CATÓLICA
ESCOLA DAS ARTES

PORTO

STUDY OF EMOTION IN VIDEOGAMES: UNDERSTANDING PRESENCE AND BEHAVIOUR

Dissertação apresentada à Universidade Católica Portuguesa
para obtenção do grau de Mestre em Som e Imagem

- Especialização em –
Animação por Computador

Jorge da Silva Antão

Porto, agosto 2021

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Trabalho efetuado sob a orientação de

Sahra Kunz

Porto, agosto 2021

Dedicatória

A vida é feita de memórias, umas a curto prazo, e outras a longo prazo. As mais fortes transportam-nos para um momento no passado. Lugares que já não existem. Uma experiência é um momento no tempo, onde uma ação, ou falta de ação, nos faz lembrar dela.

A todas as pessoas que já conheci e que fizeram de mim quem eu sou.

Dedication

Life is made of memories, some short-term, others long-term. Stronger ones transport us to a past moment in time. Places that no longer exist. An experience is a moment in time, where an action or lack of action, makes us remember it.

To all the people I have met, that made me who I am.

Agradecimentos

Gostaria de agradecer à minha professora orientadora, Sahra Kunz, por me ter guiado nos papéis e notas infinitos. Sem a sua orientação esta Dissertação não estaria feita.

Muito obrigado pelo apoio, ideias e motivação.

Agradeço também aos meus pais. Todas as oportunidades e caminhos que tive e vi foram graças a eles e às pessoas que são.

Acknowledgements

I would like to thank my supervising professor, Sahra Kunz, for guiding me in the infinite papers and notes. Without her orientation, this Dissertation would not be made.

Thank you for the support, ideas, and motivation.

I would also like to thank my parents. Every opportunity and path I had and saw was thanks to them and the persons they are.

Resumo

Só quando um videojogo é lançado é que o podemos analisar e rever. Atualmente, encontramos plataformas para partilhar a nossa opinião acerca de um videojogo, ou parte dele, em qualquer lado, com comentários positivos e negativos a serem partilhados diariamente. No entanto, o que é que faz um jogo ser visto como uma experiência positiva e quais são os componentes que satisfazem e envolvem jogadores?

Nesta Dissertação, pretendemos compreender como é que jogadores percecionam um videojogo e que emoções são despoletadas que os motiva a jogar. Iremos analisar diferentes conceitos que contribuem para o jogar de um videojogo. Começaremos por ver o que é a Interação e como é que o ser humano se comporta e age. Prosseguindo, iremos analisar o já bastante usado conceito de Imersão, e o seu desconhecido e menos reconhecido irmão, Presença. Daí iremos dividir o envolvimento com um videojogo em duas partes, no lado tecnológico, relacionado com interfaces naturais e mestria de controlos, e no lado de design e implementação de conteúdo, mais especificamente no conceito de Agência e a maneira como esta integra os jogadores no jogo.

Palavras-chave: Experiência de utilizador (UX), Game Design, Imersão, Presença, Interfaces Naturais, Agência, Vídeo Jogos

Abstract

Only when videogames are released are we able to look at them and analyse them. Nowadays, platforms to share our thoughts and opinions about a videogame, or part of it, are everywhere, with both positive and negative commentaries being shared daily. However, what makes a game be seen as a positive experience and what components satisfy and engage players in it?

In this Dissertation, we aim to comprehend how players perceive videogames and what motivates and triggers emotions one has during play. We will take a look at several different concepts that all work together when playing a videogame. We will start by understanding what Interaction is and how humans behave. Afterwards, we will better investigate the widely used topic of Immersion, and its unknown and unrecognized brother Presence. From there, we will divide involvement in game play in two parts, the technological side, which relates to natural interfaces and mastery of controls, and the side of design and implementation of content, more specifically the concept of Agency and how it plays a huge part in making players feel part of the game.

Key words: User Experience (UX), Game Design, Immersion, Presence, Natural Mapping, Interfaces, Agency, Videogames

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1. Introduction

Within the context of the Master's Degree in Sound and Image with specialization in Animation, I chose to write a dissertation on a videogame player's experience. To understand and comprehend how players look at and perceive videogames, is something that greatly interests me, as I work professionally in the area. Getting to know how players play a videogame is something crucial for the improved development of interactive experiences.

We can consider videogames an amalgamation of multiple media, from photography and cinema to new media art and its interactivity component. Animation is present between these media, containing characteristics from cinema, as well as from 2D drawing and 3D design. Having learned the several pre-production steps for the development of an animation project in the first year of this Masters, and the way it permits for a more stable and consistent development, I wanted to explore the same in the area of videogames.

Currently, the area of videogames is considered one of the biggest industries in the digital entertainment world, even surpassing the revenues of cinema and animation (Field Level Media, 2020). One of the reasons for this is the paralleled videogame development with technology advancements, such as more powerful and capable graphical technologies, and new progressive controllers (Skalski, Tamborini, *et al*., 2010, p. 225). Much like in animation, videogame development has a wide range of degrees of production, as it can be accomplished by both hobbyists or small indie teams, or with teams over 500 people and large budgets. Whichever the case may be, pre-production is an essential process so that risks can be diminished, and productivity raised. What we intend with this dissertation is to develop a theoretical model that can be used for the pre-production of videogames. However, it is not pre-production in its traditional sense of tasks, deadlines, and schedules, but one that reflects on the desired player experience.

Therefore, we will touch on concepts of engagement and immersion, driven by the question of **what makes an interactive experience something truly fun and engaging, and therefore, meaningful?**

To answer this question, we will have to approach not only areas of game design, but also of interaction, perception, and psychology. We will try to understand how we, as humans, act and perform in response to the diverse situations of our everyday lives and see how these actions are transferred to videogame play. We will consider the different emotions and sensations an interactive virtual experience can produce, such as those of triumph, freedom, excitement, or fear, and

frustration. Different videogames, played by different players, will be perceived as distinct experiences, and we aim to know why.

Additionally, unlike with a linear film, when engaging with a videogame we can make choices. These choices will be based on our understanding of real-world logic, alongside with our relationship with the virtual world of the game (Carson, 2000, p. 1). When playing a videogame, we expect to be someone else, to do something we are usually not able to and to experience something which is not possible in everyday life. As a result, videogame developers have been focusing increasingly on how to create more engaging experiences. But how can this be achieved?

One of the ways is through immersion, or as psychologists call it: "spatial presence" (Madigan, 2016, p. 120). But then again, how can you make the player feel this presence? With better technology and superior tools? Improved controllers and control schemes fit for what we are playing? It is true that certain hardware is great for creating presence (or better at not breaking it), as we do not reflect about the technology between us and the virtual world (Madigan, 2016, p. 134). Virtual reality is a great example of this: we can be dropped into a virtual empty room and feel spatially present, but as soon as we try to walk, the experience tells us that we are outside the play area and we remember what we are seeing is not real – we notice the technology between us and the game, and presence (or immersion) is broken.

Almost any element of a game can break immersion if poorly implemented – its graphics can make us question what we are seeing, if they fall into the Uncanny Valley; some design decisions may be unappealing and, at times, the narrative of the game can be so inconsistent that we just lose motivation to play. Artworks fall apart when inconsistencies come up and make the audience question what they are experiencing, be it in a book, a film, or a videogame. It is about creating something relatable and believable, which remains consistent throughout its entirety – much like the opposite of metalepses in cartoon animation.

French literary theorist Gérard Genette shows how a narrative structure is something complex, based on different layers. Additionally, each one of these layers contain its own components, more specifically their worlds, their limits, and their transgressions. A metalepsis is defined as "the passage from one narrative level to another"[1]. In other words, a metalepsis occurs when two distinct narrative worlds, for example the world of the narrator and the world of the character, merge momentarily into one. If, for instance, the main character of a story acknowledges the existence of

[1] "Le passage d'un niveau narratif à l'autre" (Genette, 1972, p. 243)

a non-diegetic narrator, then their distinct worlds will become one, and the audience's initial understanding is shifted. It functions as an expectation breaker, and (Ryan, 2005, p. 207) classifies it as a logically forbidden passage, due to the association of logics coming from different worlds. The breaking of the fourth wall is considered a metalepsis.

In the silent animated short film Feline Folies (Pat Sullivan, 1919) we experience a metalepsis when Felix and its friend dance and play music but end up building a vehicle with the musical notes shown on screen. In 1919, date when the film premiered, it was common to see visual suggestions on screen, so that the audience could better understand what was happening. In this case, the visual notes simply served as a cue for the audience to know that music was being played. However, when Felix and the other cat acknowledge and grab these notes to build a car, the barrier between the fictional world and the narrative world is broken, breaking audience's expectation and, in this case, generating laughter.

Figure 1 - Felix and its friends grabbing the musical notes

The Stanley Parable (Galactic Cafe, 2011) is a great illustration of metalepses in videogames. In this game, the narrator guides the player through the world. However, players are not forced to follow his commands. If at certain moments they do the opposite of what the narrator is saying, he will acknowledge it and even talk to the player directly. This connects the player's and the narrator's world, breaking expectations, and the initial understanding of the game, as the narrator was comprehended as an external element. Metalepses work on the foundation of making audiences question what they are experiencing, and when aiming to create immersion this must be avoided at all times. Consistency and coherence are key for players' understanding of the game world to remain intact.

The goal of this dissertation will be to understand the numerous ways an audience responds to a videogame. Videogames have become a powerful media for telling stories and delivering messages, and by understanding player's motivations behind action and behaviour, we will be able to create more fun and engaging experiences. Different types of players react differently to the same events in a videogame, so we should understand what actions our design decisions will trigger. We might want a player to feel excited for being in a huge and intricate world, which pushes him to explore, but if the player is not the explorer type, he might feel bored or overwhelmed. Based on John Creswell's book "Research Design", we will be taking a constructivist methodology towards our study. This world view supports that each person has his own subjective interpretation towards an event, therefore, we will start by studying already existent theory around the subject of interaction in videogames, as well as intrinsic motivation, with the objective of learning how to better develop interactive experiences.

Despite being presented as a theoretical model for pre-production, we believe that this may also serve as a tool for analysing and reviewing already launched videogame titles, as the intended study will enable us of looking at videogames in a newer and different way. For this reason, we will conclude the dissertation by applying the accomplished research on a case study, more specifically the videogame Celeste (Extremely OK Games, 2018), and see what makes it the experience it is.

Celeste (Extremely OK Games, 2018) is a 2D platformer with precise and easy to learn controls, and features a series of platforming challenges, divided into chapters. It contains a simple yet strong narrative that is communicated very deeply through the challenging gameplay. In its entirety, the game generates feelings of challenge, frustration, empowerment, and accomplishment, creating a memorable experience which we cannot help but admire.

2. Interaction, experiences, and videogames

(Defleur, Kearney *et al.*, 1997) and (Jensen, 1998, p. 188) defined, in a sociological approach, interactivity as a relation between "two or more people who, in a given situation, mutually adapt their behavior and actions to each other." However, interactivity nowadays is always connected to human-computer interfaces (HCI), and the definition given by (Defleur, Kearney *, et al.*, 1997) and (Jensen, 1998) does not mention anything about it. The concept of interactivity is present in many areas of our everyday lives and trying to define it in all its possible contexts can become very difficult and complex. So, we shall be referring to it in a human-computer interaction setting, within the world of digital media.

(Rafaeli & Sudweeks, 1997) fit it into the context of media communication with a similar description to the one above: "The extent to which messages in a sequence relate to each other, (…) especially the extent to which later messages recount the relatedness of earlier messages".

We can understand how **interactivity is a concept that relates to exchange**, where a transmission is influenced by the one before it and will, in the same way, affect a new one down the line. We believe that this is a key feature of interactivity. We can characterize an interactive piece as something not static which requires something else to communicate with, in order to continue functioning. Take as an example visiting a clothing web shop. For it to be useful, it requires some sort of input, something that tells it what to present. We open the website looking for a particular item, so we hover our mouse over the tab which takes us to that item. We can understand how the website, without someone to communicate with, is ineffective, as it would remain stuck on the home page with no use whatsoever. Interactivity is to be distinguished from other traditional media because of this. If we leave a film playing in an empty room, it will not make any difference to the medium and delivered experience whatsoever. It will keep playing until it reaches the end and stops. Whether there is an audience or not, what is shown will be always the same. Interactive media does not work this way. If there is no one to communicate with, the website does not progress. The same applies to videogames[2]. Additionally, there is no predetermined end point to the experience. We can

[2] In video games leaving a character idling in the middle of the street can cause it to be run over, but we want to keep things simple, despite it raising many good questions for discussion. How independent can interactive pieces be, for them not be considered interactive, by our definition? We can always design an experience in a way it changes over time, but as we want to discuss users' interactive experiences, we shall focus on the interaction side of things.

leave and return to the web page whenever we feel like it, at our own pace. This makes interactive media capable of delivering different experiences every time they are used.

Interactivity is something which allows for the participation and control of a mediated environment's content, in real time (Steuer, 1992, p. 84) Videogames are part of this world: Spacewar! (MIT, 1962), Pong (Atari, 1972), Space Invaders (Taito Corporation, 1978), Tetris (Alexey Pajitnov & Vladimir Pokhilko, 1984), Myst (Cyan, 1993), Gran Turismo (Polys Entertainment, 1997), Fallout (Black Isle Studios, 1997), Half-Life (Valve Corporation, 1998), Halo: Combat Evolved (Bungie, 2001), Forza Horizon (Playground Games & Turn 10 Studios, 2012), The Last of Us (Naughty Dog, 2013), Titanfall (Respawn Entertainment, 2014), and everything after and in between. Videogames are interactive virtual experiences.

A videogame, in the same way as non-interactive media, such as cinema and literature, has a start and end point. However, when we watch a film or read a book, we know that in fact it has a certain duration. The Lord of the Rings film trilogy (Peter Jackson, 2001, 2002, 2003) is 3 hours and 48 minutes long, Shrek (Andrew Adamson & Vicky Jenson, 2001) lasts for 1 hour and 35 minutes. A book will always have the same number of pages. When playing a videogame, we can situate ourselves in the narrative and therefore know how far deep into the game we are, in terms of medium length time, however there is no fixed time for the experience. For some, a playthrough may take a few hours, while for others it can last days or weeks in total play time.

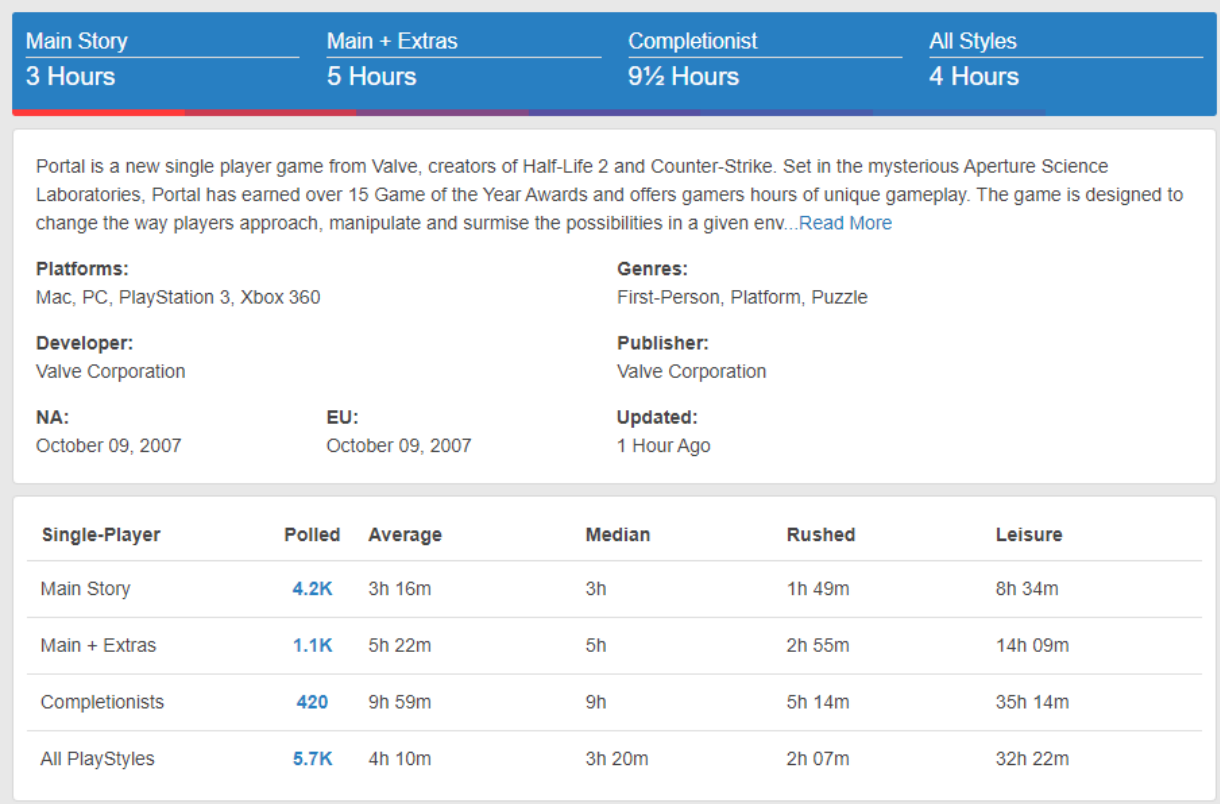

Figure 2 - How long does it take to beat Portal (Valve, 2007) from https://howlongtobeat.com , consulted February 11th 2021

In the image above we see several statistics gathered by the platform howlongtobeat.com, which breaks down and estimates how long does it takes for one to complete a game, in this case Portal (Valve, 2007). They provide an average time for several categories, that match multiple playstyles. *Main story* is made up of the main objectives, "just enough to see the credits roll." *Main + extras* include the story, but also side quests and other optional content. *Completionist* is for those that, in addition to completing the game's story and all its side quests, explore and collect everything that the game has to offer, from collectibles and unlockables to achievements and medals. The *All PlayStyles* category gives an average of all the categories.

Some players may want to finish the game as fast as possible, as in the case of speedrunners[3], while others may want to find every little secret and point of interest. Even two similar types of people playing, will most definitely, have different lengths of play. One may take a detour and go explore an interesting corridor, while another can get stuck in a fight with a boss, blocking any type

[3] "Speedrunning is the act of playing a video game with the intent of completing it as fast as possible, for the purposes of entertainment and / or competition" from https://www.speedrun.com/knowledgebase/about consulted June 3rd, 2021

of progress within the game. For now, we will not think about different types of players, as it would make our study more difficult. We will consider a standard videogame player, familiarized with traditional interfaces such as the mouse and keyboard, and gamepad, as well as most videogame genres.

