer VR entertainment,

They do not even have a functioning website (VRMax Centers, 2017a) and the information is very limited in their Facebook page (VRMax Centers, 2017b). Although a physical copy of a promotional brochure (displayed in annex 9.3 ‘VRMax Centers promotional brochure’) informs that they offer similar games like the other companies mentioned before. No price information other than “From 2,00 €” has been acquired. They are established in two locations in Barcelona. (VRMax Centers, 2016).

Xtrematic

Xtrematic differs slightly from the different companies, because it is not a company per se, but a product. It is an arcade machine that can be purchased to be installed whenever the owner wants. But in the case of Barcelona it is the only arcade machine that the company has, so essentially it is the company service. The following picture shows the machine:



Figure 9. A photography taken by the investigator of an Xtrematic machine in Barcelona. It is ready for any customer to step on.

As it can be imagined, the customer steps on the platform with an HMD (in their case it is the Oculus Rift) but the HTC Vive could be used as well (Xtrematic, 2017b), and then the game is started.

The offered experiences are unique and different from the other VR companies. They work really well with the machine, mainly because they are rollercoaster rides, spaceship travels and the like (Xtrematic, 2017a). The customer can feel the immersion because being on the platform makes it more believable. Also, a fan was running making the customer feel the wind and speakers were playing.

Regarding the price, they are not offering time ranges for a specific amount, instead they allow the customer to select an experience and pay 5€ for it. The experiences ranged from 3 to 5 minutes. Then, taking the middle point (4 minutes), the average price per minute is 1,25 € (75€ per hour).

4.2.2 Problems about the current supply

After visiting the companies and learning what they are offering exactly, several important problems were detected.

4.2.2.1 Lack of knowledge and experience

The first one is the lack of know-how, lack of general knowledge about how to manage these companies efficiently and knowing exactly what they are doing. These companies are very recent, every one of them has been around for a year (at most), some of them are not even 6 months old. Also, virtual reality is a very recent technology and owners did not have any previous significant knowledge about VR.

Those two factors combined lead to companies that are managed without guidance, and therefore they do not project an image of a company with years of experience. It is important to note that two of four companies, a 50%, can easily cause the impression of an unfinished service that it is lacking the finishing touches. The investigator, upon entering for the first time in one of them, felt that the establishment was still in construction, which in fact it was not. There were cables hanging from the walls, everything was painted with the same colour and the reception desk seemed not to have any paint on it, lacking the aesthetics of the establishment. This can cause a negative impact on the customer, he can get the impression that it is a low quality, low experimented service, generating bad thoughts. The investigator felt that way.

Another problem, that one of the interviewees admitted, is that they do not know anything and they have to do everything by themselves, discovering while doing it. For example, when choosing what games to offer for the first time, the company does not know what people like more or not, and they start to offer everything hoping the customer will reveal what products are the best. This is risky because if the experiences are not compelling because they are chosen arbitrarily, it could create dissatisfied customers and bad opinions at the beginning.

Other problems include lack of guidance when establishing prices; other products or services that could complement the main service; lack of awareness about the target public at the beginning, leading to confusion in advertising, etc. These companies seem lost in this new world.

Of course, all of this is because a VR it is an innovative way of recreation, someone had to be the first.

4.2.2.2 Lack of space and presence

Space is a problem, especially in VR. If you want to play a game where you have to explore a desert that is several square kilometres long, you cannot, simply because you cannot move beyond your assigned space. That is why some strange movement systems have been applied to some games, like short range teleportation (Jackfrags, 2017), and why VR walkers are being developed. These are ways to find a solution to the space problem, but of course, nothing feels more natural than real life walking.

It would be amazing if the player could move 100 meters in real life, increasing immersion by a substantial amount (Usoh et al., 1999), when the game told him to do so. Furthermore, if someone plays an action game he may want to crouch, crawl, run, hide behind a wall or jump. This is not possible if you cannot move more than 2 meters. For example, to really feel and believe you are in a real war conflict in the World War 2 you need to crouch so you do not get shot and you need to run when an enemy throws a grenade at you. This is not possible with these companies, and it is not a way of fully utilising the potential that VR has.

4.2.2.3 Lack of physical interaction

Another issue detected was the isolation of the experience. People play with VR in their assigned space and that is the end of the physical interaction with another human, until it ends.

This could be a negative factor for some people, because recreation with a group of friends (to work with an example) it can be better than doing it alone. It is possible that 4 friends play the same VR game and interact in the virtual world, but in real life, they are still in their respective spaces. For instance, if a friend wants to high five the other for doing a great job, he cannot feel his palm. And of course, more physical interaction boosts immersion.

And to make it worse, through the interview about the target public and the questionnaire, it has been found that the most frequent customer of these VR companies are kids and adults, usually the whole family consumes it, although sometimes are groups of kids or adults.

To illustrate with an example, if a family of 4 members (a dad, a mum, a son and a daughter) come to a VR cyber with 4 spaces they will usually put on their HMD and they will play different games because the clerk will ask about what type of games they want, individually. In the end, this could result in the dad playing an action game, the kids playing another game and the mum playing an exploration experience. Of course, multiplayer games are possible, but while visiting it seemed that it was not usually encouraged.

Families cannot play physically together, they can do it virtually but not in reality. They cannot have a complete immersive experience as a family because VR is isolating. If one of the main customer types, families, cannot experience a good game together, it is a problem because the customer could not be fully satisfied, feeling like something is lacking.

4.2.2.4 Lack of differentiation

Every VR company except Xtrematic offers the same experiences with the same technology, and to make things worse, every person could purchase the same experiences and play them at home.

This is a problem, because the only differentiation that remains is about pricing and staff service. There is no room for unique experiences at every place, one could specialise in action games, other in social games, other in exploration and adventure, to put some examples. But this is not possible because every company offers the same and restricting to only one type of experience is risky.

The most dramatic change one of them could do is to offer Oculus Rift rental instead of HTC Vive, but the experiences would be the same (except exclusives, which are not many). The overall service would not change much. It seems like it is a packaged business, you do this or you do nothing.

5 Project proposal

After having studied what the current companies offer and having identified their problems, it is time to make a detailed project proposal that will solve all these problems, getting closer to the goal of this work. Thus, being an improved way of VR recreation and differentiating itself from the VR competition.

In this part, a draft of the project is presented. It is not by any means anything static, it is a detailed example of the initial idea.

5.1.1 The concept

The goal is to achieve a service that make customers live in a virtual world while they are using the company's facilities. The best way to explain the idea is using the point of view of the customer.

A small group of customers, with all the VR gear on, enters in the field and a video game is started. It can range from a typical combat one (like two teams shooting each other in a WWII scenario) to unique experiences (like contemplating the earth from the inside of a lunar base).

When that happens, customers suddenly see all their field of view covered with virtual images, if it is a medieval village, they only see that. It is not like a screen, where you can still see your own hands and your bedroom. With VR, you only see what the game wants you to see. With your ears the same happens, you are isolated from outside sound and only hear what the game wants you to hear. And with your body, you physically move and the game responds accordingly.

After the game is started people play it with their group of friends or relatives, even with unknown people if there is a minimum player count required. They can run, jump or crawl within the limits of the virtual world, which will match the real ones to avoid accidents and disappointment. If in the real world there is a brick wall the game will display a virtual wall, a cliff or another path blocking item so players are still aware that they cannot go past that point.

They see other people in the game but with a virtual appearance, maybe the other player is no longer a human, but an alien from another world. If they want to touch the other player they can do it, like high fiving when they win. They can interact with virtual objects, some of them at least, that also match the real ones. If they encounter a box maybe there is a real box imitation in the real world so players can feel the weight, the texture and in summary, that the object is there.

This is a time-based or match-based activity. Customers pay for a determined amount of time or matches (or plays in case it is not a competitive game) and when the limit is reached they must stop and take off their gear to finish the session.

In the end, the goal is to deliver a group VR experience that feels as “real” as possible (read immersive), within the limitations of the current technologies and the budget of the company. Below an example of the intended result is shown in a picture, courtesy of The Void (2016).



Figure 10. An example of possible experience. Comparison between what is seen in the real world and in the virtual world. This figure shows, in the upper half, how an external viewer that is not using VR views the two persons using VR. The lowest half shows how the same viewer, but this time also using VR, sees the same two persons.

5.1.2 How it solves the current problems

The necessity to create a project like this is because the current supply of VR services it has several flaws, explained before in point 4.2.2 ‘Problems about the current supply’.

The problem of the lack of space it is solved in this project, the customers would be happy to move around without being enclosed in a small squared area. Of course, it would not have square kilometres of space to move, but the experiences would not require such movement distance and they would be compelling enough.

This can be achieved with a technique called Redirected Walking. It allows for tricking the brain into thinking the body has moved several hundreds of meters in straight line, when in reality this has not happened at all, it has moved in an arc.

It was discovered that blindfolded people trying to walk in a straight line, usually, walked forming an arc and not a line but they thought they were walking straight. It seems that without visual input the brain cannot know exactly the path a person is walking. This is achieved by rotating the scene without the viewer noticing and other techniques.

Several experiments have been done with VR and have detected that it is even possible to make a person walk along a circle infinitely while thinking he is walking straight. This allows for virtual infinite distances and solves the problem of lack of space in a very clever way (Razzaque, Kohn, & Whitton, 2001). There is even a technique called "Unlimited Corridor" that proves this theory that infinite virtual straight distances can be achieved with this technique (James, 2016).

Apart from having virtual immense spaces, the problem of lack of presence is solved by allowing people to jump, roll, crawl, and even run short distances. This would improve immersion in a substantial way (Usoh et al., 1999). To truly believe you are in a game you need to feel it, apparently.

There is also the problem of lack of physical interaction. But with space people could interact with each other by touching and knowing they have their friends there in the same room, making the experience more natural. For example, if in the virtual world there is a car crash and a friend needs to be rescued by pulling his leg from the debris, this could be physically done with the project.

The differentiation problem is solved as well, simply by the nature of the project. Since there is not any VR recreational service like this in Barcelona, it is implicitly different. Of course, original custom experiences would be offered because they must be specifically designed for the project (or heavily adapt current experiences designed for household VR).

The problem that is most difficult to solve is the lack of knowledge and experience. This VR project is a new concept, something never done in Barcelona before successfully. Therefore, it is natural to not have any previous knowledge about VR in the city.

But there is a way to acquire general VR knowledge: by joining a franchise. This project is being proposed in year 2017, but it is not the first time someone in the world has thought about something similar. In fact, Zero Latency, is a company that started in 2013 (Hopewell, 2014) developing the idea of a project practically identical as the proposed in this work (already described in point 3.3.1.2 'Virtual Reality parks'). If a VR park would be established in Barcelona, joining the franchise Zero Latency would provide the company with the knowledge and expertise they have been acquiring since 2013, now 4 years and a half. Another alternative could be The Void, also treated in the same point.

5.1.3 The equipment

Customers would put on a HMD attached by straps on their heads. It would be connected to a powerful small computer by a short cable. This computer would be inside a bag or a case firmly attached to the back of the customer, so it would not hinder mobility.

Also, some types of controllers would be given to people so they could interact with the virtual world. These could have a wide variety of shapes and uses, for example they could hold a sword handle if they had to interact with a sword in the virtual world, or the Oculus Touch if they would need finger tracking, it depends.

They would need to wear protective gear as well, so they would not get hurt if they trip or bump into something of the real world, like a wall. A picture below (Tech Crunch, 2016) shows an example of the equipment (the complete set) being worn by a person but without any protective gear.



Figure 11. A person wearing the HTC Vive with the bundled controllers and a backpack computer ready for mobile VR. It is an example of what gear VR parks are using.

5.1.4 The space

Customers would play inside a controlled indoors space where they would be safe from any danger, being actively monitored by specialised personnel. If any problem would occur, the personnel could pause the game, attend that person immediately and resume the game, if possible.

The space would allow complete free movement. If they moved within the physical limitations of the space, including objects on the field, then they could do whatever they wanted. A warehouse would be a very good place to set up this experience. Trackers would have to be installed to detect the position of the players, so having a ceiling is very useful. Also walls and the floor could be protected with foam to avoid injuries.

An example of a paintball setup is shown below (ExtremeSports.ie, 2016). In the VR project this would have simple objects that will blend with the virtual world. The level of complexity and detail is variable depending on the budget of the project, but the idea is to offer customers a good value per price experience.



Figure 12. A typical indoors paintball scenario. It could be the inspiration of a VR paintball scenario to offer players the experience enhanced with VR.

5.1.5 The experiences

The experiences that a customer could consume with this project are practically infinite. The digital world is something humans create, so in practice it is only limited by imagination, technology and resources.

The ideal system for creating experiences should be modular and customizable, to adapt to the desires of the customer. If we could tailor the experience to every person's desires, we could have a wide range of possible experiences and make the most out of their time. It could have different pre-made scenarios so they serve as a base for the experience, and then we could make small to moderate changes to accommodate customer demand. The following examples show some experience ideas:

5.1.5.1 Battlefields

One of the most typical experience a group could ask for is being in the middle of the battlefield, like paintball but enhanced with VR. Since it is a group experience, always two teams would be formed and play against each other. Some examples of what scenarios we could offer them are:

- In the middle of a current Middle East village.
- In a medieval arena, using swords, bows, and weapons from that time.
- In a sci-fi arena where they shoot lasers and use futuristic devices.

They would choose a base scenario, a theme, where they want to interact. And then, we would make the adjustments. We could, for example:

- Vary the sizes of the teams. For example, give one player a lot of power, like being in a special suit that absorbs damage and make all the other people fight this player alone.
- Create a story, instead of just trying to shoot each other plainly. Maybe we could set up a kidnapping story or a bomb defusal one.
- Put all the players in one team and make them fight against computer controlled enemies.
- Add or modify some objects in the field to vary the scenario.

5.1.5.2 Sports

Another type of experience we could offer is a competitive sport one. For example, we could track a real handball in VR and make enhancements to the real game. Or if it offers more possibilities, we could make them play with just a VR ball, although the lack of physical feedback is usually a big impediment to the enjoyment of the experience, we could invent a sport that does not suffer from this problem as much.