Videogames allow for participation and control within the mediated environment, and therefore do not have a predefined ending. We are the ones who move the experience forward, as we act and play. Therefore, this theoretical research, will not be focused on the narrative portion of the video gaming world. Although usually accompanied by a narrative[4], we will be directing our research mostly towards the interactions generated by videogames, and towards what makes an interactive experience something fun, engaging, and truly meaningful, even before we start immersing ourselves in its narrative. We will consider the narrative part of videogames only as an instrument capable of contextualizing mechanics into a believable world, suitable for creating immersion.

(Hunicke, LeBlanc *et al.*, 2004) connect game development and game design with game criticism and scientific research on videogames, with the "MDA Framework", which stands for Mechanics, Dynamics and Aesthetics. It aims to clear and express the iterative processes of development, and simplify the study and design of videogames, from a scientific research standpoint.

Iteration is crucial in videogame development, as the medium's interactivity is a cause for complex and rather unpredictable behaviour. Therefore, designers and researchers need to take all systems and possible outcomes into account in order to create the desired experience. A game is a "consumable good", "purchased, used and eventually cast away", created by designers and consumed by players. However, they differ from other entertainment media because of their interactive and unpredictable nature (Hunicke, LeBlanc *et al.*, 2004, pp. 1-2). When a videogame is made, one does not know the reception it will have, as many of its aspects influence players' intake of the experience – recent AAA games such as The Last of Us Part II (Naughty Dog, 2020) and Cyberpunk 2077 (CD Projekt Red) are very straightforward examples of this. The games did not meet certain players' expectations or had technical faults; therefore, their reception was not the best.

However, before we dive deeper into the breakdown of a videogame within the MDA Framework, we must understand how videogame worlds are perceived (Swink, 2009).

[4] Games ranging from the Uncharted series (Naughty Dog, 2007 – 2017), Halo: Combat Evolved (Bungie, 2001), The Stanley Parable (Galactic Cafe, 2011) to walking simulators, such as Dear Esther (The Chinese Room, 2012) and Gone Home (Fullbright Company, 2013), make use of narrative elements in the environment.

2.1. Perception and action

According to Steuer, interactivity is based on the participation and control of a mediated environment's content in real time (Steuer, 1992, p. 84), but what does real time mean?

In the context of videogames, (Swink, 2009, p. 35) defines real-time control as "the uninterrupted flow of command from player to game resulting in precise, continuous control over a moving avatar." It can be considered a type of interactivity and so, requires at least two participants for an exchange to happen. In our analysis they are the player and the computer[5]. As we can understand, real-time communication between player and computer is the last thing we want to be lagging and drawn-out. When in real-time, the user must always have a responsive feeling of control, and never feel like his input is out of sync with the experience (Swink, 2009, p. 35). However, if we are driving a car on a rainy day and suddenly accelerate in the middle of a curve and turn the steering wheel more than normal, it is very likely that we will lose control of the car. It would be an expected outcome of the action, triggered by ourselves while having real-time control. (Swink, 2009, p. 47) mentions playing Street Fighter II (Capcom, 1991) with Zangief, a big and heavy character, which has certain attacks that break responsiveness. However, he stresses how this "loss of control is ignorable", because the player chooses when to trigger the move, becoming a "risk-reward trade-off rather than a disruption". It fits in the context of the videogame, along with the type of character. The player knows that he will be unable to move for a small amount of time, but that it will be worth it, he just needs to pick the perfect opportunity to do it. This to say that "real-time control can be broken without interrupting the player's feeling of being in control." (Swink, 2009, p. 47)

(Swink, 2009, pp. 10-13) illustrates the action of driving a car, where communication between the vehicle and its driver is constant, requiring continuous input from the driver. It is essentially an instantaneous process where the driver acts based upon what he sees, hears, and feels. Driver and car become extensions of one another as uninterrupted and precise continuous control is required to keep the car moving safely. Interactivity as a whole, is a loop comprised of two parts: the user/player and the computer, which keep communicating with one another over time.

[5] PC, smartphones, home consoles like the Xbox (Microsoft, 2001-present) and PlayStation (Sony Interactive Entertainment, 1994-present), etc... are all computers

We as humans act based upon the things we sense, after reflecting on them. If we see a glass of water at the edge of a table, we will move it to a safer place, farther away from the edge. This action is based on experience and our human ability of prediction. Players in videogames act the same way (Sayin, 2014). A player perceives the state of the game through his senses, reflects on them and then acts based on his built-in understanding. These three processes of sensing, thinking, and acting can be labelled Perception, Cognition and Action respectively (Card, Moran *et al.*, 1986), and although processed separately, they make up the way we as humans behave and experience things.

> "Sights and sounds, feelings and thoughts, motives and actions, all closely knitted together and stored in memory, labelled, relived and communicated to others. Experiencing is the stream of feelings and thoughts we have while being conscious—a continuous commentary on the current state of affairs." (Hassenzahl, 2010, p. 1)

(Hassenzahl, 2010, p. 1) defines an experience as "an episode, a chunk of time" which we go through and remember, made possible through technology and objects. Not technology as something related to tech, but as in technical, "relating to the knowledge and methods of a particular subject or job" (Cambridge Dictionary, n.d.).

(Hassenzahl, 2010, pp. 1-2) remembers a special meal he had at a restaurant, made possible by technology. The room, with its furniture, lighting, and atmosphere. The kitchen, the waiters, and other people, the food, and drinks, even the money and the cash register. All these objects composed together make up the experience of the special meal he had. The kitchen and employees allow for the food to be prepared and served, the room with all its furniture and lights makes the act of eating possible, and the money made it a possibility, as payment was required for the service. What this means is that the technology behind all the experiences we have is not thought of very often. However, that is reasonable, as an experience is rarely about technology, but about what the technology enables and creates. **An experience is a set of particular feelings, thoughts and actions tied to a particular place and time.**

(Russell, 2003, pp. 164-165) refers that [emotional] experiences are a narrative construction built on self-perception, fitted in a certain category inside a person's general knowledge. They come as narratives contextualized with our knowledge of the world, composed of many different layers and processes. We can understand how emotion is at the heart of experiences, as it is exactly what is generated by them and allow for their categorization (McCarthy & Wright, 2004, p. 83). Even so, we must not discard the fact that experiences, before generating emotion, require perception and

action, or in simpler terms, can be characterised in, “knowing, doing and feeling” (Overbeeke, Djajadiningrat *et al.*, 2000, p. 1).

Experiences start with perception. American psychologist J. J. Gibson helps us in understanding this concept by identifying *perceptual systems* as active systems which work together towards gathering and analysing information and stimuli (Gibson, 1966, p. 47). Although almost the same as the five senses we learn in elementary school, (Gibson, 1966) makes note that perceptual systems are to be distinguished from these five traditional senses, as it is different to refer to them as something which **informs** us of what we are experiencing and to refer to them as something that helps us understand how we **feel** about what we are experiencing (Gibson, 1966, p. 47). We can be walking near the river at sunset and the smell of water brings to memory a day in the past which can make us feel happy or sad. Either way, the sense of smell informs us of the current smell that is in the air, but it is the perceptual system that sparks emotion. So, perceptual systems are to be considered instruments capable of qualifying experiences. They are: the *orienting system*, the *auditory system*, the *haptic system*, the *taste-smell system* and the *visual system* (Gibson, 1966, p. 51).

The orienting system allows us to balance ourselves and understand acceleration forces, as well as letting us move and orientate in space. Therefore, it provides a basis for all other systems, by giving them a frame of reference. In a bumpy car ride, we know that it is bumpy mostly because we feel the various forces pushing us around. The haptic system may be giving us an interrupted sense of touch as we lift on and off from the seat and our visual system shows us that the road ahead is not the best, but it is the orienting system which informs us of what is currently happening. A clear image of the orienting system in action is a rollercoaster ride.

The visual system allows for the visualization of anything which is illuminated. (Gibson, 1966) underlines how the eyes are not to be deemed as a “pair of cameras”, but as something capable of detecting shapes, silhouettes, textures, and colours.

The auditory system is activated when vibrations through the air reach our ear drum and are transformed into electrochemical impulses that our brain transforms into what we experience as sound. The system allows the positioning of sound sources in 3D space, as well as the distinction between noises and language (Scott, 2019). The auditory system gives us information about things we may not be feeling, seeing, tasting nor smelling.

The haptic system allows us to physically feel, from light and hard touches on the skin, to the temperature, weight, and texture of objects.

The taste-smell system permits, as expected, the process of tasting and smelling. The haptic system also cooperates with the act of tasting, as the tongue and rest of mouth feel the food (Gibson, 1966, p. 53).

Human behaviour is always coupled with emotions, good or bad. They are the ones which qualify an experience, and make it something memorable, both for positive and negative ones (Carver & Scheier, 1998, p. 120). The perceptual systems all work together to provide us an interpretation of what we are experiencing, by translating external *stimuli* into information we can understand (Gibson, 1966, p. 54). Design for interactivity should begin with the desired emotional experience of the user. If we think about what we want the user to feel, it will guide us on the development of the interactivity set pieces. If frustration is what we seek in our experience, then making a non-intuitive and unresponsive user interface (UI) is a great way of achieving that feeling.

Feelings are at the core of the experience, and they are what move us towards action. Therefore, when designing interactive experiences, the desired emotional experience of the user should be thought of first, before moving towards layouts and more technical developments.

(Hassenzahl, 2010) provides a simplified three level goal hierarchy breakdown of Human-Computer Interaction (HCI), also referred to as User Experience (UX) (Hassenzahl & Tractinsky, 2006, p. 91) (Zagalo, 2019, p. 59). This breakdown permits the understanding of actions in relation to the world around them, regardless of medium, and shows how actions in a chain can originate memorable experiences.

User experience can be understood as goal-directed behaviour (Norman, 2013, p. 37). (Hassenzahl, 2010) gives three types of goals, each one with a higher hierarchical value than the one below it. At the top of the hierarchy, closer to the emotional side of interactivity and the highest value, sit *be-goals*. Below we have *do-goals*, and at the lowest level, we have *motor-goals*, characterized as the actions required to achieve the final major goal. Let us start by looking into *do-goals* at the middle of the hierarchy, from where we will have a means for observing the other types of goals.

A *do-goal* is related to something objective and precise and is represented as the final desired action of the user. Opening a refrigerator door, reading a book, or calling someone are examples of *do-goals*. They are semi-dependent on technology, as most of them are brought by it. Without the invention of the refrigerator, there would be no refrigerator door to open. The same applies to the book and smartphone. As *do-goals* refer only to the final action users aim to accomplish, we can

understand how they lie at the middle of the hierarchy. They answer to the question “What?”, as in “what needs to be done to reach the desired goal?”

From here we can jump onto *motor-goals*, which simply provide an answer on how *do-goals* can be achieved. In the case of the refrigerator and book there are not many options, as they can be broken down into simply grabbing the object gently and pulling it, but in the case of the phone call, one can make several options. The call can be made through a house phone, a smartphone, or an online application, such as WhatsApp or Telegram; And finally, will we use the speaker phone or a microphone? Each one of these approaches have their own procedures for reaching the desired objective. Through what menus do we need to pass to get the phone call going? Should we scroll through the contact list or use speed dial?

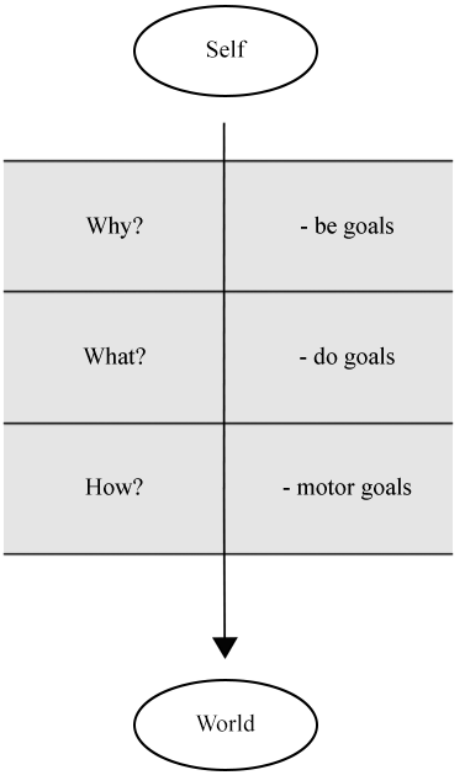

Figure 3 - (Hassenzahl, 2010) three level hierarchy of goals

These actions all stem from a broader and stronger type of objective, a *be-goal*. We went to the refrigerator because we were hungry, we opened the book because we were curious about its cover, we made the phone call because we were bored. *Be-goals* lie behind actions and are the reason for their existence. They answer the question of “Why?”, as in why we are performing a certain action.

Moreover, "*be-goal*s motivate action and provide it with meaning." (Hassenzahl, 2010, p. 13) Opening the refrigerator or the book is not something memorable and relevant, but driven by a greater goal – hunger, curiosity, boredom – they become meaningful. A savoury snack, a great read, a lovely conservation. **We can say that we work based on goals and that these goals initiate actions.**

The design of interactive products is no longer solely about actions relative to an end, but also about the significance of the experience and the user's emotional state. (Zagalo, 2019, p. 59). Therefore, interactivity design should start with the reflection of the desired experience of the user, ahead of the product (Overbeeke, Djajadiningrat *et al.*, 2000, p. 3; Hassenzahl, 2010, pp. 2-3; Zagalo, 2019, p. 60).

Let us say we are on the beach playing football and feel thirsty. We stop playing and walk towards our backpack which we packed with a bottle of water, exactly for this moment. We open the bag and find that the bottle is empty. Oh, that is right, we already drank everything. So, we grab our wallet from the bag and walk to the nearest café and buy a bottle of water. We open and drink it.

We had a goal and came up with a plan to fulfil it. We were able to tell that the bottle was empty, so these circumstances forced us to alter our plan, but everything turned out well, as the café sold water and we had the money to buy it.

As action took place, emotions were felt, even if not conscious or very strong. These emotions led to other actions, which *per se* generated more emotions (Norman, 2013, p. 37). The *be-goal* "I am thirsty" gave us the *do-goal* of getting our bottle of water, which we managed to do, by walking to the backpack, picking it up, and grabbing the bottle inside it. This illustrates how we do things. An event generates us a goal and through perception and cognition, we find the best way to solve it, most of the time subconsciously and instantaneously. As (Norman, 2013) shows, when using something, we oscillate between two states, or "gulfs" as he names them: Execution and Evaluation.

When in the Gulf of Execution, we try to understand how the *thing* works and operates, and then act. In the Gulf of Evaluation we see if the actions we did went according to plan and worked (Norman, 2013, p. 38).

In our beach example, our thirst put us in the execution state that led us to the bottle of water. The moment we felt and saw the empty bottle, we switched to the evaluation state. The bottle is empty. Why is the bottle empty? We drank it all. But I am thirsty, what can I do? Look for a fountain, borrow from someone, or buy more. And from here we go back to the execution state and repeat the loop until the goal is achieved.

Through perception we understand the world we are in. Consequently, reflection occurs, generating actions and goals. From here, the loop repeats.

Perception occurs during what (Norman, 2013, p. 39) defined as the evaluation state. We receive feedback through our perceptual systems and with our existing mental model of the situation, we evaluate the amount of work and effort required to reach the goal. We can take as an example the action of trying to close a stubborn window, which fits in the frame but refuses to lock itself in place. We push and twist the knob and feel it fitting correctly to its place, but as we let go, we see, feel, and hear it still opening. Only when we give it that special nudge and feel it click, are we satisfied. Our understanding of windows, stubbornness, and nudges, along with the feedback the window transmits, allows us to complete our goal.

It is in the Gulf of Evaluation where we interpret the current state of the situation and conclude if the built expectations are met. The Gulf can be considered to be small when "the device provides information about its state in a form that is easy to get, is easy to interpret and matches the way the person thinks about the system." (Norman, 2013, p. 39). So, clear and expected design, manages to bridge the gap between the two gulfs more easily, and allows things to work more naturally and intuitively. In the case of the stubborn window, everything was going well until the point where it refused to lock into place. The push and twist of the knob was something we could interpret naturally, but if we were not familiarized with the "special touch" the window required, we would have failed to reach our goal of closing the window. We will return to this topic when discussing natural mapping and intuitive controls.

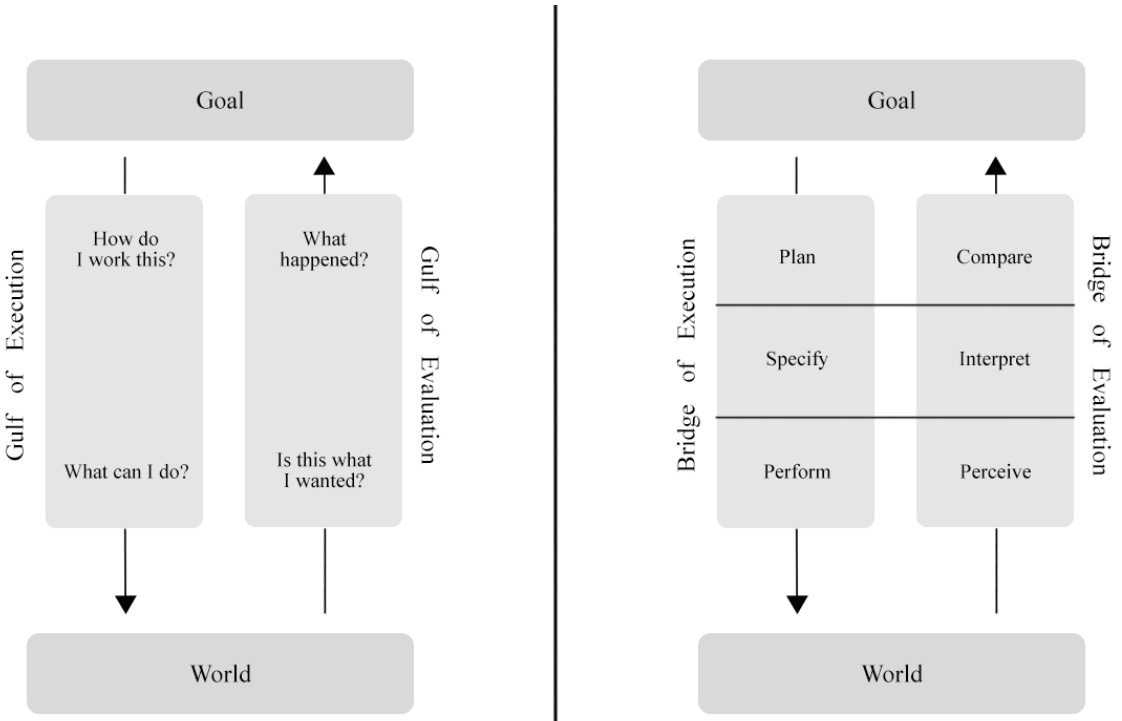

Figure 4 - The Gulfs of Execution and Evaluation (Norman, 2013, p. 39) and the Seven stages of the Action Cycle (Norman, 2013, p. 40)

Actions are split in what the gulfs mean: execution and evaluation, and both affect us emotionally. Actions arise from a goal, and pass from an execution stage to an evaluation stage, which ends with the comparison of the result and the intended goal. This cycle, although simply structured, is a "useful framework for understanding human action" (Norman, 2013, p. 40).

We process what we are experiencing while jumping between the gulfs of execution and evaluation, based upon *stimuli* felt through our perceptual systems and support from our constructed model of objective reality, built from past experiences, learned skills, ideas, thoughts, concepts, fantasies, generalizations, and misconceptions. When we cannot fit what we sense into any of our mental models, then we reflect on it consciously, trying to understand it. This reflection can be both a delightful process as well as a hectic and nervous one (Swink, 2009, p. 61).

Through the auditory and visual system, we see a vehicle rapidly looming in our direction, so we stop walking instead of advancing towards the cross walk. Only when we feel it is safe to cross, do we continue. Our perception and understanding of the world trigger action.

We play videogames the same way. *Stimuli* from the game world reach us through audio, visuals, haptic feedback, and any other sensation capable of being transmitted through technology (Swink, 2009, p. 36).

This feedback is what makes up the mental model of the game world and how it operates. We start learning its rules and functions and extrapolate an understanding of it. If when we jump, we fall back, we know that the game world has gravity. If when we hit a block with our head and a mushroom pops out of it and makes us bigger, we know that these blocks have rewards to offer. Through perception, cognition, and action in the game world, we start building expectations, that is, we will start acting in a determined way, because we already have an idea of what the outcome will be. As (Swink, 2009, pp. 61-62) affirms, "simple interactions yield a wealth of knowledge: generalizations, ideas, concepts and misconceptions about the nature of the world."

(Swink, 2009) provides an image that shows the process of interactivity in a player and game interaction.

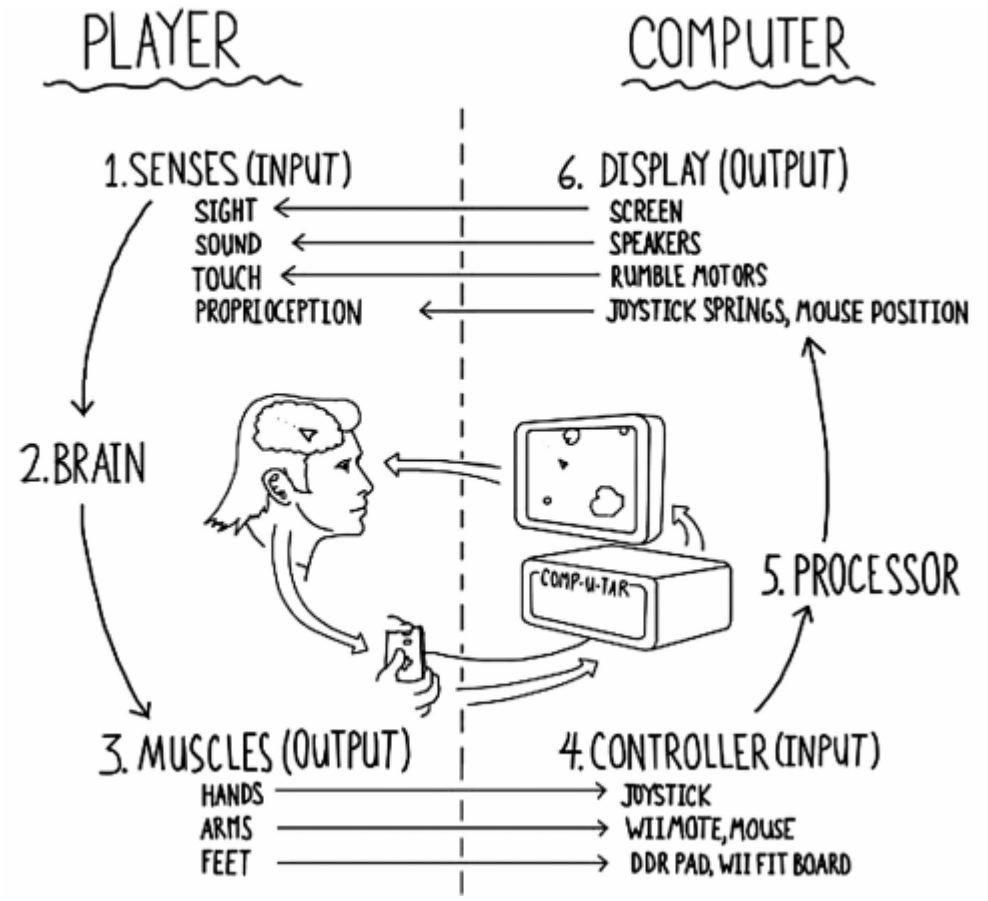

Figure 5 - "Interactivity in detail" (Swink, 2009, p. 36)

We see how the player starts by sensing the world through his perceptual systems, reflects on them consciously or unconsciously and then acts. Through the controller interface, the computer receives the input the player fed it and makes the game process it. When playing Super Mario Bros. (Nintendo Entertainment Analysis & Development, 1985), if the player presses the jump button, the

computer will make Mario jump. Additionally, if the player jumps under a yellow block, the computer will not only make Mario jump, but also will make a pickup pop out of the block. We are aware of these in-game reactions through the computer's output, that comes to us through the screen, the speakers and haptic feedback of the controller. From here, the loop repeats. We sense the computer's output and keep acting based upon it. To note that this is an ongoing continuous loop, where the human part is about 240ms per cycle. This to say that this is a very rapid process, which we are never aware of (Swink, 2009, p. 36).

2.2. Game design

Now that we have a basic comprehension of how videogame worlds are perceived, and how users act in a human computer interaction setting, we can start breaking down what a videogame really is and see what types of experiences they bring. We understand that games, just like films, music, and books, can fit into genres. Platformers, shooters, horror, role-playing games (RPG's), roguelikes, and management, amongst many others. Each one of these genres, and even different games within the same genre, will evoke different emotions in the player. That is because every videogame has its own unique way of working[6].

Platformers require players to run, jump, and climb in order to get to their objective.

Shooters usually include action, and make players defeat enemies using mostly long-range weapons. They may be one of the most controversial videogame genres, due to their violent nature.

Horror games can offer varied gameplay, but focus on generating fear on the player, creating cycling waves of tension and release.

Role-playing games provide fictional worlds for players to take the role of a character. They come accompanied with branching narratives, rule systems, and decision making.

Roguelikes make use of procedural generation and permadeath and demand that players train and get skilled in order to pass it.

Management games, as the name suggests, get players to manage and develop a particular project, along with resource management.

Design methods are what drive thinking processes and aid in the production of quality work. This means that everything is created with some design behind it (Hunicke, LeBlanc *et al.*, 2004, p. 1). During the development process, from the developers' point of view, analyses are made in order to certify the best possible quality in the artwork, resulting in an iterative process, from the beginning of development until the end. As interactivity and videogames generate unpredictable behaviour, iteration is something both unavoidable and necessary (Hunicke, LeBlanc *et al.*, 2004, p. 2). Game designer Liz England has a great description for how developers and players interpret one same situation. She shares how each member of a game development team deals with doors and ends it with the player's side. She calls it "The Door Problem", and it came up as an explanation to what

[6] And depending from player to player as well, which we will see when discussing (Bartle, 1996)'s player types

game design really is. Firstly, (England, 2014) shares all the questions that game designers raise when a door is needed in a game:

- Can the player open it? Can he open every single door in the game? Can doors be locked and unlocked? How will the player be able to distinguish a door that is locked and can be opened, from one that can never do that?

These are just a few questions from a sizable list she presents. Later, she gives us the interpretation of developers outside the role of game design:

- The creative director asks for doors in the game and the designer writes a document breaking down the doors. The environment artist makes the door and places it in game, the lighting artist illuminates it, the sound designer gets the door to make noise as it opens and closes.

As before, these are just some of the tasks game developers have. However, after sharing each developer's preoccupation towards the door, she gives us the interpretation that the player has of the door, which is: "I totally didn't even notice a door there." (England, 2014)

Players' behaviour can be very erratic and dynamic, even seeming random at times. As a result, to construct the best possible experience, all options and outcomes must be considered (Hunicke, LeBlanc *et al.*, 2004, p. 1).

The MDA Framework – standing for Mechanics, Dynamics, and Aesthetics – is a methodology towards understanding videogames. It attempts to connect game design and development with criticism/journalism and research. It aims to "clarify and strengthen the iterative processes of developers, scholars and researchers alike" (Hunicke, LeBlanc *et al.*, 2004, p. 1).

Game development stands as a *mishmash* of several creative and scientific areas – when building a videogame, either alone or in a team, we will most definitely need to consider questions from outside our area, in order to build the best possible experience. So, overall, how is the desired user experience built and iterated on?

When all game systems come together as one consistent whole, coherence is key, as well as a "fluent motion from systems and code, to content and play experience, and back." (Hunicke, LeBlanc *et al.*, 2004, p. 2) Traveling between all these layers of development is something required to break down, comprehend, and create this coherence. The MDA Framework separates videogames into 3 components, based on their consumption and resulting experience. **Rules lead to a system which creates fun**. Subsequently, these three parts have corresponding design elements, respectively. *Mechanics*, *dynamics,* and *aesthetics*. (Hunicke, LeBlanc *et al.*, 2004, p. 2)

Mechanics can be considered something specific to the game, defined in its code and engine. Dynamics are what mechanics allow for, being described as the behaviour generated from the loop between player's inputs and game's outputs. Lastly, we have aesthetics, the emotional responses felt by the player caused by interacting with the experience.

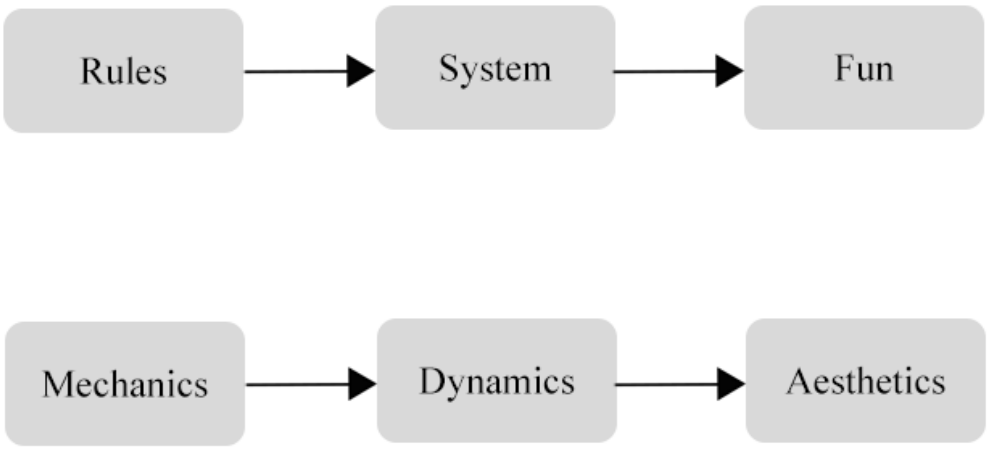

Figure 6 - MDA Framework (Hunicke, LeBlanc *et al.*, 2004, p.2)

(Hunicke, LeBlanc *et al.*, 2004) stress that the MDA framework takes games as artifacts, rather than as media. This because what defines the content of the game is the behaviour and experience produced, rather than the media content the player receives. This allows us to comprehend games' systems and how they are interacted with.

The framework can be seen from two sides: the player's side and the designers' side. For players, the flow of the framework starts straight away from the aesthetics side. Emotional responses are generated from the first moment players lay their perceptual systems on the artwork, mainly based on what they see and hear. Right afterwards, they begin being moved by the dynamics and mechanics. Of course, this "later" moment is very relative and quick, capable of being considered at the same time (Hunicke, LeBlanc *et al.*, 2004, p. 2). As (Swink, 2009, p. 36) mentions, the minimum time it takes for a player to perceive the game world, reflect on it and finally act is around 240ms, so we understand how discussing what comes first is something more theoretical. Nevertheless, it is important to know this, because in the long run, players do not care about the mechanics. They care about how the mechanics make them feel. They act inside the game world based on the aesthetics the available mechanics evoke on them. If jumping feels good, they will keep doing it, not because of the mechanic in itself, but because of what it emotionally evokes in them.

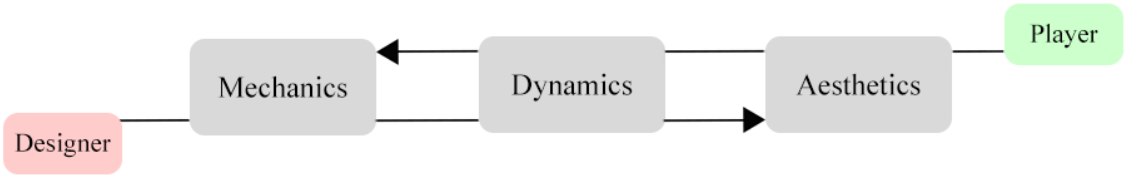

Figure 7 - Designers and players view the MDA Framework from opposite sides (Hunicke, LeBlanc *et al.*, 2004, p.2)

For designers, the framework is reversed. Mechanics lead to behaviour dynamics, which subsequently lead to "aesthetic experiences." (Hunicke, LeBlanc *et al.*, 2004, p. 2)

Note that this framework is helping us understand games, and not literally explaining how to develop them. As stated before, game development is a very iterative process and there are multiple ways of approaching a goal or problem we might be having. Nevertheless, the MDA Framework is beneficial for seeing how a change in a game's design can expand and multiply into other unexpected factors It is especially helpful when trying to understand a problem we may be having, for it brings forward the implications it is causing.

But first, let us take a closer look at the elements the MDA Framework is composed of.

2.2.1. Aesthetics

Why do we play and what makes a game fun? And how can the fun two different games deliver be distinguished? To answer these questions and avoid generic terms such as fun and gameplay in videogame discussion, (Hunicke, LeBlanc *et al.*, 2004) present eight aesthetic goals a game can generate:

1. Sensation, game as sense-pleasure;
2. Fantasy, game as make-believe;
3. Narrative, game as drama;
4. Challenge, game as obstacle course;
5. Fellowship, game as social framework;
6. Discovery, game as uncharted territory;
7. Expression, game as self-discovery;
8. Submission, game as pastime.

Despite the listing, the authors mention how these aesthetics can co-exist and interconnect with each other, as well as for other non-mentioned aesthetics, such as competition or arousal, as an experience which brings positive emotions (Ryan, Rigby *et al.*, 2006, p. 162). These terms help describe games and understand why different games can appeal to different players or at least to certain *moods.*

A game like Dirt Rally 2.0 (Codemasters, 2019), for us, generates aesthetics of challenge, submission and arousal or sensation. The game's easy to learn and hard to master mechanics provide a very well balanced challenged, that when successfully performed in sequence creates excitement and even euphoria.

Hunt: Showdown (Crytek, 2019) generates aesthetics of challenge, competition, discovery, and fellowship. In this game we play as a bounty hunter, who must find a boss in the world, kill it, and then extract with the collected bounty. However, we are in a race against other players, who are looking for the same boss. Additionally, the 19th century setting of the game makes it much slow paced compared to other games in the genre, due to the fact that the weapons and tools used are more rudimentary. The game rewards teamwork and patience, which is why we selected these aesthetics.

2.2.2. Dynamics

Dynamics create the aesthetic experiences, through the game's mechanics. They are a bit harder to define, as they cannot be listed. They vary from game to game, according to the feedback systems of the game. Shooters, despite using weapons as mechanics, allow for camping and stealth dynamics. Racing games use driving as a mechanic but generate various overtaking dynamics. The aesthetic experiences come from these dynamics. For us, a hectic race in F1 2020 (Codemasters Birmingham, 2020) with an overtake in the last corner contains a challenge aesthetic, but it also creates a sensation and narrative aesthetic. Sensation because of the satisfaction and relief of finally passing the car that was ahead of us and a narrative because we will be sharing and remembering this race for a while.

Dynamics are also created by what are called feedback systems, or feedback loops. The authors show us the example of Monopoly and how it rewards winners and penalizes losers, which creates a gap between players and decreases motivation and interest. It unbalances the game, however it simulates reality (Hunicke, LeBlanc *et al.*, 2004, p. 3). Players with less properties and therefore less income, have fewer means to increase their monopoly. Wealthier players with a larger number of properties are more at ease on landing on other player's houses, as the income they get just from others rolling the dice makes up for the expenses they might get if they fall in a property they do not own. Feedback loops consist in how a player's success or failure impacts the likelihood of future successes and failures (Game Maker's Tool Kit, 2018), and inevitably create emotional responses in players.

There can be two types of loops, positive and negative ones. Monopoly makes use of positive feedback loops, where a successful move is rewarded with more success, and an unsuccessful move is penalised. The most common application of this principle in videogames are level ups, that grant more power and stronger equipment as we progress through the game. Chess is the perfect example of the penalised unsuccess, where a bad move costs us a piece, hampering the game. Call of Duty: Modern Warfare 2 (Infinity Ward, 2009)'s multiplayer has one huge positive feedback loop, which are the killstreak rewards. These rewards are obtained by killing a set number of opponents without dying, and provide the player with better equipment that allows him to gather more kills. Additionally, these killstreak kills count towards the next killstreak rewards, meaning that skilled players can get on a killing spree more easily and faster than less skilled ones.

Negative feedback loops work towards balancing the game's successes and failures. Party games are the ones that make most use of them. The Mario Kart series (Nintendo Co., Ltd, 1992 – 2020) makes great use of negative feedback loops. Players leading the race get weak items, such as bananas

and green shells, while players at the back of the pack get the most powerful ones, such as bullet bill or the mighty blue shell. This gives players in the last places of the race opportunities to catch up and still win, something that is very difficult to do in regular motorsports and racing games (Game Maker's Tool Kit, 2018).