We could, for example, offer racing pods, like the equipment present in an arcade. Customers would put on a HMD and see that they are in a real race, with racing cars or even space ships. They would talk with each other by microphone and have a very good race against each other.

5.1.5.3 Exploration and cooperation

We could bring non-combat focused experiences for people that do not want that. We could set up a story with a VR character being portrayed by one of our personnel members that would guide the group and interact with them.

For example, a member of the company would portray a villager that is scared, looking for help. In this case, he encounters the group of players and believes that they are strong and capable of dealing with monsters. He tells them that a dragon is attacking a fantasy medieval village. And that the only way to destroy him is to extract from its body the devil that has possessed it. They would need to solve riddles and puzzles to obtain clues and the necessary objects to progress.

We could also vary some things so every time the experience is a bit different:

- We could change the location of the objects.
- Adjust the difficulty of the challenges.
- Give players different items and powers each time.

6 Supply and demand analysis

The VR park project can deliver different experiences to customers. But to have a general idea of how viable the project would be, the competition must be analysed and the target public found. To simplify the process, the VR park is going to be treated as VR paintball, because it would be one of the major applications of it (or at least, the intention would be to start with a “battlefield” experience).

To study the competition, it is compared with other possible competitors to see if they are really competitors as suspected or not. After that, the target public is asked to VR companies and VR stores to help in finding the target public of the project.

6.1 Standardisation by characteristics

The VR proposed paintball (and any other recreation option) can be classified in different ways. By doing so it can be positioned inside the recreation ecosystem of the analysed region and help in extracting conclusions.

The standardisation system used in this work it is based on the characteristics of the offered recreational services. It allows comparing different characteristics that are the base of every service and finding similar options to the ones being compared.

6.1.1 Scientific support

This is useful to position the VR project in a system and to find different recreation options that share similar characteristics. By finding these options, there is a higher chance of finding possible competitors. If a service is more similar to another, it has higher probabilities of competing against it.

For example, a person who has watched a movie for 2 hours it is more likely that he engages in another non-movie involving activity than to watch a second movie or a documentary. Similar options in nature compete more with each other than different ones.

In an article by Patterson & Pegg (2009) it is stated that tourists (essentially consumers of recreation services) seek experiences rather than individual activities. This means that they want to purchase groups of different activities linked together rather than the activities themselves, it is the whole trip that the tourist experiences, something composed of different parts that result in a (hopefully) pleasant memory for all their life.

Also, the variety of leisure activities in a touristic trip enhances psychological wellbeing. Meaning that, statistically, if we asked two persons that dedicated a day to recreation, the most satisfied one would be the tourist with the most variety of activities experienced (Wei & Milman, 2002).

If a VR recreation company is to be established in Barcelona, a low number of similar services will facilitate its success. In other words, the most it differentiates, the better. That is because if a potential customer wants to use his leisure and has many options, he will choose usually one of every type, since people seek variety and leisure is limited. If he has to choose from a few options (in contrast from a lot) similar to the project, then there is a higher chance that he will consume it.

6.1.2 The Virtual Reality project in the system

The standardisation system it is original content created exclusively for this work. It is based on common, shared characteristics of every recreation option a person can choose from. It analyses these characteristics and compares them against other options to show how many common variables in common they have. Then it shows graphically which options are more similar to each other in terms of common characteristics. In annex point 9.1 'The standardisation system (original content)' the system is explained thoroughly.

First, data is entered into Microsoft Excel program to automatically (via macro¹) compare options between them and output a graphical result. Then a graphical result shows a comparison between all recreation options introduced and shows their similarities.

The VR project standardised in the system is only represented by the data that it is entered in it. The following table shows the data:

<u>VARIABLES</u>	<u>RECREATION OPTIONS</u>
	VR Paintball
Availability	All year
Content	Fiction
Duration	Short
Educational level	Low
Ideal participants	Big
Mental Intensity	Low
Physical intensity	Intensive
Price	Low
Space	National
Target age	Young + Adult

Figure 13. Table showing the assigned system's variable values to the proposed VR project before any real data analysis.

¹ A macro is a way to automate Excel tasks in order to do them repeatedly according to user defined rules. For example, if a user wants to colour to red every cell with a number in the spreadsheet, he could do it manually but it could take a long time, with a macro the colouring task is performed automatically every time Excel detects a number. Macros can be recorded or programmed manually with Visual Basic for Applications (VBA) language.

The previous table shows what variable values are assigned to the project. Now, by finding other recreation options with similar variable values, the chances of finding possible competitors is considerably higher and backed by a standardisation system.

6.2 Findings using the system

The number of recreation options that share many values of the previous table can be high, that is why a threshold must be established. It is considered that a recreation option is a possible competitor if it shares 7 or more values of the VR project.

The definition of the proposed VR project, in one summarising sentence, is “A leisure activity for groups of friends that revolves around an unconventional way of enjoyment”. This sentence has been the basis for choosing different options and trying them in the system. All options can be group based (though a multiplayer videogame at home the group is virtual).

After choosing different recreation options that fit that statement, they were tested in the system to determine the number of shared variable values they had with the VR Project. For example, some options that fit the statement, like going to the cinema or to a theme park with a group of friends, were not similar enough to consider them as possible competitors. While testing, the graphical output of the macro easily showed what of those options were similar and what they were not.

The following picture shows the graphical output of the macro that allows to easily see the similarities of the 4 chosen possible competitors that are going to be further evaluated (see annex 9.2.1 ‘Theoretical data’ for the actual values):

Source	VR PROJECT
Compared to VR PROJECT	10
VR Videogame - MP SHOOTER	7
Cyber VR	7
Paintball	8
Kart Racing	7

Figure 14. Graphical result of the standardisation system when comparing the VR project with the theoretical competitors with theoretical data. Note: MP shooter refers to Multiplayer shooter².

² A multiplayer shooter is a videogame that is about shooting other players and usually, causing their virtual death. If played from a computer, the player connects to an online server via internet that serves as a meeting point for various other

In the end, four possible competitors based only on the system's results were chosen. The virtual reality project would compete against multiplayer VR shooter games played at private homes, VR cybers, paintball (and very similar activities like laser tag, airsoft, etc.) and kart racing. In the next part 'The competition in Barcelona', these competitors are explored in detail.

This theoretical analysis was needed because interviews and questionnaires were done to different companies. To find what recreation companies needed to be interviewed, a guide was needed, and this system was the starting point to discover what recreation options are competitors in Barcelona. Later corrections to the values used on the system are applied based on the findings.

6.3 The competition in Barcelona

This part focuses on analysing the possible competitors chosen before. These recreation options are: VR cybers, VR Multiplayer shooter at home, paintball and karting. After obtaining real data, the system's results are adjusted to the reality and reevaluated in what degree are still competition for the VR project.

6.3.1 Description

To know what these recreation options are, a general description is provided.

6.3.1.1 VR Cybers

For starters, the VR Cybers have already been mentioned in part 4.2.1 'VR Companies'. Nothing more is needed to be added about them except a few details about the location.

There are no more than 4 companies in 5 locations offering VR recreational services in the city of Barcelona. They are located pretty distant from each other, except two of them, that are 10 minutes apart walking. They usually concentrate on highly people traffic areas, like malls or important streets. They are very recent, less than one year.

computers and their respective players. Usually there are two teams, from 4 to more than 20 people per team in some games. They compete each other for a goal, which depends on the game mode. Some examples are scoring the most kills or capturing a zone and controlling it until the end of the match. The most famous example like this is Counter Strike games.

6.3.1.2 Multiplayer VR shooter at home

Multiplayer VR at home does not refer to a specific experience (like a specific game) but to a range of them, like the previous recreation options that were groups of similar options with a detailed one as main reference.

More specifically, VR experiences that are similar to the project, like multiplayer shooters from home. There are varying degrees of resemblance, but the more similar ones are those that work with all the gear: VR basic stuff, walking platform and weapon controllers. Players who do this they basically have the same experience of the project at home, and their group experience is virtual (online), not physical.

Nowadays it is not possible to purchase any game that works flawlessly with all the VR gear, because they are in development, the games listed on Virtuix Omni webpage are not available for private purchase (Virtuix, 2017). But some of them are working well with the basic setup, the HMD and the controllers. Let's see some examples to know what multiplayer VR at home refers exactly.

The most popular multiplayer VR shooter is a game named Rec Room. But except this game, any other multiplayer shooter is on the most played games, not even in the top 10 (SteamSpy, 2017a). The game is not only an experience, but a bundle of different ones. That is why calling it multiplayer VR shooter is not entirely fair. It is like there are minigames and people can choose from and play in groups.

One of the games people can play is paintball in VR. It is a very simple game, with very simple graphics, but it works. People review the game with very positive opinions, in fact Steam labels the rating as "Overwhelmingly positive".

The game allows for at least 8 people in two teams to play at once. They see and listen each other's avatar in game if they have a microphone. It is an entirely fictional scenario, but it is a representation of a real game because nothing seems to be different from a real paintball match, except the poor graphics, almost cartoonish and the movement (Against Gravity, 2016; Nathie, 2016).

Another multiplayer VR shooter is Farpoint, a game already mentioned in point 3.3.1.1 'Videogaming'. It is the only multiplayer VR shooter game that runs on Sony's console, PlayStation 4 with PSVR. Therefore, customers have no other option for this platform (Sony, 2017b).

This game is designed to be played alone, but it allows for cooperative gaming (only 2 players though), converting it to a multiplayer shooter. It is entirely fictional content because the action is based on an alien planet, where everything is invented. They go through this alien planet defending themselves

from creatures like giant spiders and monsters. It works the same way as Rec Room, by an online connection. (Sony, 2016a, 2017a).

The most similar game to a typical multiplayer shooter is a game in development called Onward. It is a realistic military simulator that makes two 5-person teams fight each other with apparently real weapons and scenarios. Players fight each other in scenarios that can resemble to real ones, they have to use real tactics, like communication through gestures because if they talk the enemy could hear them. They have to be coordinated as a real military team, use grenades securely and overall feel that they are in a real battlefield (Downpour Interactive, 2016).

6.3.1.3 Paintball and similar

Paintball, airsoft, laser tag and these similar recreation options are clearly the most similar competitors to the VR Project, and are similar among themselves. Mainly because we could say that the project is an evolution from these recreation options. Paintball is the reference option to respect the data analysed with the system.

Paintball is a sport where two teams compete each other in a field trying to eliminate opponents by shooting dye-filled, breakable, paintballs. Essentially is a simulation of a firearm combat between the two teams, although some paintball companies try to dissociate itself as much as possible from any real military conflict resemblance (Rohrer, 2009) while others encourage realism (Airsplat, 2017).

Games can be played either outdoors or indoors. Outdoors fields are usually composed of natural vegetation and terrain, while indoors ones are made using plastic props. Game types include capture the flag, elimination, ammunition limits, defending or attacking a point or area. Depending on the variant played, games can last from seconds to hours, or even days in scenario play.

Airsoft is a similar sport to paintball, with the difference that the projectiles are plastic based and do not leave a mark when someone is hit. Weapons and gear also differ slightly.

Laser tag is also similar to airsoft and paintball but the difference is also in the type of projectiles and weapons that are used. The gear is electronic, where infrared laser are shot to special vests that detect it and mark someone as hit or not. Thus, laser tag is no physically harming.

In Barcelona there are few paintballs because they need a lot of space, and usually scenarios are in the forest. One of the companies has a place in the middle of the city, the rest are outside. The concentration of paintballs in Barcelona is more than kartings and VR cybers, but a considerable distance has to be travelled to access them because they are not in the city.

6.3.1.4 Kart Racing

Kart racing or mini motorbike racing is a recreation option that revolves around having fun racing with motorized vehicles of small size. Kart racing is the recreation option analysed for the system.

It is practiced using small, open, four wheeled vehicles that are usually called karts or go-karts. They come in various types, speeds, sizes, but that is not relevant to this part. The races are done in smaller versions of higher motorsports circuits and inexperienced public can participate without problems.

It can be done alone or in group. People go to the karting to race against each other while having fun. Basic security rules are explained and in a few minutes the customers are ready to race.

The concentration of kartings in Barcelona is low, there are fewer companies than paintballs. Only one company has an indoor circuit, the rest are in the open outside the city, usually in neighbouring villages.

6.3.2 Methodology

A questionnaire was filled by 3 companies of every recreation option (except Multiplayer shooter VR at home, explained below) to standardize them and compare them with the project using the standardisation system. Some of them were filled directly by the company representative (sometimes the owner, other times a worker, etc.) and others were answered by phone.

Regarding every recreation option, this work always refers to unofficial (competitive or not) ways of practicing them. For example, in the case of paintball, that excludes practicing it in an official team and official tournaments. It is practiced by amateurs, mainly people who want to have fun playing the game with their friends. This point of view was chosen because the project it is not in any means competitive in an official way, it is a casual recreation option.

The questionnaire model, present in the annex point 9.4 'Questionnaire model' tries to make questions that can answer every variable evaluated with the system (further explained in annex point 9.1 'The standardisation system'). The questions were designed to be understood by everyone with ease and trying to use simple language.

The answers do not correspond with a variable value directly, they have to be interpreted and then assign a value within the system's rules. After being answered and interpreted the data was entered in the standardisation system using the program Microsoft Excel.

The sample of companies delivered an average value for every variable of every recreation option. The correspondence between each variable and the goal of each question can be observed in the following

tables. The first table shows to what variable each question from the questionnaire corresponds to, and the second table shows the information that wanted to be obtained from every question:

<u>QUESTION</u> <u>NUMBER</u>	<u>VARIABLES</u>
2	Availability
3	Content
4	Duration
5	Educational level
6	Ideal participants
7	Mental Intensity
8	Physical intensity
9	Price
10	Space
11	Target age

Figure 15. Table showing to what question number of the questionnaire is assigned to each variable value.