Feedback loops should be handled with care, as they are what determine a game's balance and can make it fair or unfair. Negative feedback loops can make a game more just, but at times they simply punish winners and reward losers, which does not feel right. Positive feedback loops, if in use too often, can distance winners from losers, unbalancing the game too much and killing fun and motivation to play (Game Maker's Tool Kit, 2018). Therefore, feedback systems should be thought of carefully, particularly the right time to use them.

2.2.3. Mechanics

Mechanics consist of the actions and control mechanisms the player can use within the game, supported by its environments and assets. They enable game dynamics. In shooters, pointing, firing, and reloading weapons are part of the mechanics, which allow for camping, flanking, and rushing dynamics. Speedrunning illustrates the difference between mechanics and dynamics quite well. We can take a look at Super Mario Odyssey (Nintendo Entertainment Planning & Development, 2017) mechanics, which involve (several types of) jumps and rolls, that when mastered allow players to traverse the game's environment very quickly. The Super Mario series (Nintendo Co., Ltd, 1985 – 2021) is well known for its use of simple mechanics (running and jumping), but still making the game extremely fun to play and managing to keep it fresh.

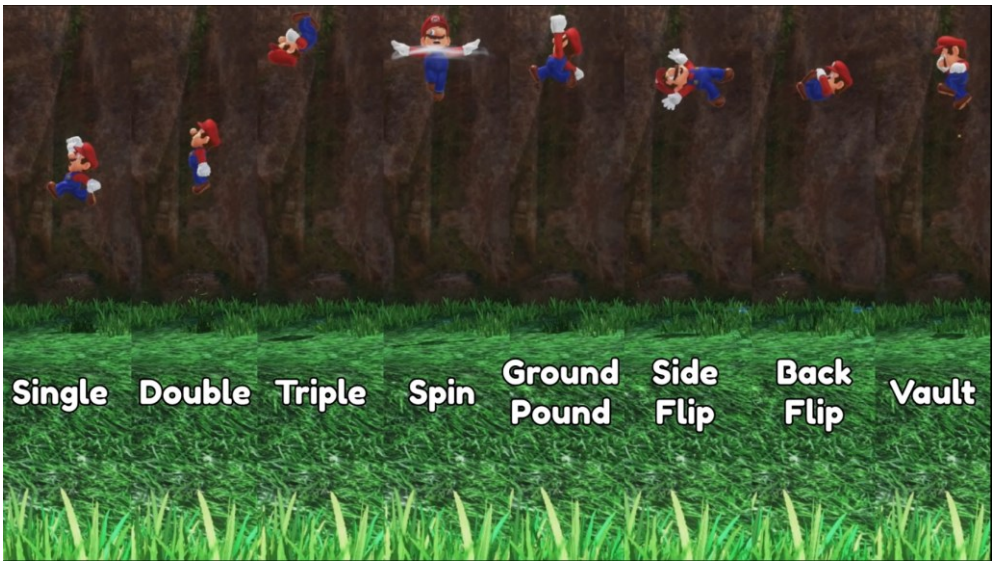

Figure 8 - Super Mario Odyssey's various jump compared, in the context of speedrunning. From https://www.youtube.com/watch?v=F7HZT2lmL04 consulted February 3rd 2021

In the same way Monopoly's mechanics and consequent systems may discourage play, Super Mario Odyssey (Nintendo Entertainment Planning & Development, 2017) keeps players coming back to the game, long after they have finished it. This shows how we can change aesthetics of play by adjusting the game's mechanics and analysing the systems they might create. Mechanics generate dynamics which generate aesthetics.

These adjustments always involve play testing and iterating, until we are satisfied with the aesthetics generated, in other words, the gaming experience.

The MDA Framework helps us identify the original source of a problem we may be having and allows us to understand what mechanics can be used in order to generate a certain type of aesthetic experience for the player. "It allows us to reason explicitly about particular design goals, and to anticipate how changes will impact each aspect of the framework and the resulting designs/implementations. By moving between MDA's three levels of abstraction, we can conceptualize the dynamic behavior of game systems." (Hunicke, LeBlanc *et al.*, 2004, pp. 3-4)

We now understand what a real time interactive experience is, and how users and players perceive them. We broke down the concept of a videogame and what sensations they bring to the player. Onwards, we will try to understand what other factors over and above mechanics, dynamics and sensations produce and influence the perceived experience of the user, as well as what motivates play.

3. Immersion and presence

Videogames are capable of moving audiences much in the same way any other types of storytelling media can, but when it comes to creating meaningful experiences, they differ significantly. We can interpret a film or book in our own way, but in videogames, each player will have his or her own unique playthrough and gameplay experience. We are given autonomy through the game's mechanics, which then permit the formation of various dynamics and sensations.

Technological advancements have made the simulation of virtual environments possible, which consequently have allowed for new and innovative explorations in education, social interaction, entertainment, and recreation areas. The gaming industry has become one of the largest and fastest growing industries (Yi, 2004), with its revenue surpassing the film and music industries combined (Sergeev, 2016; Witkowski, 2020), which pushes the limits of what digital technologies can achieve.

By conjugating game design and these technological improvements, interactive experiences have evolved in a way that facilitates the creation of better immersion.

One of the most regularly heard comments about videogames is how immersive they can be (videogamedunkey, 2017). Critics and reviewers suggest how great games are immersive and engaging, and that make us *feel* like someone or something else... (Houghton, 2009) (Dornbush, 2020). Immersion has largely become a buzzword, used when describing the next big videogame (Madigan, 2016, pp. 119 -120), however, despite its wide usage in videogame marketing, designers and players also use it.

Therefore, we will start by discussing the topic of immersion, as it is a fundamental concept to understand when studying game design. We will try to find a definition for it and break it down, see how it is formed, when is it formed, and what factors might affect it.

Immersion is always kept in mind in videogame development and is most easily achieved by making the game world seem more tangible and present, to meet player's basic expectations. It has been studied for numerous years, in the context of knowing how audiences are drawn into the fictional world's storytelling media create (Madigan, 2016, pp. 119 -120). However, when it comes to interactive experiences, the concept of immersion as we know it, is actually referred to as *presence* (Slater & Wilbur, 1997, p. 605).

The first explorations on presence focused solely on the technological aspects of the experience – they were all about the format in which the content was delivered to the user, and only media features were considered as effects for the formation of presence (Madigan, 2016, p. 127). Further studies came to reveal that the actual medium content and personal user characteristics reflected on

the feeling of presence (Hofer, Schramm *et al.*, 2012, p. 374). Currently, research has been focused on the cognitive processes and personality traits of the user (Przybylski, Rigby et al, 2010, pp. 154-155), rather than on the technology used to achieve it. But before we analyse how presence is interpreted and achieved by the user, let us find a definition for it.

The concept of presence has been studied and deconstructed in several research. In these studies, different sub-concepts of presence were created, two of the few known as social presence or co – presence (Bulu, 2012, p. 2). Despite this, in our literature review, we verified that most of these concepts of presence all stem from a main concept known as physical or spatial presence.

When interacting and playing within a virtual environment, we can get a sense of being there, present in the virtual world (Schubert, Friedmann *et al.*, 2001, p. 2). This is a distinct sensation from other media, as they do not provide this type of feeling. When watching a film, we act with the hero, and the experience is locked to the events of the story. In a videogame, even if linear, every play experience will be different, as the actions we make as players always vary from play session to play session.

This illustrates the definition for presence as **the sense of being located within a virtual environment and feeling that we can act within it** (Hofer, Schramm *et al.*, 2012, p. 385). But why distinguish presence from immersion? Well, computer science and virtual environments investigators Mel Slater and Sylvia Wilbur state that immersion is the extent to which the technological form can deliver the illusion of reality (Slater & Wilbur, 1997, pp. 605-607). In other words, it consists in the way information is delivered and displayed to the user and the degree to which he is aware of it. This makes it something **quantifiable**, in aspects such as field of view, resolution, fidelity, among many others, which are fitted inside *inclusive*, *extensive*, *surrounding*, and *vivid* categories. While immersion is "an objective and quantifiable description of what any particular system does provide", presence is a "state of consciousness (...), related to a sense of being in a place" (Slater & Wilbur, 1997, pp. 605-607), which depth may of course vary from user to user and their own unique experience. We can see immersion as the main stage for the creation of presence, and the more inclusive, extensive, surrounding, and vivid it is, the greater the latter will be (Schubert, Friedmann *et al.*, 2001, p. 3; Slater & Wilbur, 1997, pp. 605-607).

We can read a description of a bridge and have a clear picture of it in our mind, but it would be very difficult to feel vertigo or other sensations caused by its portrayed magnitude. The same is valid for a film, we can look down the bridge with the hero and feel excited or anxious, however, if we equip a VR headset and load a virtual bridge to walk and look down on, the sensations and feelings generated will be much more intense and quite realistic. However, solely this would be considered

to be immersed, as presence requires us to be in the world, believe in it, and be suspended in disbelief (Schubert, Friedmann *et al.*, 2001, pp. 2-3). To be suspended in disbelief means to believe and accept the seemingly impossible events of the story in order to enjoy it. Defined by Samuel Coleridge in 1817, it supports that when a story has a "semblance of truth", the audience will produce a natural interest that allows them to see beyond the non-possible events happening in the story. (Coleridge, 1817, p. 175). It implies avoiding too much critical thinking and to be carried by the narrative, its world, and its rules. We can imagine using a VR headset and being immersed in a dense beautiful forest. As we explore its surroundings, we notice a flying horse passing by out of nowhere. This, in its colloquial terms, would be considered immersion breaking. However, we consider this to be presence breaking, as the VR technology providing us the experience would be the same. No narrative nor mechanical reasons were provided to us before that justified seeing flying horses in the virtual world so our understanding of it changed, breaking our suspension of disbelief and consequently our presence.

3.1. The formation of presence

It is understood that presence is composed of two main feelings: the feeling of being physically present in the mediated environment, and the feeling of being able to act within that environment (Schubert, Friedmann *et al.*, 2001, p. 7). Because of this, we can recognize the formation of presence as a two-step process (Slater & Wilbur, 1997; Schubert, Friedmann *et al.*, 2001; Hofer, Schramm *et al.*, 2012).

It begins with users getting *stimuli* from the virtual environment and building a "mental picture" of it, through what they see and hear. Consequently, this allows them to recognize the virtual world as an existing and believable reality, and not as a series of displayed images generated by a machine[7]. This mental picture is defined as the spatial situational model and is the representation of the user's interpretation of the environment, built from his past memories, knowledge, and intuitions (Ellis, 1991, p. 323; McNamara, 1986, p. 87). Additionally, because every type of environment (virtual and real), is comprehended by the possible navigation and actions one can make inside it, based on real world knowledge and expectations, the mental model can also be labelled as a spatial-functional model (Glenberg, 1997). It lets users familiarize themselves with the virtual space, by comparing what they see, hear and can do, with their own real-world understanding. As they do this, and with the support of suspension of disbelief, they start being transported to the virtual environment. The constructed mental model allows the user to place himself in the virtual space, thus seeing the environment from the inside, rather from the outside (Biocca, 1997; Regenbrecht, Schubert *et al.*, 1998) – the second step. To establish the feeling of being located in the virtual environment and the ability to act within it, the user must accept the spatial model as his primary frame of reference (Barfield, Rosenberg *et al.*, 1995, p. 233; Riecke & Heyde, 2002, p. 6). After the mental model foundation is constructed, users must supress external *stimuli* from real world and the technology interface, in order to start being pulled into the media world, while slowly forgetting and losing track of the real one (Glenberg, 1997, pp. 4-7). Users need to shift their perspective and reflect on all possible actions and outcomes within the virtual environment, while never being reminded of the real world outside it. Therefore, we can associate this suppression step to the concept of immersion seen before, where the user must not feel that he is interacting with a piece of technology, but is in fact a single body with it (Keogh, 2014) (Swink, 2009, p. 36). The technology between user and

[7] We can view this as the opposite of the work of René Magritte "The Treachery of Images" (1929), also known for its sentence "Ceci n'est pas une pipe". In our case, we want the user to see it as a pipe, and not as an image of a pipe.

experience must be the least noticeable possible, for the user to **change his primary frame of reference** and be present (Hofer, Schramm *et al.*, 2012, pp. 375-376).

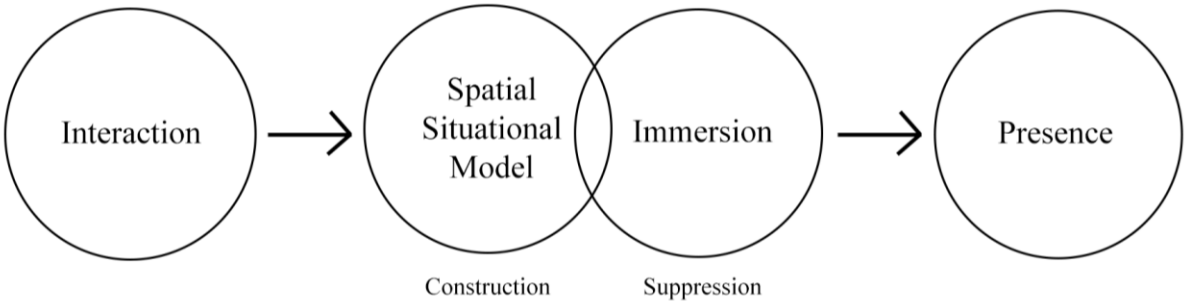

Figure 9 – Presence arises from immersion with the spatial situational model, which derives from interaction

We conclude that presence emerges from the construction of the environment's spatial model along with the suppression of real-world input or, in very simple terms: construction and suppression. (Schubert, Friedmann *et al.*, 2001, p. 6). During construction of presence, the user's thoughts of interaction and navigation go from being with the technology medium and display, to being inside the virtual environment – it is the way the user relates to the virtual space.

It is important to note that even if not immersed or present in the environment, a mental model still exists and users can still interact with it, which might end (or not) in the emergence of presence later on (Schubert, Friedmann *et al.*, 2001, p. 5). We can be playing Generation Zero (Avalanche Studios, 2019) and be aware of the keyboard, mouse and monitor in front of us, but still have an understanding of the game's world and its rules. As we continue playing and focus our interactions on the experience, the closer we will be to the feelings of immersion and presence.

With the two steps in consideration, we recognize that the experience of presence is composed of two fundamental components: spatial situations and action possibilities (Regenbrecht, Schubert *et al.*, 1998, p. 4; Schubert, Friedmann *et al.*, 2001, p. 6) which consequently, turn the presence experience into a loop: spatial situations originate action possibilities, and these action possibilities strengthen the spatial situations:

1. By being in a spatial situation, users will want to act;
2. As users act, they start approaching presence;

If they cannot act as expected, the illusion is shattered, presence is broken and the process restarts.

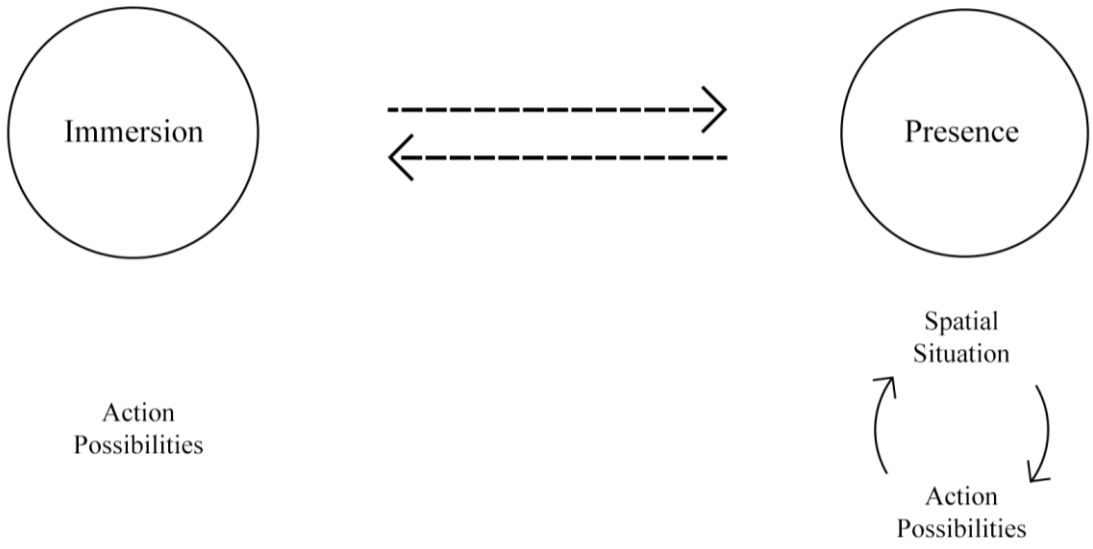

Figure 10 - Immersion and presence states in virtual environments. We consider that users can oscillate between the two states depending on their awareness of the illusion that the virtual environment is

3.2. External influences on the formation of presence

Immersion and presence do not exist as pieces that fit perfectly together. Various factors influence the immersion of the experience and *per* consequence, the formation of presence in the user (Schubert, Friedmann *et al.*, 2001, p. 4). Given the fact that users analyse the virtual environment by comparing what they see and hear with their own past experiences, the formation of the spatial situational model will vary from person to person. Not only that, but the way content is presented will influence users' interaction. The immersion hardware allows and/or the engagement the game creates are great cases of these impacts. We can compare the beginnings of Metal Gear Solid 5: The Phantom Pain (Kojima Productions, 2015) and Dishonored (Arkane Studios, 2012) and see how they deliver very different experiences. While Metal Gear Solid 5: The Phantom Pain (Kojima Productions, 2015) introduces you to the narrative and situation your character is in, it stretches it along 30 minutes of dull gameplay, with the character struggling to walk and stand. This may put off newcomers, as these will be the impressions they have of what is to come. In Dishonored (Arkane Studios, 2012), we have a narrative introduction, paralleled with moments of action, which teach us the game's setting and mechanics, in an enticing and exciting way. Both these games are focused on stealth and action, and start with the characters losing their power, but only in Dishonored (Arkane Studios, 2012) do we understand what the core of the experience is and get excited about, with an interest to experience more.

Although this relates to player's motivation, the aesthetics generated from these experiences impact the way presence is formed. Because gameplay experiences are always built upon the feeling of being someone we cannot be, in a non-possible virtual scenario, we should identify what factors influence the formation of presence, so we can understand what makes for the best possible virtual experience.

Despite their hard to quantify nature, (Witmer & Singer, 1994; Witmer & Singer, 1998) listed possible factors that influence the formation of presence, disclosing how hard it is to accurately know how they blend and work together. From their speculations, four main components stand out: *control responsiveness*, *sensory exploration*, *interface awareness*, and *involvement*. Control responsiveness relates to the control the user feels and holds, and sensory exploration is related to how sensory interaction is enabled within the virtual environment. Interface awareness is quite explicit, as it portrays how aware the user is of the display and controllers which provide him the virtual environment. Lastly is involvement, which is used to measure the user's engagement in the virtual experience (Witmer & Singer, 1994, p. 12; Witmer & Singer, 1994, p. 30).

Based on these factors and with the objective of understanding the "effects of cognitive processes and user traits on the formation of spatial presence", media researchers Mathias Hofer, Werner Wirth and Holger Schramm built their own predicted path for the formation of spatial presence based upon seven hypotheses (Hofer, Schramm *et al.*, 2012, pp. 383-385). In order to validate them they organized three studies, with 173 students in total, who were asked to navigate a virtual learning environment (Selverian & Hwang, 2003), entitled The House of Learning. It was composed of ten rooms distributed along four floors, with each one of these rooms focusing on a life period of Austrian classical composer, Wolfgang Amadeus Mozart. Subjects were seated 2 meters in front of the screen and allowed navigation through the virtual environment with a wireless mouse and keyboard. After a familiarization phase, they were given 10 minutes to explore the house and a questionnaire to answer afterwards (Hofer, Schramm *et al.*, 2012, p. 381). Through the questionnaire, presence was assessed along with its contributing factors, which are the seven firstly suggested hypotheses (Hofer, Schramm *et al.*, 2012, p. 381). We shall look at them.

In order to develop the spatial situational model – the first step in the formation of presence – users will have to focus their interest on the virtual medium and not on the real-world (Glenberg, 1997, pp. 4-7). Hence, two factors come into play: *attention* and *visual spatial imagery*.

Attention, as we can assume, is necessary to build a mental model of the environment and to interact and navigate in it (Hofer, Schramm *et al.*, 2012, p. 376).

Visual spatial imagery is a factor related to the user's general visual culture. The more skilled in producing and using spatial images from past memory and experiences, the better at understanding the overall layout of the environment users will be, which directly reflects on higher levels of presence (Cutmore, Hine *et al.*, 2000, p. 239; Hofer, Schramm *et al.*, 2012, p. 376)

As we saw before, for users to feel present in an environment it is necessary to have its spatial situational model, however, this does not guarantee the user will be present (Schubert, Friedmann *et al.*, 2001, p. 5). If we look back at figure 9 and what it represents, we can see that when interacting with the environment, a spatial situational model is created, which will then allow for the formation of presence. Thus, it is comprehended that "having a spatial situational model is a positive predictor of spatial presence" (Hofer, Schramm *et al.*, 2012, p. 378).

In addition, even though conscious interaction with the medium's world is not needed to create spatial presence, it plays a huge part in achieving it, and one of the ways to attract the user's focus and get him to shift his main frame of reference towards the virtual environment is through *involvement*. While attention can be considered an "automatic reaction to a stimulus", involvement is a voluntary and controlled exchange between user and virtual world (Dholakia, 1998).The more the user processes and utilizes his mental model of the environment, the more he will be pulled into it. This reinforces the previously mentioned factor of the spatial situational model being a positive predictor of spatial presence. Furthermore, involvement is affected by the *domain-specific interest* of the user. Whether a person feels tempted to interact with the mediated environment or not, is dependent on the user's personal interests and how they are represented within the environment and collaborate in building the spatial model (Hofer, Schramm *et al.*, 2012, pp. 378-379). This can be labelled as selective attention, which is driven via the significance of the information presented (Triesman & Riley, 1969).

Based on (Hofer, Schramm *et al.*, 2012)'s path model, this selective attention, or domain-specific interest, causes involvement with the mediated environment and the already created spatial model, and will lead to the emergence of presence. However, we would like to consider that domain-specific interest and involvement may assist in the development of the spatial situational model. If we take as an example someone with an interest in motorsports picking up a controller to play Dirt 4 (Codemasters, 2017) for the first time, they will have more ease in developing its spatial situational model, versus someone who has no interest in it or no experience in racing games. We understand that (Hofer, Schramm *et al.*, 2012)'s spatial situational model is focused more towards visual and audio sensations from the environment, but we must consider interaction factors to make a difference. The involvement the virtual experience generates plays a huge role in motivating play, which we will further explore in the next chapter. For now, we can think of how game tutorials sometimes go without notice while others can overwhelm and put us off from playing entirely. We can examine Forza Horizon 4's (Playground Games, 2018) first minutes of game and see how they deliver very different levels of engagement when compared to Dirt 4 (Codemasters, 2017). In Forza

Horizon 4 (Playground Games, 2018) we have a one-minute introduction to the Horizon festival, the car classes and changing seasons, and right after that we have a seamless transition into gameplay with a very discrete interface that tells us what buttons to use for accelerating and braking. In Dirt 4 (Codemasters, 2017) we are greeted with some slow-motion cinematics and a voice-off telling us what amazing things we will be able to do. After this we get a loading screen, followed by the profile creation menu and a settings menu. Only after this are we able to play, and it still is under someone else's guidance, which advises us to get a feel of how the car brakes and turns. Of course, these are different types of games, one is a rally simulator, and the other is an open-world car festival, but we believe that when delivering a virtual experience, it should always try to captivate the player as best as possible. In this case, Forza Horizon 4 (Playground Games, 2018) delivers by showing in a fast-paced manner everything that the game has to offer followed by setting the player free to experience it, while Dirt 4 (Codemasters, 2017) makes us wait tolerantly (or not…) for the moment of play.

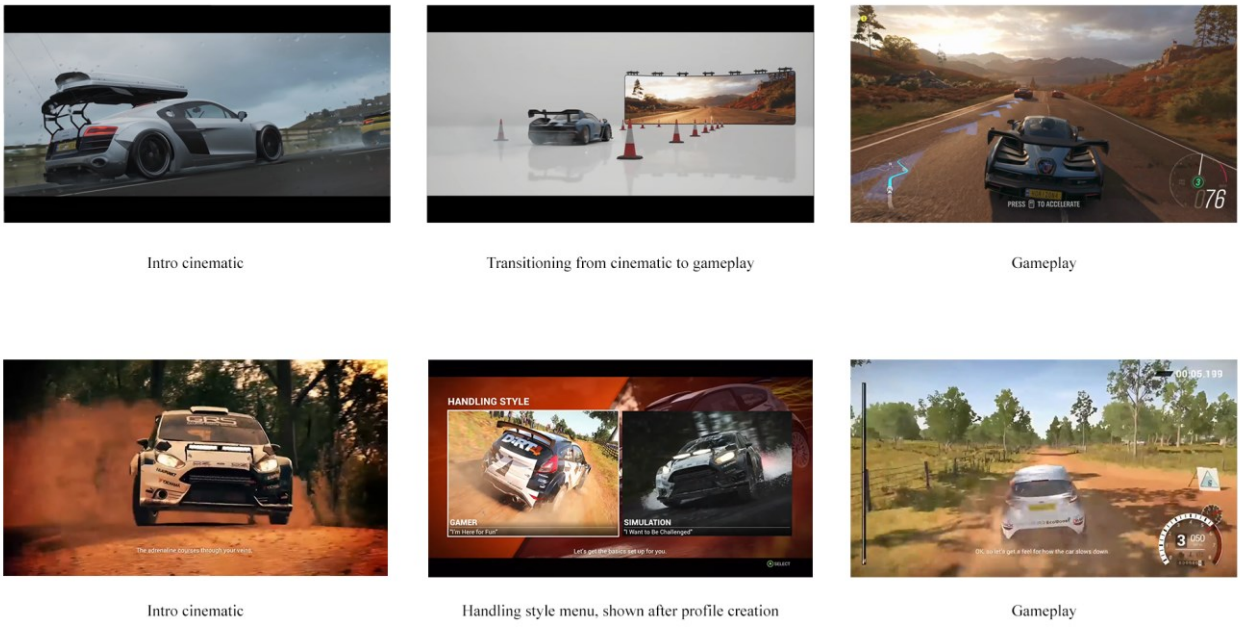

Figure 11 - First minutes of Forza Horizon 4 (2018) compared to Dirt 4's (2017)

So, despite being presented as two separate factors, we can see how domain-specific interest and involvement interconnect and function practically as one. We also want to note that, although (Witmer & Singer, 1994) mention interface quality as an interfering factor for the formation of presence, (Hofer, Schramm *et al.*, 2012) do not mention it in their path model. It is our understanding that (Hofer, Schramm *et al.*, 2012)'s presented model focuses more on the theoretical formation

process of presence, and despite easier to use interfaces and natural controls help increase users' involvement by facilitating interaction (Przybylski, Rigby *et al.*, 2010, p. 156), we understand that they fit inside the involvement factor in a more practical sense. Nevertheless, intuitive controls and their mastery play a huge part in involvement, which is why we will take a deeper look at this topic when studying interfaces and mapping.

Because users must change their main frame of reference and interpret the virtual environment from the inside, by supressing the technology and real world between them and the experience (Regenbrecht, Schubert *et al.*, 1998, p. 246), one other factor comes in, which is *suspension of disbelief*. Suspension of disbelief allows the user to be pulled into the media world, letting him see past certain inconsistencies and even technical faults in the mediated environment (Hofer, Schramm *et al.*, 2012, p. 379). Art pieces fail when irregularities are noted and consequently make people question what they are viewing, be it in a book, a film, or a videogame, but suspension of disbelief helps mediate these ruptures. It allows audiences to develop an interest in the artwork and seeing past the debatable occurrences the story might contain. (Coleridge, 1817, p. 175). This is the reason for why suspension of disbelief is a requirement for the emergence of presence.

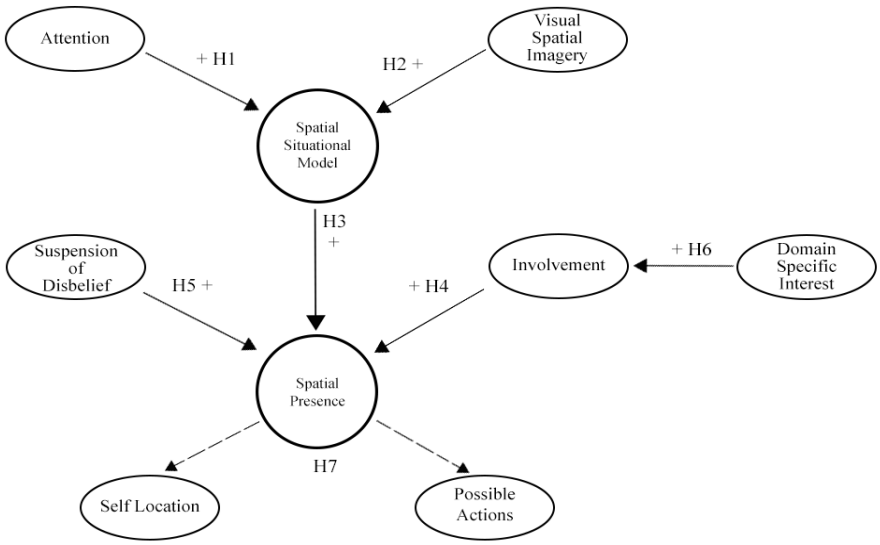

Figure 12 - (Hofer, Schramm et al, 2012, p. 380)'s "predicted path model of the formation of spatial presence with hypotheses labelled"

In figure 12 we see (Hofer, Schramm *et al.*, 2012)'s predicted path model for the formation of presence, with all before listed factors, except for the interface quality one, which we believe exists inside involvement.

Ultimately, we can verify that the spatial situational model lies right before spatial presence which subsequently delivers two major features: spatial situations and action possibilities, which set up one's desired experience and loop of virtual interaction.

With the reviewed literature, we can present our own understanding of presence and where it fits inside virtual interaction:

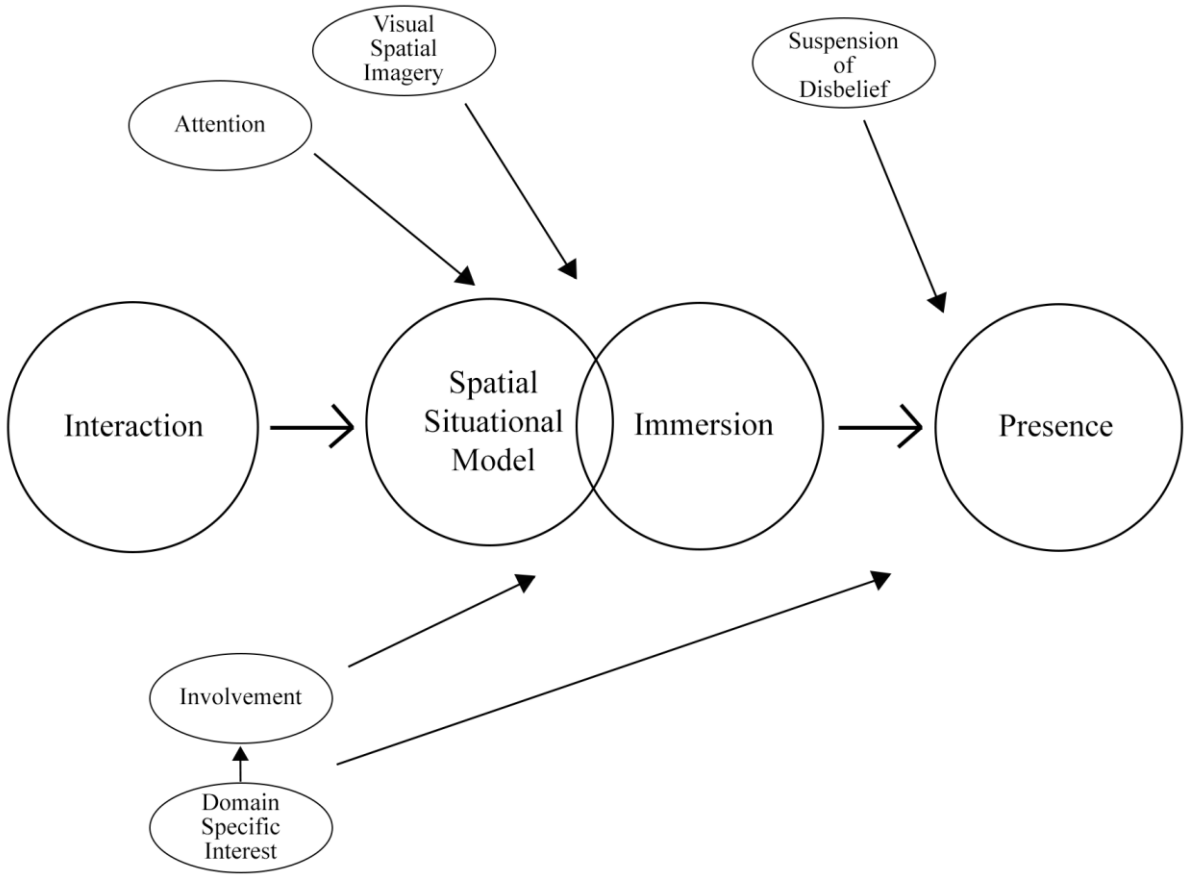

Figure 13 - Our model for the formation of presence, with its steps and influencing factors

Our objective with the model is to show the layers users need to traverse before reaching presence, along with its several influencing factors. We see that interaction stands before immersion, which *per se* stands before presence. In practical terms, we can state that when beginning interaction with a virtual environment, users will build its spatial situational model and eventually become immersed,

depending on their visual spatial imagery, and given attention, and on how the environment relates to their domain specific interest along with the existing involvement.

We want to stress that these factors can all exist outside interaction, as users may just look at the virtual environment from a distance and develop an interest for it, which may lead to them interacting with it. Take for example seeing someone else play at an event or in social media or getting a recommendation from friends which leaves us curious to try it. We would also like to note, that because immersion is a quantifiable factor based on the technological medium delivering the experience, certain hardware can make us question what comes first, the situational model or immersion. With the case of VR technologies, the user is, in practical terms, instantly immersed in the environment from the moment he places the headset, but at the same time, he will build his spatial situational model which lets him see the environment as a valid reality or not. Thus, we could affirm that the line between having a spatial situational model and being immersed can, in some cases, be very thin, but that the spatial situational model will always be the validation test for the acceptance of the environment. Although stated earlier, we want to emphasize that users may have a spatial situational model and still not be immersed if, for example, their visual spatial imagery does not grant them a serviceable situational model.

Nevertheless, as users familiarize themselves with the virtual environment and its content through the spatial situational model along with attention, visual spatial imagery, involvement and domain-specific interest factors, suspension of disbelief comes to bring support and make users reach presence more easily, by facilitating engagement with the environment's characteristics, events, and plot, if in a narrative setting.

Videogames allow users to take their own paths and make decisions based on what they see, hear, and feel, in a separate life from their own. Because presence is the feeling of being located in a virtual environment and feeling like we can act within it, it opens up the opportunity for users to deeply envelop themselves in spatial situations with various potential for action and meaningfulness.

User's attention, past experiences, interests, and generated involvement are very important factors to take into account, as they impact the formation of the spatial situational model, which stands right before immersion and presence. Inconsistencies in the virtual world leave us (conscious or unconsciously) thinking and analysing the game world, restraining the development and use of the virtual environment's mental model. However, suspension of disbelief assists us in ignoring certain irregularities we might encounter, and in accepting the virtual world as our main frame of reference.

Presence is connected to the overall enjoyment of the experience, and the more natural the game's content and systems are, the less notable the connection between audience and experience will be which consequently brings stronger feelings of presence (Madigan, 2016, p. 121).

In this chapter we analysed what presence is and how it is formed, along with the factors that influence its emergence, and concluded that it can be summed up in construction and suppression stages. However, the speed at which these phases progress, varies according to the way content is delivered and presented by the game, which we can fit inside the involvement factor. Although the factors listed before all play their part in allowing the emergence of presence, involvement is one of the most fundamental ones, as it branches into a wide range of subtopics, such as the way interfaces and the game's design and content generate dynamics and aesthetics, and consequently control player's motivation. Hereafter, we will examine these topics of interaction.

4. Technology vs Implementation

Games are experienced as a whole: not by what the audio solely provides, nor the visuals, nor the haptic feedback (Keogh, 2014). As we described in the first chapter, players and users act by jumping between two steps: evaluation and execution, motivated by a *be-goal* (Hassenzahl, 2010, p. 13). They explore and analyse the situation they are present in through the perceptual systems and then act with prediction. And this applies to actions ranging from opening a bottle of water or unscrewing a tiny piece of metal, to cooking and setting the table or even working on a school project. Interacting with a videogame is done the same way, except that instead of interacting in a real environment, it is done in a virtual one.