#	<u>QUESTIONNAIRE GOAL INFORMATION</u>
2	Know if they close any month or are opened all year.
3	Know if the match it is usually based in a initial plot or history, or if it is only playing without purpose.
4	The duration of the standard session.
5	Whether they teach any real concept. For example, any real military tactics in case of paintball, or racing techniques in case of karting. Know if customers learn something.
6	The number of participants to enjoy the experience at its best.
7	How much planning is necessary to play the game and have a good level of satisfaction.
8	How physically demanding is the experience in general.
9	The price in euros of a standard session.
10	Where is the point of origin of the most frequent customer.
11	The age, in years, or a range of age that the activity is targeted on.

Figure 16. Table showing what information is expected to be retrieved with each question of the questionnaire.

After obtaining the answers, the data was introduced into the system to correct the theoretical data previously used to identify possible competitors. After this, the system outputted an adjusted graphical result, explained in the next part.

There is one problem though, there is one recreation option that it is a product, multiplayer VR shooter at home. As such, it cannot be evaluated like a service because the procedures do not make sense. Specifically, some questions of the questionnaire cannot be answered by them. For example, a question about what is the average duration of a play session of the buyers of VR cannot be answered by a physical store because the sellers cannot know accurately what use their clients give to their product, because it is always used in private homes.

Another problem, is that they cannot know accurately what games the customer plays. That is because VR games are usually sold in digital format and are not purchased in physical stores (except in the case of Sony's VR, which has a substantial amount of games on the stores, but the customer can purchase games online too). Since the recreation option evaluated is "Multiplayer VR at home" as a whole, it involves the experience with the HMD, accessories and videogames. The two first components can be purchased in person or online, but the majority of videogames can only be purchased online. That generates huge difficulties to acquire information because some variables should be asked to the VR equipment store and other to the digital videogame store, which are not easy to access to.

In practice, it is inappropriate to evaluate Multiplayer VR shooter at home recreation option the same way the other competitors are evaluated.

A solution for this problem would be to create a new version of the questionnaire, asking the questions physical VR equipment stores can answer and try to find the missing information elsewhere. But such questionnaire would be very short, unstructured and poor, therefore another method is required: the semi structured interview.

An interview is explained in the next chapter to know information about the target customer of every recreation option. The questionnaire corresponds to the evaluation of the activity itself and the interview is for discovering the target public.

But since a questionnaire is inappropriate for VR stores, only one interview was done in this case, and information relevant to this chapter is presented below. The information that should be obtained from the interview relevant to this part is the following:

- Range of VR products: What products the customer can buy. Only the HMD? Or also other accessories? This is to know the relevance of shooters in stores.
- Consumer definition: Determination of the relationship between the buyer and the real consumer. Maybe who usually buys the product is not a consumer because it's a parent buying for his children, for example. This is just a question to specify the interviewee what the interview is about the consumer, not the buyer.
- Price: Price of the most economical and the way to enjoy VR at home, consoles or computers.

The rest of variables for Multiplayer VR shooter at home are obtained from analysing some games that fit the genre, described in the previous point.

6.3.3 Questionnaire results interpretation

The results come from 9 questionnaires answered by each recreation option company, except stores, that have answered 3 extended interviews, and also from research about multiplayer VR shooter games. Making a total of 9 questionnaires answered in case of the services recreation options, 3 extended interviews and research data that tries to find system's variables values in the case of Multiplayer VR shooter games. Also, information from the target public interview and the visit complements and explains these findings.

6.3.3.1 VR Cyber

Results obtained from 3 of the 4 VR cyber companies of Barcelona, explained in detail in point 4.2.1 'VR Companies'.

Availability: All year. The VR cyber recreation option is available all year for every customer. It usually does not need reservation and is available if there is no one occupying the playing space.

Content: Fiction. In terms of content, sometimes the customers participate in a history, but it is usually fictitious and not based in real facts. There are a lot of experiences, and sure there are some that have real life elements, but it is not the case in the majority of them.

Duration: Short. The usual duration is less than 30 minutes. It is difficult to obtain an exact answer because it depends on the experience the customer is playing, some are better for longer durations than others. Also depends on customer preferences.

Educational level: Low. Usually the experiences are not intended to teach anything. People want to play and enjoy, disconnecting from the real world, and have fun. It is uncommon to find popular experiences that resemble a documentary, for example.

Ideal participants: Small. VR experiences are usually meant for one person, and sometimes they can be shared with a multiplayer game, but usually with small groups because of space constraints.

Mental intensity: Low. Experiences do not require much mental preparation and planning. They are meant to be played without worries. People play and let themselves go, and if there are puzzles to be solved, they tend to be easy.

Physical intensity: Low. Since people are restricted to a small square area, they cannot move very far from the starting position. However, this does not mean they could not do a physically taxing experience like stationary exercise is. But the offered experiences do not include this, even the action focused ones involve little body movement.

Price: Low. The price is established by fractions of time. The average price is 0,73 € per minute, and people spend up to 30 minutes, which would be 21,90 €. This falls in the low value of the variable.

Space: Regional. Customers come from various places, this is a variable value that is a bit inconclusive. But taking into consideration that there are not many VR cybers outside Barcelona, and that tourists and people from outside Barcelona also consume it, the regional value seems appropriate.

Target age: Child and Adult. In terms of age ranges, this is inconclusive. But cross-referencing with the interview about the target public and the questionnaire, families seem a frequent type of customers. Since families are usually children and adults in this type of recreation, this value has been assigned. Also, children without parents and adults without kids are a frequent customer too.

6.3.3.2 Multiplayer VR shooter at home

Results obtained from 3 stores that sell VR equipment and internet research from point 6.3.1.2 'Multiplayer VR shooter at home'. They are stores of major chains (like Carrefour), each one of a different chain, they are not small companies. These types of stores sell a lot of different products, some similar to VR, and others not so much. Even though, all except one of those that were interviewed, considered VR as something that should be treated differently than other products.

This is important because a store that sells VR products like any other product, without having a person in charge that knows about it, does not know very well about VR. The information was obtained from stores that knew well what VR is and could answer with an informed opinion (it should be noted that

the interviewee from the store that did not differentiate VR seemed very informed about the products and the customer as well).

Availability: All year. Physical and online stores are usually opened all year and the customer can purchase any VR product they offer whenever he wants to.

Content: Fiction. The analysed games have fictional universes, anything is real. At most, Onward has realistic imitations of several things and another and Rec Room is loosely based on real paintball, but it is still invented content.

Duration: Short. Steamspy website can reveal the average playtime per user in 14 days, that means, how much time the average user has played in those days. The data is from 15 July. For Onward and Rec Room, the playtime is around 2,5 hours in 14 days (SteamSpy, 2017b, 2017c). And for Farpoint this is unknown, but as stated in other parts, these games are not meant for long sessions.

Educational level: Low. Onward advertising video shows how players use real military tactics and communication (Downpour Interactive, 2016) but it is not required to enjoy the experience, maybe only the most hardcore players would do that. For the other 2 games, they teach actively nothing.

Ideal participants: Big. If a multiplayer VR shooter is based upon existing famous multiplayer shooters for inspiration, they have to be designed for big groups of players (counting both teams). The analysed games show that Rec Room and Onward need a big group. Farpoint does not, but that is on purpose, it seems that it would be no problem to support more players at once (PlayStation Access, 2017).

Mental intensity: Low. It seems that not much planning and strategic gameplay are necessary to enjoy these games. That is why they fall in the shooter genre, and not strategy. Onward maybe is the game that would require more planning because it is a military simulator, but it is not strictly necessary.

Physical intensity: Low. It seems that players usually do not move much nor constantly to play these games. They crouch and lean forward, but that is it, Farpoint can even be played seated. A degree of moderate stress could be achieved by short periods, but it is not a constant state that taxes the user.

Price: High. The price for someone to try VR videogaming for the first time in his life, at his home, it is high. Since it is considered that a person does not own VR technology for recreation except if he already uses it, the first-time player has to purchase everything from the VR gear to the videogame (and this is assuming he already has a powerful PC). The price is around 850 € videogame included without discounts (HTC, 2017; Oculus VR, 2017b; Valve, 2017).

Space: Anywhere. It can be played at home, or at any other place providing the user has enough space and a VR ready laptop. Usually, of course, it is played in the owner's home.

Target age: Adult. Stores agreed confidently that adults are the main customer for private VR. The customer is a person who has enough money to not have to worry about spending several hundreds of euros into something new, just for fun.

6.3.3.3 Paintball

Results obtained from 2 paintballs and 1 laser tag company. Since Laser Tag is very similar to paintball and the work does not make distinction in the system, it is treated as equal.

Availability: All year. Paintballs are usually opened all year. Customers can go any time and ask to play some matches. There is only one company that works only under reservations, but they can be arranged at any time of the year.

Content: Real. Paintball has nothing fictional because it is not a history or something to imagine. The only case is when different game modes are played, but they do not focus on any fictional content.

Duration: Short. Inconclusive directly from the questionnaires. But approximating, one match usually lasts up to an hour, around 45 minutes according to one questionnaire. It is a slower activity compared to other recreation options, but it still falls under the short value within the system. It is a bit difficult to obtain an exact number because paintball is usually sold by packages of shots, not time. Also, a laser tag company answered a duration different from the paintball, it is unknown if it is because the playstyle of laser tag or it is an isolated case.

Educational level: Low. It is the recreation option that has scored the lowest in this variable, like karting. There is nothing that is taught about other topics than security concerns a company's rules. Customers learn basically nothing except how to play paintball.

Ideal participants: Big. In terms of numbers, the average is 10. Sometimes 8 players are allowed but companies recommend at least 10 or more. Since two teams have to play in a relatively large area, these numbers are required to experience the service at its best.

Mental intensity: Low. No need for planning strategies or how to form the teams is strictly necessary to enjoy the activity and be satisfied with it. Customers usually play and have a good time without thinking too much about it.

Physical intensity: Moderate. The physical demand of the activity is moderate according to the questionnaires. People do not run all the time, it is a playstyle more of waiting and shooting when having an opportunity. Short runs are involved, but it is not constant.

Price: Low. A standard session costs around 17 €, being 42 minutes on average. The price for the standard session is low according to the system rules.

Space: Regional. Varied answers have been obtained. It seems that depending on the location it can be a touristic activity, or more for people from around the company. Since some companies answered that the customer does not travel much and others that it travels considerably, regional value has been chosen because it is a middle point. Also, tourists are unlikely to only come for paintball.

Target age: Child and Adult. A very clear answer from all the companies is kids and adults, families mostly. It can seem that paintball is more adult focused than other recreation options but apparently kids go frequently, accompanied or not by adults.

6.3.3.4 Karting

Results obtained from 3 karting companies, one indoor and two outdoors.

Availability: All year. Kartings are usually opened all year. Customers can go any time, no reservation.

Content: Real. Karting has nothing fictional because it is not a history or something to imagine. It is a sport like any other and there is no virtual content that it is not present in the material life.

Duration: Short. On average, the standard session lasts 13 minutes. It is clear that the value is short.

Educational level: Low. It is the recreation option that has scored the lowest in this variable, like paintball. There is nothing that is taught about other topics than security concerns a company's rules. Customers learn basically nothing except how to drive a kart.

Ideal participants: Big. The average is 9 people. Different answers were given but the smallest answer is 6 to 8 people, and that corresponds to the big value in the system.

Mental intensity: Low. No need for planning strategies or how to drive through the circuit is strictly necessary to enjoy the activity and be satisfied with it. Customers usually play and have a good time without thinking too much about it.

Physical intensity: Intensive. Companies think that physical demand is high. Not because body movement, but more because of adrenaline, constant attention and the stress needed to drive a fast vehicle through a circuit avoiding other karts.

Price: Low. The price for the standard session of 13 minutes is 23 € on average.

Space: Local. Customers come from around the company location. It seems less touristic than paintball and people do not usually travel as much distance to do this activity.

Target age: Young and Adult. The only company to focus on young people is karting. Seems that the age is from 20 to 40. Maybe this is because it is the most expensive option per minute and it could seem more dangerous than paintball, therefore children do not come much.

6.3.3.5 System results with adjusted data

After finding the real variable values for each recreation option, the system must be updated to ensure that the theoretical competitors are really competitors. By doing so, it will show if the competition identification plan is pointing to the right direction or not.

If results are overall really different and the suspected competitors are not really that, then the assumptions probably are bad and they need to be rethought or use another system to detect the competitors. If results are overall approximately the same and the data varies slightly, then the system is presumed to work in approximating the type of recreation options that compete with the proposed project. And further analysis would be required to really determine against what recreation options and specific companies the project is competing against, but that would be the goal of another study.

The old system results are displayed first, and the adjusted data, in second place:

Source	
Compared to	VR PROJECT
VR PROJECT	10
VR Videogame - MP SHOOTER	7
Cyber VR	7
Paintball	8
Kart Racing	7

Figure 17. Graphical result of the standardisation system when comparing the VR project with the theoretical competitors with theoretical data.

Source	
Compared to	VR PROJECT
VR PROJECT	10
VR Videogame - MP SHOOTER	6
Cyber VR	7
Paintball	8
Kart Racing	6

Figure 18. Graphical result of the standardisation system when comparing the VR project with the theoretical competitors with adjusted data according to the findings.

The changes are Multiplayer VR shooter videogame and kart racing losing one point of similarity with the project, the rest remain the same. This suggest that the approximations were correct and not very far from reality. But to be sure, the exact data that has changed has to be analysed, because if 4 variables changed from one option and 2 were different and 2 were similar, after adjusting the data they have been reversed, then it would seem as nothing changed, when in reality 4 variables values were wrong.

The changes in the exact data are shown in the next figure and can also be consulted by comparing the points inside annex 9.2 'Raw data used to find competitors':

VARIABLES	RECREATION OPTIONS				
	VR Project	VR Videogame - MP SHOOTER	Cyber VR	Paintball	Kart Racing
Availability	No change	No change	No change	No change	No change
Content	No change	No change	No change	No change	No change
Duration	No change	No change	No change	No change	No change
Educational level	No change	No change	No change	No change	No change
Ideal participants	No change	No change	No change	No change	No change
Mental Intensity	No change	No change	No change	No change	No change
Physical intensity	Different	No change	Different	Different	Different
Price	No change	No change	No change	No change	No change
Space	No change	No change	No change	No change	No change
Target age	Different	Different	Different	Different	No change

Figure 19. Table showing what variable values changed between the theoretical data and the adjusted data with the findings.