It is the combination of all these parts that makes up the experience, even when referring to single parts of gameplays. Fallout 3 (Bethesda Game Studios, 2008)'s DLC The Pitt (Bethesda Game Studios, 2009) will make us feel daunted and nervously excited, while Pikuniku (Sectordub, 2019)'s first 10 minutes will evoke warm and happy emotions.

In the previous chapter we defined presence, and what factors can affect its formation. We reviewed already existing models of its development path and composed one of our own, with interaction and immersion steps taken into account. We concluded on the note that involvement is a fundamental factor that includes several of the components that make up a game, ranging from the interface used to interact in the virtual environment, to the way it is designed and presented to the user.

Involvement is a concept related to motivation and covers several forms of possible interaction with the media in question (Rothschild, 1983) (Wirth, 2006). It is a conscious reflection between user and stimulus, where the user connects and compares the stimulus received with his own experiences (Krugman, 1965).

Therefore, involvement allows users to feel and react, because of the relations and connections between media content and users' experiences, values, and beliefs. In simpler terms, involvement allows for the creation of meaning in the experience (Wirth, *et al*., 2007, p. 512).

Additionally, we know that it is a predictor of presence, and that it consequently increases one's desire to play. It is directly connected to the overall enjoyment of the virtual experience, as it is what defines its perception as intuitive and natural, or not. It plays a huge part in connecting the audience with the experience, and in allowing the formation of presence (Madigan, 2016, p. 121).

As we saw before, (Hofer, Schramm *et al.*, 2012) place involvement between the formation of the spatial situational model and the emergence of presence and refer to it as something restricted inside the mediated environment. However, we consider involvement to be something that can exist outside the mediated environment. (Wirth, *et al*., 2007, p. 513) refer involvement to be an "active and intensive processing of the mediated world, whereas [Spatial] Presence emphasizes the experience of "being" solely within the mediated world." It is something that involves reflecting and interpreting as well as "assigning relevance to the media content" (Wirth, 2006).

When interacting with media content, be it interactive or not, users will "think about the narrative's characters, actions, and feelings, and not care about the physical/technological component the media uses (the actual book, the screen, or the controller). We can consider users to be immersed within the media content or narrative, as they are neither noticing the medium nor the piece of technology delivering them the experience. When this is valid, the probability of the virtual world becoming their main frame of reference increases, as well as the one for the emergence of presence, because "[users'] concentration and mental capacity are primarily devoted to the media content and not to reality" (Wirth, *et al.*, 2007, p. 513).

Involvement plays a huge part on the suppression of reality and suspension of disbelief required for the emergence of presence. However, we must consider the fact that different videogames (even in the same genre), combined with different technologies, combined with different players will offer different forms and degrees of presence.

Just like (Witmer & Singer, 1998) firstly suggested, easier to learn interfaces and mastery of controls allow the user to focus on the environment and have the full expected potential of the virtual experience. Simultaneously, Janet Murray in the book "Hamlet on the Holodeck", presents three interdependent aesthetics that computer interaction affords: agency, immersion, and transformation.

(Steuer, 1992) mentions two main technological factors that influence the formation of presence and define the potential of the technological medium to deliver the experience to the user. They are *vividness* and *interactivity* and provide a way of classifying media purely on a technological level, without taking into account users' interpretations. (Steuer, 1992, pp. 79-84).

Vividness is based on the "technical characteristics of a medium" and contains two subcomponents, labelled *breadth,* and *depth* (Steuer, 1992, p. 81).

Interactivity is described as "the degree to which users of a medium can influence the form or content of the mediated environment" (Steuer, 1992, p. 80). However, (Steuer, 1992)'s concept of interactivity is utilized to determine how much users can modify and adjust the content or structure

of a mediated environment in real time. Despite being based on a "telepresence view of mediated communication" and focusing on the mediated environment's characteristics and the user's relation with it, it is employed as a quantitative measuring tool, limiting interactivity to a manipulation of form and content without taking into account the way it can control how the medium is experienced by the user (Steuer, 1992, p. 85). Following this definition, a film visualized at the cinema is not to be considered interactive, but when in DVD format it can, as users are able to choose in what order they watch the chapters or even fast forward or backward through the film as they wish. Imagine we are at home watching Harry Potter and the Goblet of Fire (Newell, 2005) and reach the scene where Harry spits out his drink when Cho looks at him. We laugh, and with the goal of laughing more and seeing him do it again, we grab the DVD Player remote, hit the back button and the film starts rewinding. As we see Harry grabbing the cup to drink and eventually spit out the drink again, we press the play button, and the film starts playing normally again. We laugh and carry on watching. Using the remote to rewind the film may control the way we experience it, but in a very confined way. Watching the film in DVD format allows only for skipping or re-watching specific scenes we want and despite making up a very short interactivity loop of user/computer communicating with one another, it lacks meaning and engagement. Let us put this into comparison with a videogame. If we are fighting a boss in Dark Souls (From Software Games, 2011) and instead of dodging left we dodge right, we might die, which involves traversing several kinds of obstacles in order to try killing it again, hopefully for good. Grabbing the remote and pulling the film backwards does not create the connection between user and computer (Swink, 2009) mentions we have when driving a car and will never be strong enough to create a sense of presence. User and television do not become extensions of one another. They are still well apart from each other, as the user just waits for the moment he wants to watch again. Despite having interaction, the medium remains as one-sided communication.

Hence, when (Steuer, 1992) mentions his concept of interactivity, it directs us towards the concept of agency referred by Murray, which we will address further ahead.

Videogames in numerous genres, with varying art styles and distinct mechanics can create presence experiences. If a game has ultra-realistic graphics, it does not mean that it will be a great experience. It might help, but it does not guarantee it. The same happens for the opposite. A game can feel very good to play, but there is something about its art style or audio that just does not allow us to be immersed, and therefore create presence. In order to better analyse these particular aspects, we need to break down even more what interactivity in a videogame is comprised of. Therefore, we would like to split involvement into two main branches: one which is focused on the technological side of things, shaped by the interface and controllers used, and the other which is centred on the

way users perceive and feel the experience psychologically, thus dedicated at the design and implementation of the media content and in what way it manages to engage the player.

On the technological side of things, we will look at (Steuer, 1992)'s vividness factor, as well as the concepts of speed, and mapping. We will also look at how mastery of controls influences players' perception of the game. We shall start by discussing this part, as it is the one which can be examined more linearly, based on empirical data. In the design chapter, we will look at the concept of agency mentioned by (Murray, 1997), that plays a huge part in maintaining engagement and motivation. We will also take a look at how agency relates to autonomy, helping shape psychological processes and generating well-being, based on the self-determination theory.

However, we should first understand what motivates play and only after that can we take a deeper look at the two pieces that make up involvement.

4.1. Play motivation

Games generate both positive and negative effects. It is understandable that game environments have a huge power and wonder, and that players are motivated to engage in them (Ryan, Rigby *et al.*, 2006, p. 2). In "A Motivational Model of Videogame Engagement", (Przybylski, Rigby *et al.*, 2010) base themselves on the self-determination theory (SDT), which focuses on human motivation and experiences that satisfy universal human needs, to examine and evaluate the way videogames shape psychological processes and influence well-being. They aim to better understand how games manage to keep players engaged, and how play affects psychological and physical well-being. They also mention the characteristics and effects of immersion, the motivational appeal of violent game content, and even investigate sources of post play aggression and its origins, as well the consequences of disordered patterns of game engagement. (Przybylski, Rigby *et al.*, 2010, p. 154)

Based on the reasons and objectives that lead to action, SDT separates motivation in two types: intrinsic and extrinsic. Intrinsic motivation is related to doing something for the simple act of doing it, whether because it is fun or interesting. Extrinsic motivation is related to actions done for external factors, that lead to secondary outcomes (Ryan & Deci, 2000, p. 54).

These two types of motivation cannot co-exist, as when extrinsic motivations are added to an already intrinsic experience, the intrinsic motivations are lost (Przybylski, Rigby *et al.*, 2010, p. 155).

As we saw before, videogames prompt goal directed behaviour and their intrinsic qualities are what make them particularly appealing. From research using the cognitive evaluation theory (CET), a sub theory of SDT, we as humans have three fundamental human needs. They are the need of competence, the need of autonomy and the need of relatedness. Activities which satisfy these three needs are considered intrinsically motivated, while activities which reward, punish or pressure self-esteem are considered of extrinsic motivation (Ryan & Deci, 2000, pp. 54-55). To illustrate intrinsic and extrinsic motivation (Ryan & Deci, 2000, pp. 54-55) give the example of a student and his homework. The student can either feel motivated to do them because he likes the subjects that are being taught or be motivated to do them because he does not wish to fail the class and disappoint his parents and teachers. In this case, we cannot be sure if the motivation level changes, however we understand that its nature does. However, defining how motivated we are to do something is not always an easy answer. Motivation does not function in a linear way, and it possesses different forms, which vary in level, but also in orientation, as in how devoted or committed we can be to an activity (Ryan & Deci, 2000, p. 54).

(Ryan & Deci, 2000) define the idea of being motivated as being driven to do something, more specifically by some type of goal. Orientation considers the goals behind action, so answer the question of why we are performing a certain action, much in the same way as (Hassenzahl, 2010, p. 13) points out. The fun and/or challenge an activity provides, is what motivates its intrinsic doing. It is linked to volitional actions and feeds our interests of learning and exploration. (Ryan & Deci, 2000, p. 55).

SDT, more specifically CET, implies the idea that intrinsic motivation is not created out of nowhere, but is in fact cultivated and cherished when basic psychological needs are satisfied. It also specifies that our competence and autonomy needs are connected, which means that a sense of competence might not always catalyse intrinsic motivation if no feeling of autonomy is present (Ryan & Deci, 2000, p. 58). Within the competence need, positive feedback increases intrinsic motivation, while negative feedback decreases it. Regarding autonomy, if external enticements such as tangible rewards, threats, deadlines, directives, and competitive pressure are added to the activity, they can be experienced by people as controllers of their behaviour, which clashes with the principles of performing an activity for the pure sake of it. Understandably, freedom of direction and choice contribute to intrinsic motivation (Ryan & Deci, 2000, p. 59).

Nevertheless, we comprehend that not everyone is intrinsically motivated for the same actions, but what distinguishes an intrinsic activity from an extrinsic one is its associated process of enjoyment and satisfaction (Ryan & Deci, 2000, p. 61).

Games began as tests of skill, which satisfied competence needs, but as time went by, technology and game design progressed in a way that allowed not only for the fulfilment of our competence needs, but also of autonomy and relatedness, through player choice, flexible objectives, and strategies, along with the growth of communities and online interactions (Przybylski, Rigby *et al.*, 2010, pp. 162-163). We would like to add that games also began to tell stories much in the same way as cinema and literature, which we believe can add to the relatedness need satisfaction, through the empathy we build with the heroes and characters of the narratives.

Competence is related to a sense of skill and efficacy and arcade games were great for it. The games' challenge progressed along with the players' skill, which kept it balanced. Due to the infinite levels design, the player could keep playing for as long as his skill matched the game's challenge. Players would also always have a grade of their skill, shown to them through the high score, which kept them coming back for more, in attempts of breaking records and being on top of the leader boards. Nowadays, games have many ways of giving competence feedback to players, some in very direct ways, while others more subtly. Scores are one of the most straightforward approaches of giving competence feedback. The better the player performs, the higher the score. Other games manage to do this more subtly. For example, Guitar Hero (Harmonix Music Systems, 2005) illustrates this very well, being the example provided by (Przybylski, Rigby *et al.*, 2010). If the player is doing well, the crowd cheers, but if the player starts hitting wrong notes, then the crowd starts booing. This informs the players on how well they are performing, while keeping the game's presence and setting — *per* consequence, games that manage to do this in a diegetic way, end up being more immersive. Because competence feedback increases intrinsic motivation, videogames that positively deliver this need to players can be considered more engaging.

Autonomy is connected to the player's volition and personal agency. In the first The Legend of Zelda (Nintendo Research & Development 4, 1986), players were not given a linear set of instructions of what to do or where to go. They were dropped into the world and invited to explore it and find their own path. This meant that they could enter a cave and find a great sword or turn a corner and come across too powerful enemies which prevented them from progressing in that direction. The game provided players with freedom of where to go and what to do, consequently allowing for different methods for advancing through the game. Games began providing freedom in choosing how to play, by allowing objectives to be achieved through different approaches and strategies. Levels started having more than one simple path and players started being able to create their own characters and choosing their classes, as is the case with role-playing games (RPG's). Players were given the opportunity to choose what tools to use, what boss to tackle first. Every single

game's play-through could finally be moulded to each individual player's desire. Creators started providing players with meaningful choices, "to continuously balance their boundless curiosity (...)" (Przybylski, Rigby *et al.*, 2010, p. 156). This also catalysed intrinsic motivation.

Relatedness is linked to social connectedness. Videogames have always had a great social component attached to them, from arcades to home entertainment systems. Nowadays, with online play, connecting socially could not be easier. Being able to cooperate and compete online has been a big step in gaming history, and the creation of online forums and communities has brought many people together. However, given the name of this universal human need – relatedness – we believe that the satisfaction for this may not only come from social interaction. It might also come from relating to the game's characters or narrative. The videogame industry, now more than ever, has become a huge medium for telling meaningful stories, filled with characters and moments for the audience to relate to. Videogames have become a storytelling medium, much in the same way as cinema and literature.

Now that we understand how games manage to keep players motivated and engaged, we can take a deeper look into the technological and perception side of things more meticulously.

4.2. Interfaces, controllers, and mapping

"Seeing an ogre lumbering toward you in a game is good. Also hearing its thunderous footsteps is better. But feeling your controller rumble with each stride in addition to all that is the best." (Madigan, 2016, p. 125)

The technology used to experience a videogame has a huge influence on the immersion one can achieve. Some technological interfaces and control schemes can make us experience it almost instantly (which is the case of VR), while others leave us struggling trying to achieve it (games with not great controls such as System Shock 1 (LookingGlass Technologies, 1994) or Armored Core 3 (FromSoftware, 2002) are examples of this.

A control interface coordinates player's actions (Przybylski, Rigby *et al.*, 2010, p. 156) and in order to be immersed in a videogame, players need to build their own understanding of that videogame and they need to learn and understand its basics, such as its mechanics and possible dynamics, as well as its environment. This is done through what we described as the process of interactivity in the first chapter. Players perceive what is output by the computer and then act according to the mental model and expectation built. In addition, it is with a control interface that they can act within the game's environment and do all this. Understandably, depending on the control interface used, interaction with the game varies in difficulty and ease of use (Witmer & Singer, 1998).

Nevertheless, the connection between player and game is not achieved solely through the control interface (Przybylski, Rigby *et al.*, 2010, pp. 161-162). Common computers also deliver *stimuli* to the user through its visual and audio interface.

(Steuer, 1992) mentions a variety of factors that can quantitatively measure interactivity[8], such as *vividness*. Vividness consists of the technological ability of creating a sensory rich mediated environment and in the way the environment transmits *stimuli* to the user's perceptual systems and is defined by two subcomponents labelled *breadth,* and *depth* (Steuer, 1992, pp. 81-82).

For understanding breadth, we can look at the five perceptual systems (Gibson, 1966) defined and see how the best way of being transported to an environment is with the amalgamation of all

[8] He refers to these factors in the context of influencing [tele]presence however, in our view, interactivity precedes immersion and presence.

these systems, as just one solely is not enough to cause the sense of being in a desired environment. The example given by the author illustrates this very clearly:

> "Imagine standing on a street corner in a rainstorm. Which sense is responsible for generating a sense of presence in that environment? The haptic system is activated by raindrops hitting the body, but a similar sensation could result from being sprayed by a nearby sprinkler. Similarly, the smell of a soggy dog standing nearby could result from other situations. But when these perceptions occur simultaneously with the image of raindrops falling on the streets and the wet pavement, and the taste of wet diesel exhaust from passing buses, one clearly has a sense of being on a street corner in the rain. The vividness of the street corner scene is not generated by any single sensory input alone, information is presented simultaneously. This redundancy serves to further enhance vividness." (Steuer, 1992, pp. 81-82)

Breadth consists in the number of sensory dimensions the medium can deliver to the user, while depth is related to the fidelity or resolution of such sensory dimensions. The greater one or both factors are, the more vivid the media content will be (Steuer, 1992, pp. 81-82).

So, the medium of literature can be considered less vivid than television, as television provides information to two perceptual systems, while literature delivers only to one (Skalski & Tamborini, 2005, p. 6). Nonetheless, within the medium of television we can have varying degrees of vividness, through the depth factor. We can consider larger and higher resolution screens, and stereo sound systems to have higher depth than lower resolution screens and mono audio setups.

In the medium of videogames, we can relate this to the art style and visual techniques used. Whether the game's graphics are *pixel art*, *cel shaded*, *ps1-style,* or *photo-realistic* makes its vividness vary in depth.

Pixel art is a form of digital art, and its visual style is achieved by making up the image pixel by pixel. It originated because computers in the 1980's and 1990's did not have the rendering power of today, which made assets very restricted (Techopedia, 2021). As technology progressed, pixel art branched into other sub-genres, like the 8-bit or 16-bit style.

The *cel shaded* art style uses 3D models but with a cartoon style effect. It makes use of flatter simpler colour shapes and can also use outlines. This gives models and objects a cartoon animation look (Jones, 2017).

The PS1 graphics art style, as expected, is inspired by the PlayStation (Sony Computer Entertainment, 1994) era of games. It is achieved by limiting the fidelity of the resources used and recreating the technical limitations of the time. The art style ends up with a rough look, and

sometimes uncanny, which is why a good number of horror games have started using this art style (Macgregor, 2020).

In terms of breadth, most digital media nowadays deliver on two sensory systems, the visual and auditory. In videogames this is the most common case however they can also cover the haptic system depending on the control interface used.

Other more specific types of media, such as 3D IMAX cinema and 5D film experiences we see in amusement parks aim to deliver a greater sense of immersion by increasing both their breadth and depth factors. The latter media example attempts to deliver on all senses, with dynamic chairs and special effects, as well as increasing the screen size and resolution, and by improving the audio system to be more accurate.