First of all, the VR project changed two of its variables values after examining the real data. That is because it felt more appropriate to change the proposal in these areas after seeing the reality. Mainly because it makes assumptions more realistic and it blends better with the type of recreation option.

For example, the target age changed from “young and adult” to “child and adult” because it seems that paintball and VR are consumed by this public. That means the project would more likely appeal these demographics more than the previous ones. In case of the physical intensity it changed from intensive to moderate based on paintball data, because the physical demand would be very similar.

Regarding the other recreation options, it seems that the physical intensity and target age was bad assumed. This is mainly because the physical intensity experimented depends on the opinion on every person, and also because tension, stress and adrenaline were not counted neither in physical or mental intensity. The target age was also guessed incorrectly, but not by much, because usually the variables changed from “young and adult” to “child and adult”, this is not any radical change. And since the project change the target age as well, the similarities stayed the same.

Now, with the adjusted data everything is corrected and the system improved. It seems that Multiplayer VR shooter at home and karting lost a bit in similarity, which only strengthens the position of the project against them.

Since the differences are very small and the numbers are still high, they are still considered competition to the proposed project. In the next part, a general descriptive analysis of the competition is presented to make these claims more specific.

6.3.4 Descriptive analysis of the real competitors

In the previous point, different possible competitors have been found. In this part, the findings are expanded, and more specifically determined how much competition power they hold.

The system’s findings are not the only basis for establishing how a much recreation option is a competitor. That is because similarity does not need to be exactly correlated with competition. Maybe a 7-rated similar recreation option is not that competitive when other factors are considered, although it can also happen the other way around. In this part, they are analysed in a descriptive way.

6.3.4.1 VR Cybers

VR Cybers currently would compete with the project in different ways, and in the future, it could get worse. It may not be a strong competitor now, but in the future maybe it is.

For starters, the ideal participant number of these companies is small, up to four people. But that is going to change if these companies grow. Because then they will have more available space and will offer experiences for numerous groups of people, like the project.

This is because VR cybers could get enough money to grow in space, but also because technology is going to be cheaper. Usually, the price of electronic items like computers, mobile phones, televisions and the like, goes down over time (Rosoff, 2015; Taylor, 2015).

This will probably happen with virtual reality as well. People and companies will find their VR products cheaper than the year before, allowing them to equip their rooms with it. If VR walkers, custom controllers and other gear ends being affordable, these companies are going to offer it. Also, more games will support more players and this equipment.

This is counterproductive though, because the cheaper the equipment, more people are going to have it at home without needing to rent it. Over time VR cybers will probably die like traditional cybercafés have done in various places (Hargrave, 2004; Panigrahi, 2015). More of this explained in the next point.

As for now, they are competition because they offer recreational VR as well. Probably with cheaper price, but also lowered quality. The risk is that people may consider VR cyber enough to have fun with VR, not needing a project like the proposed one because for them it is not worth the extra price.

The project is a lot costlier than a VR cyber, but the quality is much higher. It is expected that the experience with the project clearly outmatch the VR cyber one. Overwhelmingly positive online opinions, explained in point 3.3.2 'Public opinion on VR', show that people love the experience. Meaning that if they try the project one, they will find VR cybers underwhelming, and then maybe they decide to only consume the project's service.

Maybe the two recreation options could coexist. One serving a wealthier public than the other. But of course, an important degree of competition will occur. For example, with experiences that do not rely much on space. The space and uniqueness that the projects offer is something that VR cybers would never offer, because they are small establishments that reduce costs by offering off the shelf products and experiences.

Another issue is proximity. The travel required to experience a VR paintball is very long, at a national level, because such companies will only exist in major cities. VR cybers will exist in many smaller cities and will be present near every person. If they succeed, no more than 30 minutes by car will bring a customer to a VR cyber. This accessibility could make potential customers decide for the VR cyber instead of the project, because they do not find the travel worthy enough.

The quality of the project could attract customers at a national level even with VR cybers everywhere. But furthermore, deals with transport companies could be made to make the travel cheaper and easier

for customers, like some theme parks do. Deals with travel agencies to attract tourism could also facilitate the accessibility of the project.

In summary, the project can deal with the price and accessibility issues created by VR cybers by offering superior quality and transport and accommodation solutions.

6.3.4.2 Multiplayer VR at home

This recreation option is one of the least similar recreation option to the project according to the system. The problem is that these differences may not be the same in the future.

It competes with the project in the same way affordable household desktop computers competed against cybercafés, causing a lot of them to get out of the business.

Cybercafés started to gain popularity a bit before the first decade of the century. People went there to play videogames or to chat online with their friends, with programs like Messenger or public website chats. It seemed that it was a strong recreation option because computers could do a lot of things and people really liked them, but they were expensive and difficult to configure, it was easier to rent them.

Everything seemed fine, but over time computer prices started to drop and configuration and usage started to get easier every year. With all the new advancements people had a difficult time to justify why not purchasing a computer if they regularly went to the cybercafé. Besides, it was far comfortable to have it in your home. When smartphones appeared, thing got even worse.

The time passed and cybercafés started shutting down because they did not have the clients they once had. Eventually, a few remained, and are still servicing the exception in some areas (while in other are still thriving). Nowadays a good number of people considers the cybercafé industry as a dead one (Hargrave, 2004; Lufkin, 2015; Panigrahi, 2015).

This is a risk that the VR project is exposed, because it seems like the same could easily happen if games and technology evolve. But there is a fundamental difference between computer use at a cybercafé and the VR project: the space.

When people plays a game in VR at home they need to stay where they are, in a limited space, usually in their bedroom because only a few will have a dedicated VR room in the house. If you want to really experience a VR game you want to really feel you are actually there (read being immersed). To really achieve that, a lot of space is needed, as explained in point 5.1.2 'How it solves the current problems'.

The VR project offer space, an expensive and very illiquid (Baum & Murray, 2011) resource in general. Purchasing and selling a house is not a fast process, it is not comfortable to change between spaces for VR. Common people cannot purchase the available space to play VR in a fast way, therefore it is far better to rent it. Because of this phenomenon, the VR project will not get phased out like VR cybers, and will be perdurable in the years to come.

Also, the price of household VR is currently expensive, like explained before in part 6.3.3.2 'Multiplayer VR shooter at home'. A low-end VR ready computer plus Oculus Rift headset (assuming no other peripherals are needed) already costs around 1.500 € (Ankermann PC, 2017; Oculus VR, 2017b), and that would deliver low quality VR, not comparable to the VR project's astounding visual and auditory quality. In the future, this is going to change though, but for now having compelling VR at home can be very expensive for some families. And it is unlikely the majority of VR users will buy an HMD, a VR walker and special controllers to compete with VR parks.

In the end, these two options could probably coexist well. The same happens with paintball and war simulator videogames, both are played and have been around for a long time. Household VR and recreational VR parks could be perceived as different recreation options, that customers who like them will consume both.

6.3.4.3 Paintball and similar

Paintball and similar options, could compete strongly against the VR project because of their nature. They are practically the same as the VR project but without virtual reality. In these sports people run holding devices similar to weapons and playing in a team against another team, it is the same playstyle as the project, it satisfies practically the same needs. The project could offer more experiences that differentiate from paintball, but one of the major ones would probably be combat experiences.

The difference between the project and these recreation options is, fundamentally, that they are reality based and anything virtual is involved. That may be a good thing for some, and a bad thing for others. Some people may prefer full real options more than VR ones because they want the interaction with their team to be real at 100%. This is understandable, people usually prefer real-time communication rather than via any electronic means because it feels more natural, but this will be fixed when technology improves.

With good virtual reality, the distinction between computer generated visuals and real visuals is minimal. The problem is that it is a new emerging technology. With enough time and success of the business venture, VR will be improved and this type of public that really values reality by itself will

likely be more pleased and eager to participate in a VR experience because it will be more realistic. Everything said, VR is a very stunning and incredible technology that surprises a lot of people, the innovation alone will attract a lot of customers.

Other people may prefer paintball because they want to play outdoors. The reasons could vary from temperature and airflow concerns to preferring a natural scenario. This is a difficult competitive strength to overcome in early VR stages because this technology can simulate visuals and sounds but not touch, at least efficiently. But, again, over time it will likely be solved. For temperature concerns, good air condition system could be installed.

Other people that could prefer paintball is because they already invested in the sport and have expensive gear and experience. To attract this customer, experiences like paintball will be present for them and for non-paintball players too. This would lower the difference between this sport and the VR enhanced version and would help attract more customers. There is no limit, except time and money, for making new VR experiences for the people, they just need to be profitable.

6.3.4.4 Kart Racing

Kart racing competes against the project because it is an unconventional way of recreation. If a group of friends want to spend the afternoon doing something they do not do frequently, kart racing is a good option.

The main competitive strength of the VR project is the innovative characteristic of the technology itself. It is a new way of recreation (not in a literal way) because it has achieved in recent years a degree of quality that makes it appealing to people at the first try like explained in part 3.3.2 'Public opinion on VR'.

As stated before, people like variety and to try new things. Virtual reality, if done right with the project, can attract a lot of customers because it is a new recreation option different from the existing one in many ways. Karting is already a known thing, when people has already tried it a few times they may want to seek more variety in their recreation repertoire, the project fulfils this desire.

Another strength of VR is that content can be altered in a lot of ways, for example, by changing game modes, scenarios, objectives, effects, etc. Karting does not have this possibility. The vehicles are fixed, and changing them is really expensive, the same happens with the location and the circuit. With VR, different experiences can be created and achieve that the customer does not grow tired of the recreation option itself, and wants to repeat, by adding variety every time.

Karting can be very different from day to day life, but VR can be different every time as well, which positions it in the lead in respect to this option.

6.4 The consumer of VR in Barcelona

After analysing the competitors, the supply analysis is done. Now the demand analysis is needed to continue proving the viability of the project. VR stores and VR cybers are interviewed about their target public to help find the target public of the project with more details than only the age range.

6.4.1 Methodology

The methodology used to discover the target customer of VR recreation options and stores is to interview the companies that offer such options. Asking them what is their target customer will help in discovering what is the target customer of the project. The questionnaire filled by VR cybers for the previous chapter can be useful as well.

A semi structured verbal interview was done and recorded to analyse the results among all the interviewed companies. Three service VR cybers and three VR stores (the same ones as point 6.3 'The competition in Barcelona') have been interviewed about their target customer. Always the person with most VR knowledge available was interviewed, for example, in a store where they sell a lot of other VR unrelated products, it was the person in charge of their VR section. They have been asked to describe what they offer to give them an opportunity to make promotion of the establishment and to clarify the context.

Service VR companies have already been described in part 4.2 'Analysing the VR recreational offer in Barcelona' and VR stores in point 6.3.3.2 'Multiplayer VR shooter at home'.

The interview method allows for free speech without being restrained to specific answers, but it is not completely unguided. At minimum, the following information should be obtained (Lavinsky, 2017; Porta, 2017; Smith, 2016):

- Gender: The gender of the typical customer, male or female.
- Age: The age range of the typical customer in years.
- Motivation: Why the customer wants to go to that specific company and why he likes that specific recreation option.

- Economic status: In what range of economical class does the interviewed considers the typical customer. For example, mid-class, upper-class or lower-class.
- Origin: The origin location of the typical customer.
- Group type: The typical social relationships of typical groups of customers. For example, families, co-workers, friends, etc.

If any of the previously mentioned information was missing at the end of the free speech, questions were asked to complete it. Also, some questions could be already answered in the questionnaire, those were not asked again in the interview.

After this, the recorded interviews were analysed through Microsoft Excel, listing the answer to each topic the interview has to cover. This method provides a way to observe similarities and differences to extract conclusions.

6.4.2 Findings

The asked companies offer different perspectives about the customer that consumes VR. It varies from place to place, but unified conclusions can be extracted.

For starters, not every answer has been obtained from every company, sometimes they preferred not to speak about a certain topic or not to answer a certain question. Mainly was due to confidential information not wanting to be revealed or other interview problems. Generally speaking though, the desired information was retrieved.

6.4.2.1 VR Cybers

According to the interviews and the questionnaires, a recreational VR service is consumed by men and women in similar proportions, with slightly more men than women. It is a person that can fall in two specific age ranges, child or adult, because the clear social group that consume it are families. That means that kids around 10 years old with parents around 35 years old are the primary consumers for this type of entertainment.

The economic class and purchasing power seems not to matter, but not many answers about this topic could be acquired. Analysing the price of the standard session (an average of 7€ per 10 minutes), the majority of people can afford it sporadically, one or two standard sessions.

It is a customer that seeks new experiences, something unconventional that he has never tried before. A curious person wanting to experience this new technology that he did not know about or it is too expensive to purchase it.

These are the common points among all interviewed companies. From here, some differences start to appear. For example, there is not a consensus about if the target public resides in Barcelona or not, because complete opposite answers have been retrieved, from abroad and from Barcelonès region.

This could depend on the location of the service, because one of the places is located in a highly touristic place (El Periódico, 2012). Said place answered that their main customer is from abroad. Another company answered that their main customer is from Barcelonès region, but was not located in a highly touristic place. Furthermore, another interviewee said off interview that tourists consume this recreational option more than he would have ever guessed, stating that tourists can be an important part of the customer base.

6.4.2.2 VR Store (Multiplayer VR at home)

According to the interview with the three VR stores, the consumer of household recreational VR products is usually a man, between 25 and 45 years old. Every interviewee had this definition very clear in their minds, and without any doubt they told the interviewer about it.

This middle-aged man also has another clear characteristic, he has no major money problems and can buy a set of products that costs around 450€ without thinking too much about it, and that price is without any other accessory and providing they already have the required Playstation 4 console, which its price is also in hundreds of euros. In one of the interviewees words “they have money to spend and want it, they are not very concerned about the price”.

They are motivated to purchase VR products because they want to, there is not any elaborate reason about why they purchase them, according to interviewees. The only other reason the buyers talked about, was that they wanted to try something new that could enhance their gaming experience, if it is about satisfying curiosity or more about wanting a better gaming time it is not clear, but a person can perfectly have those two motivations at the same time.

Usually the customer goes alone to purchase these products to enjoy them himself. The number of people that buy them for presents or for other people is very low.

The only information that could not be obtained was the place of origin of the customer. But considering the profile of the customer, it is unlikely that is was from afar. Chances are that is a person

from the same city or even neighbourhood where the store is located, because not many people would go alone to purchase something in another country, except if he cannot find it legally in his vicinity.

6.4.3 Project target public

Having determined the target customer for both recreational VR styles, it is time to determine the target public of the project.

As stated in point 4.2.2 'Problems about the current supply' one of the major problem with current recreational virtual reality options is the lack of space and physical contact.

If the project is going to base its existence and success on offering experiences that solve this problem, then a customer that likes to endure moderate physical intensity must be the target public of the project. Similar to the intensity of a paintball match because the main experience would be similar.

Another determining factor is the type of public that already consumes VR as a recreation option and purchases VR products: males ranging from 25 to 45 years old that seek new experiences. That suggests that the project should include this segment as one of the types of person to satisfy. These findings do not exclude other segments, but at least, this one must be present for sure.

As stated before, one of the things that the investigation has revealed is that families participate in virtual reality experiences but usually separately. With the VR project, families could play together, interacting with each other by touching their relatives in real life, by knowing they are there, and more importantly by moving freely without practically any restrictions. Kids and parents could play together, like they do in other activities, such as going to the beach or playing basketball.

Families would also be a good target public for this reason, but also because they already consume VR recreational services. Also VR products are purchased by people in parenting age (around 30 years old) (Instituto Nacional de Estadística, 2016). That means that families could very well be a viable target customer as well.

This conclusion leaves two different target publics to choose from: Groups of males between 25 to 45 years old and families with their children or young teens (from 9 to 13) with parents a bit older the average age of parenting in Spain, so 35 to 45 years old (this shift from the average parenting age in Spain is because kids have around 10 years old, and that means parents should be 10 years older).

Of course, if the project started someday in real life, maybe one of the two target publics should be the focus during the first months of the venture, to expand later to the other segment.

7 Conclusion

7.1 Findings

Virtual reality is a technology that have been around for many years, but now a new evolutionary step has been achieved, creating the current generation of VR. This has been explored to show that is has potential as a compelling leisure activity. According to the current projects, involved companies and opinions of the public, virtual reality seems like a very good industry to invest in because it will grow much more in the following years.

This study of virtual reality in Barcelona has revealed the current situation of VR in the recreation industry of the city. VR cybers are the only type of service companies involved, after being analysed it was found that they suffer from several problems: lack of knowledge, differentiation, space and physical interaction between players. A VR paintball park has been proposed as an alternative that would solve all these problems, a type of VR park that focuses on ample space and big group experiences, with the possibilities of expanding to more playstyles as required.

To prove the viability of this project an investigation of Barcelona's supply and demand has been done. The methodology uses a custom standardisation system, questionnaires, interviews and internet research to determine the real competitors of the proposed project. These have been determined as: VR cybers, multiplayer VR shooters at private homes, paintballs and kartings. After finding the major competitors, they have been further analysed and different solutions to their competitive strengths have been proposed to show that the project is viable.

The target public has also been investigated through interviews to VR companies (VR cybers and VR stores). This is to show that it has a defined public to focus on: adults and children, that usually participate as a family or groups of friends.

In the end, a VR paintball park focused on children and adults have been shown to be a great step forward to the existing recreational VR supply in Barcelona. Offering a great recreation option that will be a successful business if financial and other business elements are viable too.

7.2 Personal

A final degree work is no easy task, it has required a substantial amount of effort and decision making to create a work like this. In the end though, I think it has been worth it. Creating an original work like this is a rewarding experience, especially to show myself that I can achieve something great.

This work has some flaws, improvements to be made, corrections to be applied, but I have to say I'm satisfied because I delivered results. I studied one of the things I am more passionate in the world, virtual reality videogaming, and also it accomplishes part of the way of my dreams. The results could be more or less accurate and correct, but with the time I dedicated I am satisfied. Although not strictly speaking about the work, a lot of improvements could be made to improve my ability to do this kind of academic works, and other projects in general.

Maybe more research should be done into finding other competitors because only 4 have been determined, and not every recreation option have been tested. But as an initial competition diagnosis it is enough. Also, asking three companies about their opinions it has not been enough to draw conclusions in some variables and it would be a good idea to expand the research sample, although useful results were extracted.

I have to say that in comparison to other projects, I have managed this one the best. I did not need to stay late until 5 am to finish it the last day, for example. Or cut major parts of the work because of lack of time. I had to cut some things when I felt I was short of time, but in the end, it resulted in a long enough work, so it is ok. It seems that work by work, I am learning to manage myself better.

A lot of decision making and organization have been required to finish this work. I think I have never revised a project so many times ever in my life. I have reorganised the parts, joined two of them together, then separate them again, then delete one part that I spent a couple of hours making, and more reorganisation. This have been more difficult that I though at the beginning. Sure, I have done a lot of more works in my life, and in this one I had the help of my tutor, which I really appreciate her patience and help, but that does not make the task easier, in itself.

In the end, I am satisfied with my work, I delivered what I planned months ago, studying the supply and identifying the target public of a VR project, that I would like to create someday. I know I am late and I do not have the money to create something like this, but who knows, maybe I see an opportunity and I am part of one of these projects in some meaningful way. In the end what I want is to work in

something I love, and I think recreational virtual reality could really be my field, but I still have to work on it to be sure.

This work has helped me in my personal development and career guidance, and I appreciate the opportunity.

8 Sources

8.1 Bibliography

- Against Gravity. (2016). *Rec Room*. Retrieved from http://store.steampowered.com/app/471710/Rec_Room/
- Airsplat. (2017). *MilSim - Airsoft & Paintball*. Retrieved from <http://www.airsplat.com/MilSim>
- Ankermann PC. (2017). *Ankermann - PC GAMING Business PC VR Ready*. Retrieved from https://www.amazon.es/Ankermann-PC-GAMING-Business-PC-Ready/dp/B00BAQM72M/ref=sr_1_1?ie=UTF8&qid=1497874730&sr=8-1&keywords=vr+ready
- Àrea Metropolitana de Barcelona. (2016). *Evolució de la població segons sexe, 1991-2015*. Barcelona. Retrieved from <http://www.amb.cat/web/area-metropolitana/dades-estadistiques/demografia/serie-historica>
- Àrea Metropolitana de Barcelona. (2017). *El territori metropolità*. Retrieved from <http://www.amb.cat/web/area-metropolitana/coneixer-l-area-metropolitana/localitzacio-i-usos-del-sol>
- B., E. (2017, July 5). *Los asturianos de Zero Latency comienzan en Lisboa su internacionalización. El Español*. Retrieved from http://www.elespanol.com/economia/empresas/20170704/228727803_0.html
- Barnes, B. (2017, February). *Virtual Reality's Potential for Magic Gets Real. The New York Times*. Retrieved from <https://www.nytimes.com/2017/02/19/business/media/void-start-up-virtual-reality.html>
- Baum, A., & Murray, C. (2011). *Understanding the barriers to real estate investment in developing economies*.
- Bettors, E. (2013, August 30). *Virtual reality: Lessons from the past for Oculus Rift. BBC News*. New York. Retrieved from <http://www.bbc.com/news/technology-23877695>
- Bruno. (2016). *Top 10 VR Companies We Want To Invest In. Ultra VR*. Retrieved from <http://www.ultravr.org/virtualreality/top-10-vr-companies/>
- Bye, K. (2016, December). *VR Industry's Biggest Players Are Banding Together to Create an Open VR Standard. Road To VR*. Retrieved from <https://www.roadtovr.com/call-vr-open-standard-backed-valve-oculus-google-osvr/>
- Calabuig, J. (2016). *Tema 7 – Principals focus i fluxos. Tendències i noves destinacions*. Universitat Rovira i Virgili. Retrieved from <http://moodle.urv.cat/moodle/mod/resource/view.php?id=1625420>
- Cambridge Dictionary. (2017). *Recreation*. Retrieved from <http://dictionary.cambridge.org/dictionary/english-spanish/recreation>
- COBUILD Advanced English Dictionary. (2017a). *Reality*. In *Collins English Dictionary*. HarperCollins

- Publishers. Retrieved from <https://www.collinsdictionary.com/dictionary/english/reality>
- COBUILD Advanced English Dictionary. (2017b). *Virtual*. In *Collins English Dictionary*. HarperCollins Publishers. Retrieved from <https://www.collinsdictionary.com/dictionary/english/virtual>
- COBUILD Advanced English Dictionary. (2017c). *Virtual reality*. In *Collins English Dictionary*. HarperCollins Publishers. Retrieved from <https://www.collinsdictionary.com/dictionary/english/virtual-reality>
- Cubicle Ninjas. (2016). *Guided Meditation VR*. Retrieved from http://store.steampowered.com/app/397750/Guided_Meditation_VR/
- Davidson, J. (2016, June). *Australia's Zero Latency, virtual zombies head to Japan*. *Financial Review*. Retrieved from http://www.afr.com/technology/gaming/australias-zero-latency-virtual-zombies-head-to-japan-20160606-gpd4kf?eid=socialn:twi-14omn0055-optim-nnn:nonpaid-27062014-social_traffic-all-organicpost-nnn-afr-o&campaign_code=nocode&promote_channel=social_twitter
- Davies, A. (2016, May). *Oculus Rift Vs. HTC Vive Vs. PlayStation VR*. *Tom's Hardware*. Retrieved from <http://www.tomshardware.com/reviews/vive-rift-playstation-vr-comparison,4513.html>
- Downpour Interactive. (2016). *Onward*. Retrieved from <http://store.steampowered.com/app/496240/Onward/>
- Eadicicco, L. (2016). *I Experienced the Future of Virtual Reality By Becoming a Ghostbuster*. *Time*. Retrieved from <http://time.com/4408043/ghostbusters-dimension-review-the-void/>
- El Periódico. (2012, March 19). *Más del 60% de los visitantes de Arenas de Barcelona son extranjeros*. Retrieved from <http://www.elperiodico.com/es/noticias/barcelona/mas-del-los-visitantes-arenas-barcelona-son-extranjeros-1560484>
- Frontera Virtual. (2017). *Frontera Virtual*. Retrieved from <https://fronteravirtual.es/>
- Gilbert, B. (2014, March). *Samsung and Oculus partner to create Gear VR, a virtual reality headset that uses the Note 4 (hands-on)*. *Engadget*. Retrieved from <https://www.engadget.com/2014/09/03/samsung-virtual-reality/>
- Google. (2016). *Tilt Brush*. Retrieved from http://store.steampowered.com/app/327140/Tilt_Brush/
- Graham, P. (2016a). *Family Entertainment Group And Zero Latency Opening Two VR Centres In US*. *VRfocus*. Retrieved from <https://www.vrfocus.com/2016/11/family-entertainment-group-and-zero-latency-opening-two-vr-centres-in-us/>
- Graham, P. (2016b). *Main Event Entertainment Opening Free-Roam, Multiplayer VR Experience V-Play Reality In Orlando*. *VRfocus*. Retrieved from <https://www.vrfocus.com/2016/11/main-event-entertainment-opening-free-roam-multiplayer-vr-experience-v-play-reality-in-orlando/>
- Guideconsole. (2015). *I am demoing my Oculus DK1 at a videogame fair in my hometown for free. It's awesome to see people blown away when they try VR for the first time*. Retrieved from https://www.reddit.com/r/oculus/comments/3oc7jc/i_am_demoing_my_oculus_dk1_at_a_videogame_fair_in/
- Hamilton, I. (2016, May). *Inside The Growing Rift Between Valve And Oculus*. *Upload VR*. Retrieved from <https://uploadvr.com/valve-shared-vr-oculus/>

- Hargrave, S. (2004, March). *Terminal decline? The Guardian*. Retrieved from <https://www.theguardian.com/media/2004/mar/08/mondaymediasection9>
- Hopewell, L. (2014). *Meet Zero Latency: The Future Of Immersive Gaming, Built In Australia*. Gizmodo. Retrieved from <https://www.gizmodo.com.au/2014/05/meet-zero-latency-the-future-of-immersive-gaming-built-in-australia/>
- HTC. (2017). *HTC Vive gafas de vídeo*. Retrieved from https://www.amazon.es/HTC-Vive-gafas-de-video/dp/B01MA48Z63/ref=sr_1_3?ie=UTF8&qid=1500645228&sr=8-3&keywords=htc+vive
- Hudson, L. (2014). *How it felt to experience Game of Thrones through an Oculus Rift*. Wired. Retrieved from <https://www.wired.com/2014/03/game-of-thrones-oculus-rift/>
- IDESCAT. (2017). *Catalunya. 2016*. Retrieved from <http://www.idescat.cat/economia/inec?tc=3&id=d001>
- Instituto Nacional de Estadística. (2016). *Edad Media a la Maternidad por orden del nacimiento según nacionalidad (española/extranjera) de la madre*. Retrieved from <http://www.ine.es/jaxiT3/Tabla.htm?t=1579>
- Jackfrags. (2017). *BEST VR FPS - Arizona Sunshine (HTC VIVE)*. Youtube. Retrieved from <https://www.youtube.com/watch?v=FdhDUrytPYY>
- James, P. (2016). *'Unlimited Corridor' Video Shows Mind Bending 'Infinite' Redirected Walking. Road To VR*. Retrieved from <https://www.roadtovr.com/new-unlimited-corridor-video-shows-mind-bending-redirected-walking/>
- Kelion, L. (2015). *HTC reveals virtual reality headset with Valve at MWC*. BBC News. Retrieved from <http://www.bbc.com/news/technology-31664948>
- Kunos Simulazioni. (2014). *Assetto Corsa*. Retrieved from http://store.steampowered.com/app/244210/Assetto_Corsa/
- Lavinsky, D. (2017). *Analyzing Customers in Your Business Plan*. Retrieved from <http://www.businessknowhow.com/startup/analyze.htm>
- LetsPlay. (2017). *Let's Play - Star Trek: Bridge Crew*. Youtube. Retrieved from <https://www.youtube.com/watch?v=tRFVmAhhac>
- Lufkin, B. (2015). *The Weird, Sketchy History of Internet Cafes*. Gizmodo. Retrieved from <http://gizmodo.com/the-weird-sketchy-history-of-internet-cafes-1741978937>
- Meeras, L. (2010). *Leisure and Recreation*. Tartu. Retrieved from http://dspace.ut.ee/bitstream/handle/10062/15005/leisure_and_recreation.pdf
- Merriam-Webster. (2017a). *Leisure*. Merriam-Webster. Retrieved from https://www.merriam-webster.com/dictionary/leisure?utm_campaign=sd&utm_medium=serp&utm_source=jsonld
- Merriam-Webster. (2017b). *Recreation*. Retrieved from <https://www.merriam-webster.com/dictionary/recreation>
- Museum at Prairiefire. (2017). *Stonehenge*. Retrieved from <http://museumatpf.org/stonehenge-vr/>
- Nathie. (2016). *EPIC VIRTUAL PAINTBALL FIGHT!* Youtube. Retrieved from <https://youtu.be/zBKwMcjg7AM?t=4m42s>