Breadth and depth contribute to what (Steuer, 1992) considers vividness, despite their relative, as in hard to accurately measure, nature. So, we believe media and artworks can only be evaluated in their vividness when compared with each other. A professionally recorded audio from a live concert, when compared to a smartphone recording of the same concert may have more depth, but less breadth. While the professional recording is just audio, the phone recording fills not only the auditory system, but also the visual one. Nevertheless, this leaves the question of which one is better. Well, that all depends on the usage it will have.

(Steuer, 1992, p. 85) mentions some other factors to influence interactivity with a virtual environment. One is *speed*, which consists in the pace that input is delivered onto the mediated environment. This can be compared to (Swink, 2009)'s definition of real time control which we referred in the first chapter. Real time control is instantaneous and must be precise, continuous, and responsive (Swink, 2009, pp. 3-4). It is with real time interaction that we can instantly "alter the mediated environment" and it is because of this direct response that "even low-resolution videogames seem highly vivid" (Steuer, 1992, p. 86). This is one of the reasons why we can affirm that videogames with great amounts of depth do not necessarily imply great interactive experiences.

(Steuer, 1992) also refers the factor of *mapping* which is defined as the "the ability of a system to map its controls to changes in the mediated environment in a natural and predictable manner" (Steuer, 1992, p. 86). Mapping is related to how real-world human actions connect to actions within the mediated environment. (Norman, 2013, pp. 20-21) borrows the term from mathematics and notes how it is used for referring the relationship between two sets of things. He gives the example of an auditorium with its lights and switches, and that the switches are mapped to a specific set of lights of the auditorium. It is understandable that when mapping makes use of spatial correlation between

the arrangement of the controls and the devices being controlled, it is simpler to figure out how to operate them.

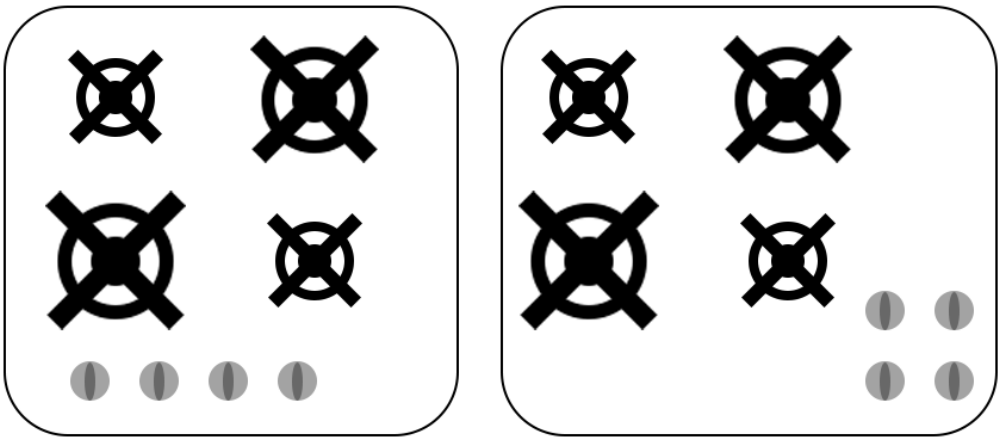

Figure 14 - The mapping to the right is easier to understand than the mapping to the left (Norman, 2013, p. 114).

Mapping helps mould user's conceptual models, and if more natural, the more compelling the models will be. When the collection of possible actions is visible, and the controls and displays expose natural mappings, a device becomes more intuitive to operate. So, the use of natural mapping results in direct and easy comprehension (Norman, 2013, pp. 21-23). In videogames, natural mapping corresponds to how close interface actions in the real world match the actions of the gameplay in the virtual world (Tamborini & Bowman, 2010).

(Skalski, Tamborini *et al.*, 2010) in "Mapping the road to fun: Natural videogame controllers, presence, and game enjoyment" explore how interactivity in videogames affects presence and game enjoyment. They focus on interactivity through natural mapping and how it can serve as a catalyst for presence experiences. They conducted two studies, where they compared different controller types in the same game and measured their perceived naturalness, presence, and enjoyment. In a previous article, (Skalski & Tamborini, 2005) suggest natural mapping to be a predictor for presence, as they have the ability of more easily fulfilling the spatial situational models with their real-world double. In their most recent study, the authors (Skalski, Tamborini *et al.*, 2010) aim to empirically prove this, as well as to taxonomize types of natural mapping. Their expectations were that "game controllers higher in natural mapping will lead to more perceived controller naturalness, which should positively affect spatial presence and resultant game enjoyment" (Skalski, Tamborini *et al.*, 2010, p. 225).

Obviously, there are many other influencing factors that affect game enjoyment, some of which we will observe further ahead.

(Skalski, Tamborini *et al.*, 2010, p. 225)'s definition of natural relates to the way players and users find the interaction to be "predictable, logical" and "in line with expectations". From here they establish naturalness as "a psychological state dependent on both technology and individual differences." This means that different players will have different perceptions of the controllers they use, one of the factors for these variations being the familiarity with the controller type. Despite this, it is expected that certain button mappings to be more natural than others, and to eventually lead to more presence and enjoyment (Skalski, Tamborini *et al.*, 2010, pp. 225-226).

Game controllers and interfaces have become universal. Currently, they all share more or less the same design, with the same corresponding buttons between them: the face buttons, the joysticks, the triggers, the bumpers/shoulders, the D-Pad and the special buttons, usually named as the start and back button. Despite this, some games and consoles stand outside this basic design – the Nintendo Wii (Nintendo Integrated Research & Development, 2006) and Nintendo Switch (Nintendo Platform Technology Development, 2017) have their motion controllers, and games like Guitar Hero (Harmonix Music Systems, 2005) or Rock Band (Harmonix Music Systems. 2007) require their own interface to play. What happens is that certain interfaces make learning how to play much easier and natural (Przybylski, Rigby *et al.*, 2010, p. 156), as they can generate better involvement, and can even turn the game into a full-fledged simulation – games such as Rocksmith (Ubisoft, 2011) which require an actual electric guitar to play, or Elite Dangerous (Frontier Developments, 2014) which is advised to play with a joystick and slider for throttle control.

Natural modes of interaction are something game developers and designers wish for. However, what we call the most realistic and natural are most often only present in arcades. The vast majority of players play on home consoles (Williams, 2002), and use traditional gamepads to play. Therefore, real world actions are usually far from corresponding to the ones made in the real world. Running and jumping with a gamepad is usually done through the manipulation of a joystick and a simple push of a button. This can be labelled as a restriction on the physical involvement with the experience (Skalski, Tamborini *et al.*, 2010, p. 226). Nevertheless, we believe that gamepads are not at all limiting regarding game enjoyment and on their ability of originating presence. (Skalski, Tamborini *et al.*, 2010)'s conducted studies will support this statement.

In mapping, actions made by users in the real world can range from arbitrary to natural, depending on the relations between the real actions and their virtual correspondents. Arbitrary mapping would be, for example, to use random keys in a keyboard to control a character. If the Enter key made the

character move left, the M key made the character move up, etc. “These controls would be unrelated to the actions being performed.” (Skalski, Tamborini *et al.*, 2010, p. 226)

Natural mapping is defined as the opposite, with the controls being the most related to the actions inside the virtual world (Norman, 2013, p. 22). A great example of this is playing baseball in Wii Sports (Nintendo Entertainment Analysis & Development, 2006), where to hit the ball, we actually need to swing the controller as if it were a baseball bat.

Mapped controllers are directly related to the mental model of the environment, as it is through them how we understand the virtual environment along with its possible actions and events (Skalski, Tamborini *et al.*, 2010, p. 227). In a baseball gameplay environment, it is easier for users to access the spatial situational model with a controller that fits their understanding of baseball. Therefore, one can argue that naturally mapped controllers provide more accessibility when interacting with the game. From here, we can assume that natural mapped controllers should facilitate presence, as players will “focus less on the controls (...) and more on the game itself” (Skalski, Tamborini *et al.*, 2010, p. 227). The connection between audience and experience will be less notable, therefore we will feel more present (Madigan, 2016, p. 127)

(Skalski, Tamborini *et al.*, 2010) suggest four possible types of mapping, which of course are measured in analogical ways, and can be placed along the arbitrary-natural scale mentioned before. From most arbitrary to most natural they are: directional natural mapping, kinesic natural mapping, incomplete tangible natural mapping, and realistic tangible natural mapping (Skalski, Tamborini *et al.*, 2010, p. 227).

Directional natural mapping involves having correlating directions between interaction with the interface and the outcomes on the virtual environment. The most straight-forward example of this is the universally known “WASD” control scheme, where W is up, A is left, S is down, and D is right. The position of the keys complies with the directions we want to take. To go up, press the upper key, to go left, press the key to the left, etc... It is the most basic form of natural mapping (Skalski, Tamborini *et al.*, 2010, p. 227).

Kinesic natural mapping is related to real life body actions without the need of a tangible controller. Examples of this are the EyeToy (Sony Computer Entertainment, 2003) and Kinect (Microsoft, 2010), where we can play just by moving around. Forza Motorsport 4 (Turn 10 Studios, 2011) makes use of the Kinect (Microsoft, 2010) by allowing players to control the car as if they were holding an invisible wheel. This can be considered natural, as real-life actions match the

gameplay in the mediated environment, as well as carrying out the mental model of driving a car. However, the lack of a physical interaction with a tangible controller, reduces naturalness (Skalski, Tamborini *et al.*, 2010, p. 228). If we compare Forza Motorsport 4 (Turn 10 Studios, 2011) played with the Kinect (Microsoft, 2010) versus played with a steering wheel and pedals, the latter will complete the player's situational model much more easily.

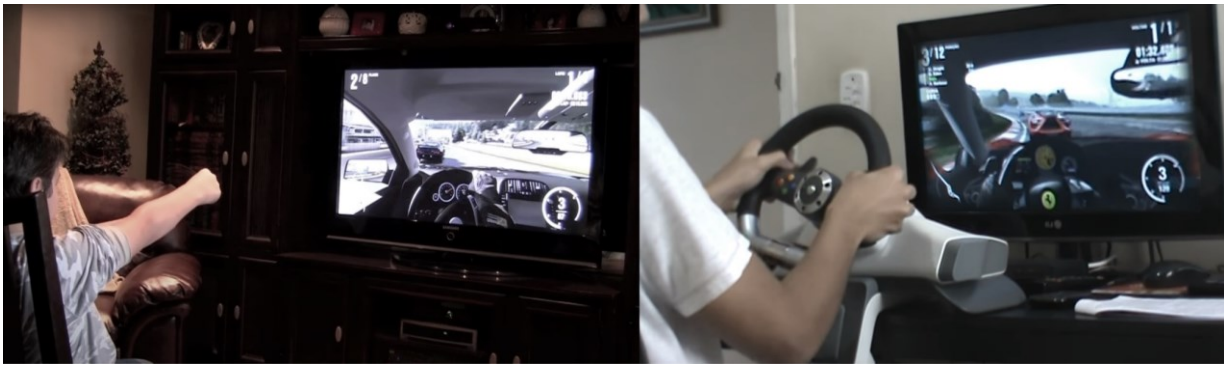

Figure 15 - Playing Forza Motorsport 4 with the Kinect and with a steering wheel[9]

Incomplete tangible natural mapping is characterized by having a physical and tangible controller, which allows the execution of movements as in the game (Skalski, Tamborini *et al.*, 2010, p. 228). The Nintendo Wii (Nintendo Integrated Research & Development, 2006) controller is an example of this, as players can use it as a tennis racket, a baseball bat, boxing gloves or a bowling ball when playing Wii Sports (Nintendo Entertainment Analysis & Development, 2006). However, the controller's general design makes the mapping incomplete. For instance, canoeing in the game's sequel Wii Sports Resort (Nintendo Entertainment Analysis & Development, 2009), the short size of the remote and lack of weight make it more difficult to play comfortably.

Lastly, realistic tangible natural mapping can be considered the most natural mapping in relation to the previous ones. It is most usually seen in arcades, in racing games played with driving wheels, shooting games with a gun controller, and dancing games with a steppable interface. This type of

[9] "Forza Motorsport 4 Kinect Tutorial" retrieved July 8th, 2021 from https://www.youtube.com/watch?v=qzYAZ_y2l7I&t=122s & "Forza Motorsport 4 + Xbox 360 Wireless Racing Wheel" retrieved July 8th, 2021 from https://www.youtube.com/watch?v=DoKsC2ol8o0

mapping facilitates the use of the mental model which then makes the bridge between player's actions and game world something very small and discrete.

Realistic tangible natural controllers may facilitate spatial presence and might even help in strengthening spatial situational models, which is the case of training with simulators, which help in developing and training certain skills (Tamborini & Bowman, 2010). Microsoft Flight Simulator X (Aces Game Studio, 2006) is an example of this, where it can serve for practicing familiarity with instruments, navigation, and communication (Schwalenberg, 2014).

We will present (Skalski, Tamborini *et al.*, 2010) conducted studies, and see how the different controller types compare between each other: (Skalski, Tamborini *et al.*, 2010, p. 229) suggest incomplete tangible natural mapping to be perceived as more natural than directional natural mapping, as tangible controllers complete mental models more easily. For the study, two home consoles were used for the comparison, the Nintendo Wii (Nintendo Integrated Research & Development, 2006) and the PlayStation 2 (Sony Computer Entertainment, 2000) (PS2), and although as seen before, players may be used to certain hardware, it is expected the tangible controller to be perceived as more natural. So, the authors hypothesise that incomplete tangible mapped controllers have a higher level of perceived controller naturalness than directionally mapped interfaces.

As natural interfaces allow for an easier interaction with the mediated environment, (Skalski, Tamborini *et al.*, 2010) suggest that "controller naturalness positively predicts spatial presence" and assume that because spatial presence makes player feel part of the environment, it should predict more enjoyment with the videogame.

Participants were asked to play the golfing game, Tiger Woods PGA Tour 07 (EA Redwood Shores, 2006) for 10 minutes. Some played it on the PS2 (Sony Computer Entertainment, 2000) with a gamepad sitting down, while others played it on the Nintendo Wii (Nintendo Integrated Research & Development, 2006) standing up, using the Wiimote. After this, perceived controller naturalness, spatial presence, and enjoyment were measured through the form of questionnaire.

The PS2 (Sony Computer Entertainment, 2000) controller falls in the directional natural mapping category, while the Wiimote can be considered an incomplete tangible natural mapping, as it allows for the playing of the videogame with the actual movements required for playing golf. The PS2 (Sony Computer Entertainment, 2000) version of the game simply requires the player to pull and push the analogue stick to hit the ball.

Results came to validate the two given hypotheses that incomplete tangible mapped controllers are perceived as more natural when compared to a directional natural mapping one — playing with the Wiimote was perceived as more natural than playing with the PS2 (Sony Computer Entertainment, 2000) gamepad — and that controller naturalness is a positive predictor of presence (Skalski, Tamborini *et al.*, 2010, p. 232). However, the presented hypothesis for presence being a predictor of enjoyment was not verified.

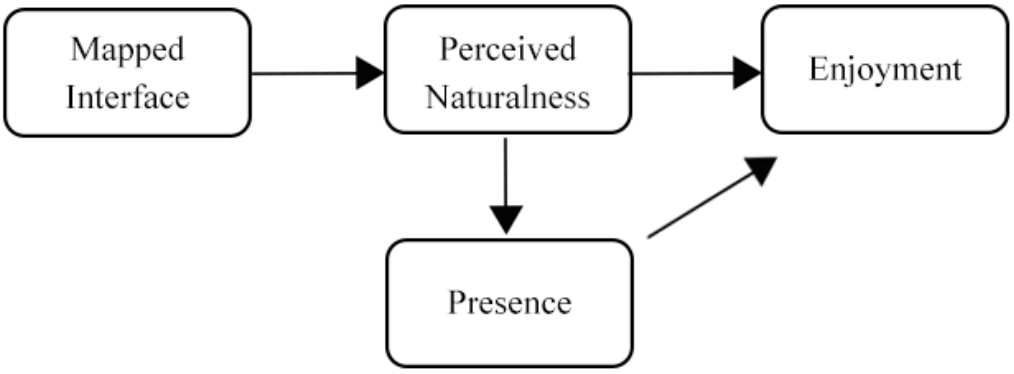

Figure 16 - Spatial presence does not increase enjoyment (Skalski, Tamborini *et al.*, 2010, p. 233)

Because the results of the first study did not suggest that spatial presence is a predictor of enjoyment, a second one was conducted, in order to confirm this result. It is suggested that "realistic tangible natural mapping, such as a driving wheel, should be perceived as more natural than incomplete tangible mapping, for example the Wiimote, because it even more quickly and accurately completes the mental model for the real-world behavior." So, the second study consisted in the comparison and measurement of naturalness of realistic tangible natural mapping controllers versus other categories of controllers. Added to the previously suggested hypothesis, (Skalski, Tamborini *et al.*, 2010) aim to know if "players of a game with a realistic tangible naturally mapped controller will experience a higher level of perceived naturalness than those who play the game using other control devices."

This time, participants were asked to play a driving game, Need for Speed Underground 2 (EA Black Box, 2004) for 10 minutes. Some played with a keyboard, others with a joystick, others with a traditional gamepad, and the remaining played with a steering wheel, the tangible naturally mapped controller. As predicted, the steering wheel was perceived as the most natural controller when compared to the other types. It also came to reinforce the hypothesis that more natural controllers

are positive predictors of presence. However, it also came to confirm that presence is not a predictor of enjoyment (Skalski, Tamborini *et al.*, 2010, p. 234).

(Skalski, Tamborini *et al.*, 2010) studies confirm that tangible naturally mapped controllers are perceived as the most natural ones, and that controller naturalness is a positive predictor of presence. It also came to show that **presence does not translate into more enjoyment, which brings motivations to explore videogames not only in content, but also in their interactivity features and the user experience they bring** (Skalski, Tamborini *et al.*, 2010, p. 238).

Knowing what types of mapping exist brings an easier way to study and understand them. We now recognize that both presence and game enjoyment are influenced by users' apparent naturalness of the controller. Presence is not as important for game enjoyment as thought to be, as being present in the game world does not mean more game enjoyment. Nevertheless, perceived controller naturalness is a predictor of enjoyment, as it allows players to focus on the game, without having to worry about the actions needed to play (Skalski, Tamborini *et al.*, 2010, p. 239).