- Oculus. (2012). *Oculus Rift: Step Into the Game* by Oculus. Retrieved 11 March 2017, from <https://www.kickstarter.com/projects/1523379957/oculus-rift-step-into-the-game>
- Oculus VR. (2013). *John Carmack Joins Oculus as CTO*. Retrieved from <https://www3.oculus.com/en-us/blog/john-carmack-joins-oculus-as-cto/>
- Oculus VR. (2017a). *Binocular Vision, Stereoscopic Imaging and Depth Cues*. Retrieved from https://developer3.oculus.com/documentation/intro-vr/latest/concepts/bp_app_imaging/
- Oculus VR. (2017b). *Oculus Rift*. Retrieved from https://www.amazon.es/Oculus-Rift-Sistema-realidad-exposiciones/dp/B00ZFOGHRG/ref=sr_1_5?ie=UTF8&qid=1500645234&sr=8-5&keywords=oculus+rift
- Oculus VR. (2017c). *Rift*. Retrieved from <https://www.oculus.com/experiences/rift/>
- Panigrahi, D. (2015, February). *No takers: After the smartphone boom, cybercafés dying a slow death in Mumbai*. *Hindustantimes*. Retrieved from <http://www.hindustantimes.com/mumbai/no-takers-after-the-smartphone-boom-cybercafes-dying-a-slow-death-in-mumbai/story-m4giaactdzn12qWLwVxhpM.html>
- Parque Warner. (2017). *Descubre la primera montaña rusa con realidad virtual de España*. Retrieved from <http://parquewarner.com/blog/batman-arkham-asylum-vr-samsung>
- Patterson, I., & Pegg, S. (2009). *Marketing the Leisure Experience to Baby Boomers and Older Tourists*. *Journal of Hospitality Marketing & Management*, 18(2–3), 254–272. <https://doi.org/10.1080/19368620802594136>
- PlayStation Access. (2017). *Farpoint PS VR Co-op Gameplay - How Long Can We Survive?* Youtube. Retrieved from <https://www.youtube.com/watch?v=puPUOqw3eCs>
- Popper, B. (2016). *We tried Ghostbusters: Dimension, the world's most immersive VR experience*. *The Verge*. Retrieved from <https://www.theverge.com/2016/6/29/12060066/ghostbusters-dimension-the-void-times-square-madame-tussauds-vr>
- Porges, S. (2016). *A Review Of 'Ghostbusters: Dimension': The Crazy New Free-Roaming VR Installation*. *Forbes*. Retrieved from <https://www.forbes.com/sites/sethporges/2016/07/01/a-review-of-ghostbusters-dimension-the-crazy-new-walk-through-vr-experience/#7e43b8bd112e>
- Porta, M. (2017). *How to Define Your Target Market*. Retrieved from <https://www.inc.com/guides/2010/06/defining-your-target-market.html>
- Protin, C., Kakoyiannis, A., & Fierberg, E. (2017). *Watch what happens when kids try virtual reality for the first time*. *Business Insider*. Retrieved from <http://www.businessinsider.com/kids-virtual-reality-first-time-htc-vive-tech-vr-2017-6>
- Razzaque, S., Kohn, Z., & Whitton, M. C. (2001). *Redirected walking*. In *Proceedings of EUROGRAPHICS* (Vol. 9, pp. 105–106). Retrieved from https://www.researchgate.net/profile/Mary_Whitton/publication/2376964_Redirected_Walking/links/0912f51100119ae9a1000000.pdf
- Recreation and Leisure*. (2017). Jones and Bartlett Publishers. Retrieved from http://www.jblearning.com/samples/0763749591/49591_Ch01_McLean.pdf
- Reid, S. (2017, March). *A gateway to Stonehenge: VR in a museum setting*. *Vive Blog*. Retrieved from

- <https://blog.vive.com/us/2017/03/23/a-gateway-to-stonehenge-vr-in-a-museum-setting/>
- Riftinfo. (2015). *Oculus Rift History - How it All Started*. Retrieved 11 March 2017, from <http://riftinfo.com/oculus-rift-history-how-it-all-started>
- Rohrer, F. (2009, May). *Is there a problem with paintball?* *BBC News*. Retrieved from http://news.bbc.co.uk/2/hi/uk_news/magazine/8067908.stm
- Rosoff, M. (2015, October). *Every type of tech product has gotten cheaper over the last two decades — except for one*. *Business Insider*. Retrieved from <http://www.businessinsider.com/historical-price-trends-for-tech-products-2015-10>
- Searles, R. (2016, December). *Virtual Reality Can Leave You With an Existential Hangover*. *The Atlantic*. Retrieved from <https://www.theatlantic.com/technology/archive/2016/12/post-vr-sadness/511232/>
- Sell, M. A., & Sell, W. (2007). *View-Master Memories*. Mary Ann and Wolfgang Sell. Retrieved from https://en.wikipedia.org/wiki/View-Master#cite_note-View-Master-1
- Smith, K. (2016). *How to Conduct Customer Analysis and Customer Segmentation*. Retrieved from <https://www.brandwatch.com/blog/how-to-write-customer-analysis/>
- Sony. (2016a). *Farpoint Announced for PlayStation VR*. Retrieved from <https://blog.us.playstation.com/2016/06/13/farpoint-announced-for-playstation-vr/>
- Sony. (2016b). *PlayStation VR: The Ultimate FAQ*. Retrieved from <https://blog.us.playstation.com/2016/10/03/playstation-vr-the-ultimate-faq/>
- Sony. (2017a). *Farpoint Launches May 16 on PS VR, Features Online Co-op*. Retrieved from <https://blog.us.playstation.com/2017/03/08/farpoint-launches-may-16-on-ps-vr-features-online-co-op/>
- Sony. (2017b). *Playstation VR Aim Controller*. Retrieved from <https://www.playstation.com/en-us/explore/accessories/playstation-vr-aim-controller/>
- SteamSpy. (2017a). *Games tagged VR Only*. Retrieved from <https://steamspy.com/tag/VR+Only>
- SteamSpy. (2017b). *Onward*. Retrieved from <http://steamspy.com/app/496240>
- SteamSpy. (2017c). *Rec Room*. Retrieved from <http://steamspy.com/app/471710>
- Survios. (2016). *Raw Data*. Retrieved from http://store.steampowered.com/app/436320/Raw_Data/
- Taylor, B. (2015). *Buy now or wait? The tech products that will likely drop in price*. *Wtop*. Retrieved from <http://wtop.com/tech/2015/12/buy-now-or-wait-the-tech-products-that-will-likely-drop-in-price/>
- The Void. (2017a). *Ghostbusters: Dimension*. Retrieved from <https://www.thevoid.com/reservations>
- The Void. (2017b). Retrieved from https://www.facebook.com/pg/voidvr/reviews/?ref=page_internal
- Trucot, L. (2016). *The Origins of Leisure*. *International Innovation*. Retrieved from <https://en.wikipedia.org/wiki/Leisure>
- Ubisoft. (2017). *Star Trek™: Bridge Crew*. Retrieved from

- http://store.steampowered.com/app/527100/Star_Trek_Bridge_Crew/
- Unknown Worlds Entertainment. (2014). *Subnautica*. Retrieved from <http://store.steampowered.com/app/264710/Subnautica/>
- Usoh, M., Arthur, K., Whitton, M. C., Bastos, R., Steed, A., Slater, M., & Brooks Jr, F. P. (1999). *Walking > walking-in-place > flying, in virtual environments*. In *Proceedings of the 26th annual conference on Computer graphics and interactive techniques* (pp. 359–364). Retrieved from <http://www.cs.princeton.edu/courses/archive/spr01/cs598b/papers/usoh99.pdf>
- Valve. (2017). *Virtual Reality on Steam*. Retrieved from <http://store.steampowered.com/vr/#p=0&tab=TopSellers>
- Virtual Reality Society. (2017a). *History Of Virtual Reality*. Retrieved 10 March 2017, from <https://www.vrs.org.uk/virtual-reality/history.html>
- Virtual Reality Society. (2017b). *What is Virtual Reality?* Retrieved 10 March 2017, from <https://www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html>
- Virtuix. (2017). *Games*. Retrieved from <http://www.virtuix.com/games/>
- Vivevirtual. (2017a). *Carta de juegos*. Retrieved from <https://vivevirtual.es/experiencias-realidad-virtual/>
- Vivevirtual. (2017b). *Compra Una Experiencia de Realidad Virtual*. Retrieved from <https://vivevirtual.es/comprar-entradas/>
- Volpe, J. (2015, September). *Oculus VP: 'Our number one goal is to make developers successful'*. *Engadget*. Retrieved from <https://www.engadget.com/2015/09/25/nate-mitchell-oculus-vr-interview/>
- VR Source. (2016). *Ghostbusters Dimension hands on: become a ghostbuster!* Youtube. Retrieved from <https://www.youtube.com/watch?v=UcHzkLk7sw>
- VRMax Centers. (2016). *VRMax Centers*. Barcelona.
- VRMax Centers. (2017a). *VRMax Centers*. Retrieved from <https://www.vrmaxcenters.com/>
- VRMax Centers. (2017b). *VRMax Centers*. Retrieved from <https://www.facebook.com/vrmaxcenters/>
- VRRelated. (2015, May). *5 Virtual Reality Devices From the 90's That Didn't Take Off*. Retrieved from <http://vrrelated.com/5-virtual-reality-devices-from-the-90s-that-didnt-take-off/>
- Wawro, A. (2013, November). *Oculus Rift is mind-blowing (if you don't barf)*. *PCWorld*. Retrieved from <http://www.pcworld.com/article/2062439/oculus-rift-is-mind-blowing-if-you-dont-barf.html>
- Wei, S., & Milman, A. (2002). *The Impact of Participation in Activities while on Vacation on Seniors' Psychological Well-Being: A Path Model Application*. *Journal of Hospitality & Tourism Research*, 26(2), 175–185. <https://doi.org/10.1177/1096348002026002006>
- Xtrematic. (2017a). *Movies and games for the new generation of the Oculus Rift-based attraction Extreme-machine*. Retrieved from <http://xtrematic.com/en/films-and-games/>
- Xtrematic. (2017b). *Virtual reality attraction Extreme-machine*. Retrieved from

<http://xtrematic.com/en/>

Zero Latency. (2017a). *Contact Us*. Retrieved from <https://zerolatencyvr.com/contact>

Zero Latency. (2017b). *Games*. Retrieved from <https://zerolatencyvr.com/games>

Zero Latency. (2017c). *Zero Latency*. Retrieved from <https://www.zerolatencyvr.com/madrid/home>

Zero Latency. (2017d). Retrieved from <https://www.google.es/maps/place/Zero+Latency/@-37.795849,144.9357143,17z/data=!4m5!3m4!1s0x6ad65d17ea9d7a0f:0x51414b030ccafa3!8m2!3d-37.795849!4d144.937903>

Zero Latency Madrid. (2017). Retrieved from <https://www.google.es/maps/place/Zero+Latency+Madrid/@40.4494903,-3.6715351,17z/data=!4m15!1m9!4m8!1m0!1m6!1m2!1s0xd4228d12d42794d:0x1f1fdca32d1c313c!2sZero+Latency+Madrid,+Calle+de+Pradillo,+54,+28002+Madrid!2m2!1d-3.6693464!2d40.4494903!3m4!1s0x0:0x1f1f>

Zervas, G., Proserpio, D., & Byers, J. (2014). *The rise of the sharing economy: Estimating the impact of Airbnb on the hotel industry*. Boston U. School of Management Research Paper, (2013–16). Retrieved from http://papers.ssrn.com/sol3/Papers.cfm?abstract_id=2366898

8.2 Figure references

Carte de la Catalogne. (2017). *Lleida: Des Racines* [Map]. Retrieved from http://desracines.be/timeline/ligne_du_temps/temeline.html

Cass, N., & Doc-Ok. (2015). *Virtuix Omni and Cyberith Virtualizer* [Compound digital image]. Retrieved from <http://fortune.com/2016/01/08/virtuix-vr-esports-tournament-ces/> and <http://doc-ok.org/?p=1284>

CNET. (2016). *Sony PS VR Aim Controller* [Video frame]. Retrieved from <https://www.cnet.com/products/sony-ps-vr-aim-controller/>

Davies, A. (2016). *Oculus Rift Vs. HTC Vive Vs. PlayStation VR*. *Tom's Hardware* [Digital image]. Retrieved from <http://www.tomshardware.com/reviews/vive-rift-playstation-vr-comparison,4513.html>

ExtremeSports.ie. (2016). *Paintball indoors scenario* [Photography]. Retrieved from <http://www.extremesports.ie/content/95-ec577b858fc6d630553f141e2acda0c8.jpg>

Hall, & Page. (2007). *Relationship between leisure, recreation and tourism* [Graph]. Retrieved from http://dspace.ut.ee/bitstream/handle/10062/15005/leisure_and_recreation.pdf

Meeras, L. (2010). *Categories of recreational activities* [Table]. Retrieved from http://dspace.ut.ee/bitstream/handle/10062/15005/leisure_and_recreation.pdf

Tech Crunch. (2016). *MSI VR Ready backpack computer* [Photography]. Retrieved from https://tctechcrunch2011.files.wordpress.com/2016/09/20160912_2.png?w=700

Tech Radar. (2016). *A person playing with the HTC Vive* [Photography]. Retrieved from <http://www.gospelherald.com/articles/68233/20161124/htc-vive-gets-100-discount-black-friday.htm>

The Void. (2016). *The void wants to make VR theme parks a reality* [Digital image]. Retrieved from <http://twistedifter.com/2015/05/the-void-wants-to-make-vr-theme-parks-a-reality/>

Vivevirtual. (2017). *Matando zombies por Cantina Tijuana* [Video frame]. Retrieved from <https://vivevirtual.es/gallery/matando-zombies-por-cantina-tijuana/>

VRMax Centers. (2017). *VRMax Centers* [Photography]. Retrieved from <https://www.facebook.com/vrmaxcenters/>

9 Annexes

9.1 The standardisation system (original content)

The standardisation system it is original content created exclusively for this work. It is based on common, shared characteristics of every recreation option a person can choose from. It analyses these characteristics and compares them against other options to show how many variables in common they have. Then it shows graphically which options are similar to each other in terms of common characteristics. Within the program Microsoft Excel it automatically compares options between them and outputs a graphical result.

It is aimed to serve as auxiliary tool to determine if a recreation option competes with another, by itself it offers an incomplete vision of the reality, but it can help in a general way and complement with other techniques.

9.1.1 Rules and assumptions

It is unfair to compare a recreational activity with another without establishing some guidelines and rules about how to do it. The lack of rules and assumptions would make the system hugely unreliable and untrustworthy. For example, it is not fair to compare an activity that the customer of reference likes against one that he does not like, because preferences are not impartial.

Thus, the following rules and assumptions have been designed to standardize all compared variables, to eliminate real life distortions and to be as impartial as possible. This is a theoretical model and it cannot include some real-life factors that would alter the results, like weather conditions or the mood of the customer.

The rules and assumptions are the following ones:

1. The recreation options must fit the definition of this work. In summary, they are performed because the user seeks fun or enjoyment in his leisure (free time). Also, tourism per se it is not considered a recreation activity because tourism is a chain of different activities that create an experience.

2. To evaluate every recreation option a specific situation is determined: It's Friday afternoon and a person is planning what to do in his leisure during his free weekend, what can he try for the first time in his life?
 - a. There's no quantity limit of what he can try, only time limit, 2 days.
 - b. He has no preferences and it is not biased in any way.
 - c. If it's a group activity, it is assumed he can find the appropriate group of people he knows enough to have fun.
 - d. There are no monetary, social, personal constraints of any special type (read disabilities, fears, etc.)
 - e. He is a standard average citizen. For example, he cannot do things an Olympic weightlifter, or a rich, or a prime minister could do and behaves normally.
 - f. He possesses goods that the average citizen possesses. For example, a smartphone, a TV, a computer, etc.

3. Every option is evaluated according with the following principles:
 - a. Everything is evaluated in a form of the standard sessions. The reference user has to try for the first time in his life one session of a specific activity. One session is the standard measure of the activity, it usually matches one unit of the service a customer pays for. Some examples to illustrate: in a football match, one standard session is one match; in a fighting videogame it is also one match (consisting usually on 3 fights); in a visit to a museum, it is the whole visit; in a hotel, it is one night; in a movie it is the whole movie but in a TV show it is a whole episode.
 - b. All conditions necessary to perform the activity are always met (good weather, good player relation, enough time to do it without worry, etc.).
 - c. No problems related to waiting times, mistakes, poor quality of the services, bad staff, are taken in consideration here because these depend on the specific company and point of view of the customer, not the recreation option in general.
 - d. The absolute maximum price for a standard session per person is 1.000 €. Options more expensive than that are excluded from the comparison.
 - e. If it is priced for groups, like a hotel that charges per room (not per guest), the price is divided and the resulting value is the compared variable.
 - f. The price is determined by the necessary goods and services that you have to pay to do it (always average quality and price). The necessary gear for every activity is

counted towards the price but only if it's specific for the activity, general use items do not count. Although if a company rents equipment, this price is used instead of buying the equipment, because usually it is a rare item that the average person does not own and it is expensive. Our reference citizen will choose the path of least resistance for a first-time participant. For example, to play a computer game for the first time in his life only the videogame price is counted, because the computer he needs is a multipurpose item that an average citizen usually has. But in the case of a VR videogame he needs to buy or rent the equipment (The HMD, other required parts and controllers), because an average citizen would only own these items if he participated in these activities habitually (if we exclude real life distortions like presents; he bought it, tried and disliked it; impulsive purchases, etc.)

- g. The price is the price of the recreation itself for the standard session and only required costs, not the associated secondary costs. For example, visiting a museum will only take into account the entrance fee, not any travel, museum store or food purchases.

9.1.2 Examples of what does and does not fit in the system

Examples of what cannot be evaluated:

- Professional sports (meaning elite level, where the participant dedicates his life to it). Because they are not only done because of fun or enjoyment, but for other reasons as well (money, fame, because it is a job, sense of being the best). Also, because it would not be the first time.
- A sport or another activity because individual seeks health or other thing than fun. Because it contradicts the definition of recreation in the work.
- Visiting a foreign city. Because people do not enjoy visiting the city itself, they enjoy visiting its cathedral, its restaurants, etc. Tourism is a chain of activities, not a single one.

Examples of what can be evaluated:

- Watching a movie.
- A casual basketball match.
- Playing a board game.
- Going to a theme park.
- Walking in a park.

9.1.3 Variables evaluated

The compared variables of each recreation activity are the following:

- **Space** [Home, Local, Regional, National]
 - Description: Taking Catalonia as reference, travel distance required for the customer to enjoy the activity. Or in other words, the range of attractiveness of the recreation option. This evaluates where the most frequent customer that travels specifically to do the activity comes from. If it is usually people from the country that have come specifically to do this activity, then the value is “National”, because it attracts people in a national range, like a theme park. But, if it something that people do because they encountered in their way, then this does not count. For example, a tourist visits Barcelona in general and while walking he encounters a virtual reality cyber and he tries it. This would count as “Local” because the customer did a very short travel to play (the goal was to play with VR) but the main travel was to come to Barcelona in general, not VR.
 - Anywhere: No travel distance required. It can be done in good conditions at an average home or practically anywhere close to the average home.
 - Local: Travel distance within a local region, in Spain, a province (like Tarragona). Usually attracts people from the province.
 - Regional: Travel distance within a national region, in Spain, an autonomous community (like Catalonia). Usually attracts people from the autonomous community.
 - National: Travel distance within the whole country, in Spain, all the Iberian Peninsula inside Spain’s territory. Usually attracts people from the surrounding autonomous communities, or more.

- **Target age** [All, Child, Young, Adult, Senior]
 - Description: To what age segment the recreational activity is focused on (it is not very restrictive though). It does not mean the allowed age. For example, a bicycle trip allows the entrance to all ages but it is usually focused on young and adults. It can include more than one value, the previous activity would have two values assigned (Young and Adult).
 - All: No age restriction.
 - Child: Less than 13 years old.

- Young: From 13 to 25 years old.
 - Adult: From 26 to 65 years old.
 - Senior: More than 65 years old.
- **Ideal participants** [Solo, Small, Big]
 - Description: Ideal number of persons to do the activity counting all teams, if applies. This is not the minimum required to do the activity, but the number of players that allow to experience it at its best.
 - Solo: 1 person, done alone.
 - Small: Up to 4 persons.
 - Big: More than 4 persons.
- **Price** [Free, Cheap, Moderate, Expensive]
 - Description: Price for the standard session for one person. See rule 3 for clarification.
 - Free: No payment required.
 - Low: Less than 50 € per person.
 - Moderate: More than 50 € and less than 200 € per person.
 - High: More than 200 € and less than 1.000 € per person.
- **Availability** [All year, punctual, seasonal]
 - Description: When the activity can be performed in a year, or if it has some date restriction.
 - All year: It can be done during all year.
 - Punctual: It can only be done on specific days of the year, like a venue.
 - Seasonal: It can only be done on specific months of the year, like skiing in Spain.
- **Duration** [Short, Moderate, Long, Very Long]
 - Description: The duration of the standard session. See rule 3 for clarification.
 - Short: Up to 1 hour.
 - Moderate: Between 1 and 3 hours.
 - Long: Between 3 and 8 hours.
 - Very Long: More than 8 hours.

- **Physical intensity** [Sedentary, Low, Moderate, High] Description:
 - Description: How much physical effort is needed to perform a standard session.
 - Sedentary: No physical effort needed, either because no constant physical displacement is involved or the effort would not exhaust a senior customer.
 - Low: The physical effort required is approximately the same as walking on a street or moving the steering wheel of a car frequently.
 - Moderate: The physical effort required is approximately the same as walking on a mountain steeped terrain or require a lot of walking hours. Hiking is an example of moderate physical intensity.
 - High: The physical effort required is approximately the same as common sports, like football, basketball or running.

- **Mental intensity** [Low, Moderate, High].
 - Description: Does the activity involve mental conscious effort? The type of effort to plan, make strategies, consider options or facts, etc.
 - Low: The mental effort required is approximately the same as player of a common sport, like tennis or basketball. In these sports, quick thinking and habits are usually better than stopping to think and plan mid-game.
 - Moderate: The mental effort required is intermittent or not a core skill needed to perform the activity. Like a museum, where the visitor usually learns information and does not have to think about complex concepts if he does not want to, because it is not required to enjoy the visit.
 - High: The mental effort required is approximately the same as a board game where strategy and planning are the core of it. For example, a chess match.

- **Content** [Real, Fiction, Mixed]
 - Description: Is the activity based on real or fictitious content? What this variable evaluates is the intention of the author. For example: The difference between a recorded basketball match and a movie where a basketball match is shown is that the recorded match is real because it happened in real life as it is shown. What happens is that the observer watches the reality deferred in time, and also the intention of the recording is to show the reality. In the movie though, the match happened but not as in real life, because there were cuts to make the movie and they had to repeat shots,

and the intention is not to show a real match but an invented one for the movie, therefore the match was made up, invented, it is not entirely real (only based upon it, it would be mixed reality).

- Real: An accurate representation of the reality, present or past. As a reminder, this is a theoretical model, mistakes and other distortions that happen in real life do not apply here.
- Fiction: Invented content that originated in someone’s mind. Clearly disconnected from the reality.
- Mixed: Invented content that originated in someone’s mind but is realistic (inspired in real events), plausible and perfectly possible in reality.

- **Educational level** [Low, Moderate, High]

- Description: Does the activity actively teaches something about the real world in some way? For example, does it teaches history, or it's pure fiction that has no resemblance with the real world, like a Star Wars movie?
- Low: It teaches nothing or very little. Everything teaches something but if it is not intended and is not very relevant, it falls in this value.
- Moderate: It teaches substantially, even indirectly. This value is for activities that do not actively teach but you can learn a lot from, like a romantic movie based on a real war or a movie like Titanic. It is not a documentary but it has a good amount of historical content.
- High: Teaching is the focus of the activity. Like a museum or a documentary.

9.1.4 Computerization

To compare the different recreation options a Microsoft Excel macro has been created to make the process automatically. In a macro enabled Excel file data can be introduced in a predetermined format, then the program interprets the data and compares the values and outputs the result.

The following table illustrates the data format needed for the computer to make the calculations:

<u>VARIABLES</u>	<u>RECREATION OPTIONS</u>	
	Recreation option #1	Recreation option #2
Availability	All year	All year
Content	Fiction	Real
Duration	Short	Long

Educational level	Low	High
Ideal participants	Big	Small
Mental Intensity	Low	Moderate
Physical intensity	Sedentary	Low
Price	Low	Low
Space	Anywhere	Local
Target age	Yadult	Ysadult

Figure 20. This table shows an example of the adequate format of the data so the system can process it.

As it can be observed in the table before. For the program to perform the comparison, data must be entered in table form, the non-bolded parts are what must be manually entered.

The first column is just information, the names of the variables. The remaining columns correspond to each recreation option that need to be compared against each other, theoretically there's no limit to the amount of options to compare.

Each variable value has a value corresponding to one of the values described in point 6.1.3 'Variables evaluated'. The last variable, "target age" can be a bit confusing, but as explained in the mentioned part it can take different values. The words "Yadult" and "Ysadult" are just codes so the program can interpret the data more efficiently with one word. They are just abbreviations for Young + Adult in the first case and Young + Adult + Senior in the second case.

When the data has been entered, the macro can run without problems. After being executed manually or via keyboard shortcut, it outputs a graphical result similar as the following one:

Source			
		Recreation option #1	Recreation option #2
Compared to	Recreation option #1	10	2
	Recreation option #2	2	10

Figure 21. Example of the graphical output by the system via Microsoft Excel.

This results in a table with the number of similarities between each other. As it can be seen in the previous table, the option 1 has all the values in common with itself and only 2 values in common with the option 2. That would indicate that these 2 recreation options are not very similar, they are different according to the system, and in real life if everything works as expected.

The programming code in Visual Basic language used to build the Excel macro is original content. It has been created only for this work. The following figure shows the exact code:

```
Sub Evaluate_options()  
  
Application.ScreenUpdating = False  
  
Dim Similarities_count As Range  
Dim Recreation_Options As Range  
Dim Starting_position As Range  
Dim Current_column_range As Range  
Dim Current_column As Range  
Dim Counter As Integer  
Dim Score As Range  
Dim Scoreboard As Range  
  
Set Similarities_count = Range("Similarities_count")  
Set Recreation_Options = Range("Recreation_Options")  
Set Starting_position = Range("D17")  
Set Current_column_range = Range("D44")  
Set Current_column = Worksheets("Macro_Data").Range("C3")  
Set Scoreboard = Range("Scoreboard")  
  
Counter = 0  
  
For i = 1 To Recreation_Options.Count  
    Current_column_range.Value = Current_column.Offset(0, Counter).Value  
    Application.Calculate  
    Similarities_count.Copy  
    Starting_position.Offset(0, Counter).PasteSpecial Paste:=xlPasteValues, Operation:=xlNone, SkipBlanks _  
        :=False, Transpose:=True  
    Counter = Counter + 1  
Next i  
  
Application.CutCopyMode = False  
Starting_position.Select  
  
Application.ScreenUpdating = True  
  
End Sub
```

Figure 22. Screenshot of the VBA code used in a Microsoft Excel macro to make the system work automatically.

9.1.5 Example of use

To understand better how this system works, an example is provided. It is just to illustrate the possibilities and reliability of the system, it is not related to the findings of the work by any means.

Several recreation options were chosen to be introduced in the system. In real life, some are similar and some are really different from each other. To prove that the system approximately represents the reality, this has been on purpose. Similar recreation options (like watching a movie on TV and watching a reality show on TV) will have high similarities and will have similar numeric scores (and a long green bar) on the outputted table, and different recreation (like walking and playing a multiplayer videogame) options will be represented the other way around, with a short green bar and small numeric scores.

The following data was introduced into the computer:

<u>VARIABLES</u>	<u>RECREATION OPTIONS</u>				
	VIDEOGAME - MP SHOOTER	VIDEOGAME – SP ROLEPLAY	BASKETBALL	TENNIS	ABSTRACT PAINTING
Availability	All year	All year	All year	All year	All year
Content	Fiction	Fiction	Real	Real	Fiction
Duration	Short	Moderate	Moderate	Moderate	Moderate
Educational level	Low	Low	Low	Low	Low
Ideal participants	Big	Solo	Big	Small	Solo
Mental Intensity	Low	Moderate	Low	Low	High
Physical intensity	Sedentary	Sedentary	High	High	Sedentary
Price	Low	Low	Low	Low	Low
Space	Anywhere	Anywhere	Local	Local	Anywhere
Target age	Yadult	Yadult	Yadult	Yadult	All

<u>VARIABLES</u>	<u>RECREATION OPTIONS</u>				
	REALISTIC FICTION MOVIE ON CINEMA	HISTORY MUSEUM	VENUE FOR GENERAL CONSUMERS	HELICOPTER TRIP	KART RACING
Availability	All year	All year	Punctual	All year	All year
Content	Mixed	Real	Real	Real	Real
Duration	Moderate	Long	Very long	Short	Short
Educational level	Moderate	High	High	Moderate	Low
Ideal participants	Small	Small	Small	Small	Big

Mental Intensity	Low	Moderate	Low	Low	Low
Physical intensity	Sedentary	Low	Low	Sedentary	Low
Price	Low	Low	Low	Moderate	Low
Space	Local	Local	Local	Regional	Local
Target age	Ysadult	Ysadult	All	Ysadult	Yadult

Figure 23. Two tables showing the data that has been entered in the system for the demonstration in this part.

And this is the result the program outputted:

Source								
Compared to	Videogame - MP SHOOTER	Videogame - SP ROLEPLAYING	CASUAL BASKETBALL	CASUAL TENNIS	ABSTRACT PAINTING	REALISTIC FICTION MOVIE ON CINEMA	HISTORY MUSEUM	VENUE FOR GENERAL CONSUMERS
Videogame - MP SHOOTER	10	7	6	5	6	4		
Videogame - SP ROLEPLAYING	7	10	5	5	8	4		
CASUAL BASKETBALL	6	5	10	9	4	5		
CASUAL TENNIS	5	5	9	10	4	6		
ABSTRACT PAINTING	6	8	4	4	10	4		
REALISTIC FICTION MOVIE ON CINEMA	4	4	5	6	4	10		
HISTORY MUSEUM	2	3	4	5	2	5		
VENUE FOR GENERAL CONSUMERS	2	1	4	5	2	4		
HELICOPTER TRIP	4	2	3	4	2	6		
KART RACING	7	4	8	7	3	4		

Source					
Compared to	HISTORY MUSEUM	VENUE FOR GENERAL CONSUMERS	HELICOPTER TRIP	KART RACING	
Videogame - MP SHOOTER	2	2	4	7	
Videogame - SP ROLEPLAYING	3	1	2	4	
CASUAL BASKETBALL	4	4	3	8	
CASUAL TENNIS	5	5	4	7	
ABSTRACT PAINTING	2	2	2	3	
REALISTIC FICTION MOVIE ON CINEMA	5	4	6	4	
HISTORY MUSEUM	10	6	4	5	
VENUE FOR GENERAL CONSUMERS	6	10	3	5	
HELICOPTER TRIP	4	3	10	4	
KART RACING	5	5	4	10	

Figure 24. Graphical output of the system with the data of figure 23. It shows the similarities among all the recreation options evaluated.

As it can be observed from the previous data, similar options in real life are similar according to the system and different options are different too. The two videogames have 7 variables in common, the two sports have 9 and so on. Also, we can observe differences like comparing basketball with a visit to a history museum, or abstract painting against kart racing.

Different recreation options in real life are also different in the data, only approximately. In some cases, it could be some discrepancy with the results, arguing that one options should have more similarity with another because in real life they are fairly similar. But again, this system is approximate and its accuracy varies in every case.

9.1.6 Reasoning behind the variables

The inspiration for this system does not come out of thin air, it is original content based on real life investigations about leisure and the main characteristics shared by every recreation option.

The pursued goal that led to the creation the system was to represent the reality in a simplified way, just enough to observe differences between different recreation options and without overly complicated calculations.

To base the system on a scientific basis, studies that classify leisure options are needed. The search for those was done prior to create anything, but results were unsatisfactory. No specific and helpful classification system was found. The results were either too general or too specific, focused only on a type of recreation, like ski resorts.

Since the work focuses on comparing the VR project against a lot of types of recreation, a middle point was needed, and after some research and reflection, the system used in this work was created.

The scientific basis is primarily composed by the different articles cited in this work on various parts, one of the most important is the work by Meeras (2010) that created the following classification table of recreation options:

Category of activities	Examples
Taking place about the home	Watching television, reading, listening to music, gardening, do-it-yourself hobbies, exercise, leisure use of computers
Having a high social content	Entertaining, eating out, drinking in bars, party going, visiting friends and relatives
Cultural, educational and artistic interests	Visiting theatres, concerts, exhibitions, museums, attending non-vocational classes
Pursuit of sport, either as participants or spectators	Golf, football, swimming, tennis, bowls, darts, gymnastics
Informal outdoor recreation	Driving for pleasure, day excursions to seaside and countryside, walking, picnicking
Leisure tourism involving overnight stay	Longer distance travel, tours, weekend breaks, holidays and vacations

Figure 25. Table showing a classification system for recreation options.

The table exposes a very general way to classify all recreation options, it can be observed that driving for pleasure would be the same as an excursion to the mountain, which in real life they would be different in many ways. A system that delves deeper into differentiating different options is needed, therefore the system in this work has been created.

The inspiration from the previous table can be observed in the work's system. Like the table, it considers the space where it can be performed, the group size is very similar to the degree of social content and the educational level it is similar to "cultural, educational and artistic interests" variable.

The other variables used in the system try to express the reality in all types of recreation. Also, the intention is to differentiate them with the characteristics the customer could differentiate them in his mind. Variables such as the price, the duration or the space are basic characteristics that can be analysed from every recreation option and also the customer takes them into account when deciding what type of recreation he could choose this afternoon.

Other variables, like content physical and mental intensity, may seem arbitrary but they are not. On the first stages of the system's creation, fewer variables were analysed to compare recreation options and results were not close enough to the reality, they were too unspecific. It happened like the previous figure, where two seemingly different recreation in real life were very similar according to the system. Then, variables such as the mentioned before were introduced and differences started to show more accurately. They were chosen because every recreation option can be evaluated with them, following the system's rules, and also make different recreation options different in real life. For example, if drinking with friends and a basketball match are compared, they would appear pretty

similar with the first version of the system, with physical intensity variable added the difference intensifies and it is more corresponding with the reality.

To summarize, the system tries to reflect the real world in a simplified way but with enough detail to help with the goal of this work, establish the viability of the project according to the offer and demand point of view. But also it is worth noting that it is not a perfect way to compare recreation options and in some cases the results could not be corresponding with the reality.

9.2 Raw data used to find competitors

9.2.1 Theoretical data

<u>VARIABLES</u>	<u>RECREATION OPTIONS</u>				
	VR Project	VR Videogame - MP SHOOTER	Cyber VR	Paintball	Kart Racing
Availability	All year	All year	All year	All year	All year
Content	Fiction	Fiction	Fiction	Real	Real
Duration	Short	Short	Short	Short	Short
Educational level	Low	Low	Low	Low	Low
Ideal participants	Big	Big	Small	Big	Big
Mental Intensity	Low	Low	Low	Low	Low
Physical intensity	Intensive	Low	Moderate	Intensive	Low
Price	Low	High	Low	Low	Low
Space	National	Anywhere	Regional	Regional	Local
Target age	Yadult	Yadult	Yadult	Yadult	Yadult

Figure 26. Table showing the exact data entered into the system to calculate the theoretical graphical output. That is useful to determine a guide of which could be the real competitors of the project.

9.2.2 Adjusted data

<u>VARIABLES</u>	<u>RECREATION OPTIONS</u>				
	VR Project	VR Videogame - MP SHOOTER	Cyber VR	Paintball	Kart Racing
Availability	All year	All year	All year	All year	All year
Content	Fiction	Fiction	Fiction	Real	Real
Duration	Short	Short	Short	Short	Short
Educational level	Low	Low	Low	Low	Low
Ideal participants	Big	Big	Small	Big	Big
Mental Intensity	Low	Low	Low	Low	Low
Physical intensity	Moderate	Low	Low	Moderate	Intensive
Price	Low	High	Low	Low	Low
Space	National	Anywhere	Regional	Regional	Local

Target age	Cadult	Adult	Cadult	Cadult	Yadult
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Figure 27. Table showing the exact data entered into the system after adjusting the theoretical data in figure 26. This is to calculate the adjusted graphical output. That is useful to determine the real competitors of the project.

9.2.3 Differences between theoretical and adjusted data

<u>VARIABLES</u>	<u>RECREATION OPTIONS</u>				
	VR Project	VR Videogame - MP SHOOTER	Cyber VR	Paintball	Kart Racing
Availability	No change	No change	No change	No change	No change
Content	No change	No change	No change	No change	No change
Duration	No change	No change	No change	No change	No change
Educational level	No change	No change	No change	No change	No change
Ideal participants	No change	No change	No change	No change	No change
Mental Intensity	No change	No change	No change	No change	No change
Physical intensity	Different	No change	Different	Different	Different
Price	No change	No change	No change	No change	No change
Space	No change	No change	No change	No change	No change
Target age	Different	Different	Different	Different	No change

Figure 19. Table showing what variable values changed between the theoretical data and the adjusted data with the findings.

9.3 VRMax Centers promotional brochure

The following figures show the scanned digital image of a physical brochure of VRMax Centers



Figure 28. Scan of the front of the physical promotional brochure of VRMax Centers.



Figure 29. Scan of the back of the physical promotional brochure of VRMax Centers.

9.4 Questionnaire model

The questionnaire asked to different companies to guess what recreation option type they offer has different versions, each adapted to each recreation option. The questions expect the same answer and ask exactly the same, but the options and the examples to clarify it for the reader are different. For example, in paintball's questionnaire, the option of question 1 "karting" is not present, and vice versa, because they do not offer karting if they are a paintball company.

The questionnaire has the following questions for the paintball version, which serves as an example of every questionnaire. Note: The options with [] means that they are described, not literally written because it is not practical:

1. Offered services: Check the main activity that you offer.
 - a. Paintball
 - b. Airsoft
 - c. Laser Tag

- d. Other similar:
2. Availability: When the customer can consume the service? Is closed any time of the year?
 - a. Open all year.
 - b. Open only during some months, for example, during summer season.
 - c. Open only under specific days (for example, under reservation).
 3. Does the customer participate in any plot?: Are customers part of a history with a main plot or they only shoot each other plainly? For example, do they participate in a bank robbery or to free an important hostage, focusing on the plot?
 - a. Always
 - b. Never
 - c. Sometimes
 4. Match duration: Specify what is the duration of the match, not all the experience. Write down in minutes, hours or another convenient measure.
 - a. [Open answer]
 5. Is any content actively taught?: For example, do you teach clients about real military tactics or other instructive concepts?
 - a. [Scale from 1 to 5, being 1 'Nothing' and 5 'A lot']
 6. What is the ideal number of participants?: With how much people is the activity enjoyed at its best? Specify the number of persons.
 - a. [Open answer]
 7. In what degree is planning necessary for match? To enjoy the match at its bests do you think it is necessary for the customers to plan specifically and organise themselves as a team?
 - a. [Scale from 1 to 5, being 1 'Nothing' and 5 'Indispensable']
 8. What degree of physical effort is endured?
 - a. [Scale from 1 to 5, being 1 'Sedentary' and 5 'Intensive']

9. What is the price of one match?: How many euros the average customer has to spend to play, including ammunition, gear rental, etc.? If the experience is sold in packages or similar, try to specify the price, by dividing the price of the package with the matches it includes.
- a. [Open answer]
10. What is the point of origin of the customers?
- a. From Barcelonès
 - b. From Catalonia
 - c. From Spain
 - d. From abroad
11. To what age range is the activity orientated?: Specify the age in years.
- a. [Open answer]