(Skalski, Tamborini *et al.*, 2010, p. 240) note that interfaces and controllers may become more natural as players use and get used to them. Additionally, even though tangible naturally mapped controllers are considered the most natural ones, this does not mean everyone needs to play with a full steering setup, in the example of car games. For some people, a gamepad is just enough to enjoy the game, be it because they are more used to it or find a gamepad or keyboard good enough for the type of experience they are looking for. This is dependent on the existing types of players, casual or hardcore ones. We can play Dirt Rally 2.0 (Codemasters, 2019) either with a directional natural mapped controller or a realistic tangible natural one, and the perceived experience will vary accordingly. If we play with a keyboard or gamepad, we might make better times on the events and feel a certain amount of challenge and excitement. If we play with a steering setup, the experience we will have will be much different, as the skills required to maintain or break the time set before are more demanding. However, it is with a realistic tangible natural controller that we can literally feel the car jumping up and down on the road's bumps and flying through corners.

A control interface coordinates player's behaviours (Przybylski, Rigby *et al.*, 2010, p. 156). Players learn and understand the basics of the game, such as its environments and how they work, as well as the game's mechanics by playing. Likewise, they play through the control interface, which can make it easier or harder to do, depending on the one used. The control interface can be hard or easy to use depending on a few varying factors: its mapping, referred to the way actions in real life are translated in the virtual world, the learning curve of using the mapping to perform in the game, along with the grasp players have of the controls. Mastery of controls plays a huge role in motivation, as it stands before satisfying play and is defined as "the learned ability of effortlessly perform[ing] intended actions in the game's virtual environments." (Przybylski, Rigby *et al.*, 2010, p. 156). However, intuitive and naturally mapped controls do not always mean they are easy to use straight out of the box. Skateboarding games such as Session (Crea-ture Studios, 2019 Early Access) or Skater XL (Easy Day Studios, 2020) prove this, as they have a steep learning curve, but once we have a better understanding of the game play and how it works, the sense of competence and enjoyment skyrockets. The learning curve is understood as the rate at which someone learns a new skill (Cambridge Dictionary, 2021) and is the "price of admission" for experiencing the full intended design behind the game (Przybylski, Rigby *et al.*, 2010, p. 156).

Both Session (Crea-ture Studios, 2019 Early Access) and Skater XL (Easy Day Studios, 2020) feature directional natural mapping which connects the skater's body and legs with the controller's joysticks and triggers. The left foot corresponds to the left joystick, while the right stick corresponds to the right foot. Having these correlating directions between interaction in real life and the actions in the game, delivers a very similar experience to skating in real life. Despite being hard to start, once we have a better understanding of how skateboarding tricks work in real life, the game becomes more accessible, as it mimics the real sport. Doing an ollie – a simple jump with the board – requires popping with the back foot and pushing with the front one. In the game we do this by pulling the back foot joystick backward and pushing the front foot joystick forward. The rest of the tricks are built on the foundation of this mapping, which then permits the game to deliver aesthetic experiences of challenge, freedom, exploration, and submission as pastime. These aesthetic experiences are, positively, the same ones we can experience when skateboarding in real life.

The mapping of a game, and the way it is able to fulfil users' basic psychological human needs, can build up to the "the feeling of being in the zone", being directly related to presence and skill (Madigan, 2016, p. 121). This is known as the concept of *flow* (Csikszentmihalyi, 1990). We can relate the flow state to players' engagement, as it provides a sense of discovery and transports a person into a new reality. It is even described as a transformation of the self, where performance is

highly stimulated and can reach greater levels than ever before (Csikszentmihalyi, 1990, p. 74). Studies focused on measuring autonomy, competence, and relatedness needs, while having mastery of controls and players' experience of immersion into account, proved that games richer in autonomy and competence need satisfaction provide better short-term well-being and intrinsic motivation to play than games which fail at that (Przybylski, Rigby *et al.*, 2010, pp. 157-158). Mastery of controls does not one hundred percent guarantee satisfying game experiences, but it allows for the full intended game experience, which in itself is the step for meeting players' psychological needs. (Csikszentmihalyi, 1990, p. 71) also defines an experience as optimal, if it transmits senses of competence, by providing an adequate challenge powered by a goal, enclosed in a rule system. He lists activities that entail intrinsic motivation, such as making music, rock climbing, dancing, sailing, between others. Videogames can also be considered an optimal experience, as they share characteristics with his definition of an optimal experience.

(Csikszentmihalyi, 1990, pp. 74-75) illustrates engagement in an experience by giving the example of a boy named Alex, learning to play tennis, and a diagram which shows his varying states in different moments in time.

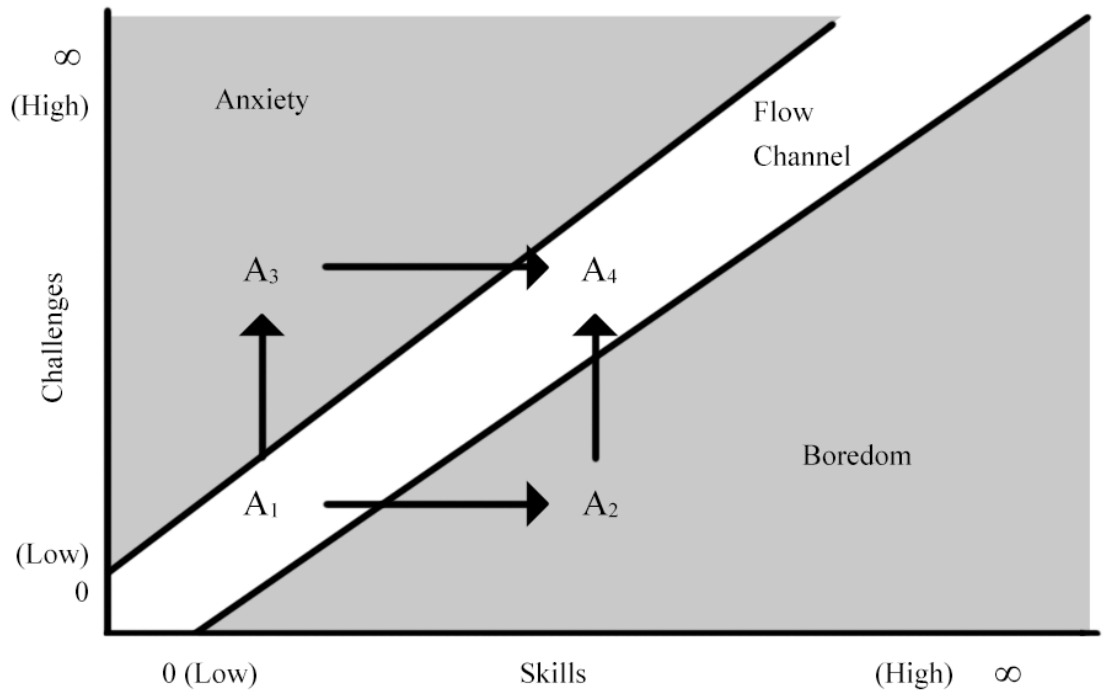

Figure 17 - Flow experience diagram (Csikszentmihalyi, 1990, p. 74)

"When he first starts playing (A1), Alex has practically no skills, and the only challenge he faces is hitting the ball over the net. This is not a very difficult feat, but Alex is likely to enjoy it because the difficulty is just right for his rudimentary skills. So at this point he will probably be in flow. But he cannot stay there long. After a while, if he keeps practicing, his skills are bound to improve, and then he will grow bored just batting the ball over the net (A2). Or it might happen that he meets a more practiced opponent, in which case he will realize that there are much harder challenges for him than just lobbing the ball—at that point, he will feel some anxiety (A3) concerning his poor performance.

Neither boredom nor anxiety are positive experiences, so Alex will be motivated to return to the flow state. How is he to do it? Glancing again at the diagram, we see that if he is bored (A2) and wishes to be in flow again, Alex has essentially only one choice: to increase the challenges he is facing. (…) By setting himself a new and more difficult goal that matches his skills—for instance, to beat an opponent just a little more advanced than he is—Alex would be back in flow (A4).

If Alex is anxious (A3), the way back to flow requires that he increase his skills. Theoretically he could also reduce the challenges he is facing, and thus return to flow where he started (in A1), but in practice it is difficult to ignore challenges once one is aware that they exist.

The diagram shows that both A1 and A4 represent situations in which Alex is in flow. Although both are equally enjoyable, the two states are quite different in that A4 is a more complex experience than A1 . It is more complex because it involves greater challenges, and demands greater skills from the player.

But A4 , although complex and enjoyable, does not represent a stable situation, either. As Alex keeps playing, either he will become bored by the stale opportunities he finds at that level, or he will become anxious and frustrated by his relatively low ability. So the motivation to enjoy himself again will push him to get back into the flow channel, but now at a level of complexity even higher than A4.

It is this dynamic feature that explains why flow activities lead to growth and discovery. One cannot enjoy doing the same thing at the same level for long. We grow either bored or frustrated; and then the desire to enjoy ourselves again pushes us to stretch our skills, or to discover new opportunities for using them." (Csikszentmihalyi, 1990, pp. 74-75)

(Gee, 2005) and (Vygotskiĭ & Cole, 1978) both defend that a learning process works the best when new challenges are considered pleasantly frustrating. Challenges must try to be balanced, staying in an ideal zone – not too easy and not too hard – and they should be within the range of players' competence and never outside it. Even so, if players fail at their current objective, they should still feel like they are learning or making progress so that the next time they can better succeed. Videogames can fulfil the basic psychological human need of competence with the

pleasantly frustrating challenges they are made up of. Game enjoyment, immersion and intrinsic motivation to play are directly related to the three psychological human needs, and natural mapping is a great influencing factor for it. When in the flow state, the videogame experience is perceived as more intuitive and user friendly, which makes sense as if the game's systems are more intuitive and natural, the connection between audience and experience will be less notable, therefore we will be closer to being present.

5. Agency

Agency and choice are concepts which are not always easy to define. Consequently, discussions surrounding these subjects do not have an empirical conclusion.

Playing games is a means to an end, as it is an intrinsically motivated action – we play for the very act of playing (Nguyen, 2020, p. 1). Currently, developers aim more and more towards creating experiences which deliver freedom and agency to players. Such games promote decision making at greater levels (Pereira, 2018). Assassin's Creed Odyssey (Ubisoft Quebec, 2018), the eleventh title of the series, added new features in order to give more agency to players, by letting them "steal, murder, betray, and disobey anyone they choose to, so long as [it] fit[s] within the confines of the story" (Pereira, 2018). In addition, developers also added the possibility of turning off guiding hints in the heads-up display (HUD), which allows players to be more immersed in the game's world, by putting to the test their knowledge of the environment, when looking for specific characters and points of interest. Consequently, these possibilities of choice lead to interesting and unique encounters, not only from a narrative standpoint, but also from one of gameplay.

Red Dead Redemption 2 (Rockstar Studios, 2018) provides agency by encouraging players to look beyond the core loops of gameplay and the narrative progression and letting the game's dynamics take over. An example of this is when the game expects players to maintain their character's look and hygiene. Depending on the player's state and figure, NPC's will have particular reactions.

Nevertheless, not all games and genres need the same exact level of agency both games provide. Agency must be set up accordingly to the experience developers wish to create. As (Pereira, 2018) states, The Last of Us (Naughty Dog, 2013) "would not have had the same emotional impact if players could freely control Joel's actions and make his decisions for him."

Let us understand agency and its nature, as well as what it brings in terms of interaction. Videogames are always distinguished from other traditional media because of their interactivity. In videogames, players do not simply consume the media, they participate and create the experience as they play (Calleja, 2011, p. 56). Videogames turn away from the usual spectator model and move to one of active participation (Muriel & Crawford, 2020, p. 139). To note of course, that this participation is always restricted within the videogame's mechanics and environments. Videogames present choices to players and certain titles or genres may be more explicit than others when it comes to communicating agency. Games such as Until Dawn (Supermassive Games, 2015) or Detroit:

Become Human (Quantic Dream, 2018) allow players to experience their narratives according to the decisions made. As the game moves forward, the player is given options to choose from, which will have repercussions on the unfolding of the narrative, affecting the world and characters, hence creating multiple endings for the game. Despite also having a narrative and a fixed objective to follow, games such as the Dark Souls (From Software Games, 2011 – 2016) series or Snowrunner (Saber Interactive, 2020) for instance, give freedom to the player for exploring the various dynamics the game has to offer, through their open-world structure. Despite not having multiple endings to their narratives, this freedom brings with it opportunity for action (Rose, 1999, p. 32).

Figure 18 - Comparing a moment from "Detroit:Become Human" and the Dark Souls pair of bosses "Ornstein and Smough"

(Muriel & Crawford, 2020) aim to identify the key characteristics of agency in videogames and in what ways different videogames allow for different forms and levels of agency, which in themselves bring opportunities for exploring meaning and behaviour.

The concept of agency can be taken as the “multiple, distributed, and dislocated production of differences and transformations that can take a multitude of forms.” (Muriel & Crawford, 2020, p. 140) In this way, agency permits the understanding of transformation and change within a certain reality. In videogames, agency is comprehended as an enabler of action and opportunity, therefore it is associated with ideas of freedom, control, and responsibility. It is up to the player to make the decisions that move the game forward, be it the choice of taking the path to the left or to the right or the choice of who to kill and who to save. The fact that the player has control over his actions and their implicit reactions means that he is also responsible for his own achievements and failures (Muriel & Crawford, 2020, p. 140). Imagine getting killed by a Grunt in Halo: Combat Evolved (Bungie, 2001). Even though we died from something outside our command, it was our decisions that brought us to that moment. The fact that we did not manage to kill the Grunt in time, be it

because we were dealing with other enemies or looking at the beautiful vistas, led to it killing us instead. Agency and the ability for the player to make decisions within the game are at the core of interactivity in videogames (Muriel & Crawford, 2020, p. 139).

Agency can be summed up in something which permits change and transformation within a reality, limited by its rules and environments. Videogames integrate players in their worlds by letting them freely interact, which pushes them into becoming "the central agent in the system" (Muriel & Crawford, 2020, p. 148).

(Muriel, 2016) equally points out how agency creates differences and transformations and that it exists when it transforms reality. However, he mentions that it does not have to do with the intention or desired action of the player, but with the identifiable transformations that occur (Muriel & Crawford, 2020, p. 142). Still, even though it can be claimed that transformation is a key characteristic of agency and not the intention of who acts, we should note that we act based on the expectation that something will happen, some kind of change. The feeling of agency is important in videogames because players' actions are driven by the game, and the game only exists when it is being played, as player and videogame need each other mutually (Tulloch, 2014, p. 348).

So, intention and transformation live together. Without transformation, action becomes meaningless and if transformation does not exist, agency does not exist as well (Muriel & Crawford, 2020, p. 142).

Janet Murray affirms that when we find ourselves in an immersive environment, we seek meaningful interaction and when these interactions are transformed into tangible results, the user will experience what is called agency (Murray, 1997, p. 126). Agency is the capability of performing an action and observing its outcome.

In a paradoxical way, the momentary loss of agency in a videogame, can also help with the creation of sensation aesthetics. Horror games such as Outlast (Red Barrel Studios, 2013) and Alien: Isolation (Creative Assembly, 2014) work on the premise of removing control from the player, putting him in an inferior and fragile position, limiting the number of actions he can take. However, these actions can become much more meaningful given the pressure and tension the gameplay creates. Videogames can both give and take agency, forcing the player to think and be flexible with his actions (Thornham, 2011, p. 82).

Videogames deliver us a set of abilities and obstacles and show us what goal to get. This creates an activity that allows us to take a new form of agency, as we adapt to the videogame's environment (Nguyen, 2020, pp. 15-17).

Alongside obstacles and restrictions, videogames offer freedom of choice and action. As such, it is the player who will feel frustrated, vulnerable, and incapable when he fails to achieve what was desired, and triumphant and happy when he accomplishes what he had projected. As (Juul, 2013, p. 7) refers, videogames "promise us a fair chance of redeeming ourselves", by the feeling of control they provide. Agency brings with it ideas of interactivity, freedom, autonomy, and empowerment (Muriel & Crawford, 2020, p. 153) and when talking about it in videogames, the player should be the main focus, due to the fact that it is him who controls the several moments of play. Videogame environments incentivise players to act according to built expectations, generating stories filled with emotion, which then end up being shared.

So, it is said that videogames can communicate forms of agency (Nguyen, 2020, p. 1). The same way traditional storytelling media let us see lives and experiences we have not lived, videogames let us explore forms of agency we otherwise would never know. For Nguyen, these experiences of agency can be considered an art form, for the intrinsic value they possess (Nguyen, 2020, p. 2).

(Murray, 1997) uses the medium of theatre to better illustrate agency. If in a play the audience had the ability to intervene in it or even to ignore certain characters, its plot would always vary from show to show (Murray, 1997, p. 126). Nevertheless, we must note that the feeling of agency is not achieved with simple interaction. Let us imagine a barrel in a videogame. If, as players, we could interact and move that barrel out of place for the simple reason of being able to move it, interaction would not be meaningful, and agency would not exist. However, in several shooting videogames, players have the ability to blow up barrels by shooting at them and the explosions caused by these barrels then kill or alert enemies. In this case, the player's actions cause a tangible effect in the world leading to the existence of agency. **Agency makes players play with intention and strategy, and goes beyond participation and interactivity.** It is an aesthetic pleasure, which must be enjoyed for its own sake (Murray, 1997, p. 128). If we can interact with an object, but are not able to create any dynamic with it, then what is its use? It is just an object we can come into contact with.

Agency differs from game to game, as well as its perception on the part of the players (Eng, 2020). Through the MDA Framework we saw that as players make use of the game's mechanics, they will have aesthetic sensations. In other words, actions through gameplay affect the game and player in some way. This applies to games from Gone Home (Fullbright Company, 2013) and Dear Esther (The Chinese Room, 2012), considered to have low interactivity, to games with more complex and dynamic systems, such as The Witcher 3: Wild Hunt (CD Projekt Red, 2015) or Middle Earth: Shadow of Mordor (Monolith Productions, 2014). All games possess different ways of

involving players, and it is argued that player preference also affects their perception of it (Grosso, 2015).

Agency consists in allowing players to make choices about their actions within the game. What armour to equip, to be nice or to be rude, to go left or to go right. However, interactions within the game vary from player to player, along with their motivations. (Bartle, 1996)'s four player types come in handy as a way of seeing these motivations. Bartle divides players into four types: killers, achievers, socializers, and explorers. Each one of these types of players are considered to have their own reasons for playing, and Bartle got to them by thinking of the dimensions of behaviour players have: **acting on** the game versus **interacting with** the game, as well as if the actions are focused towards **players** or the game's **world**.

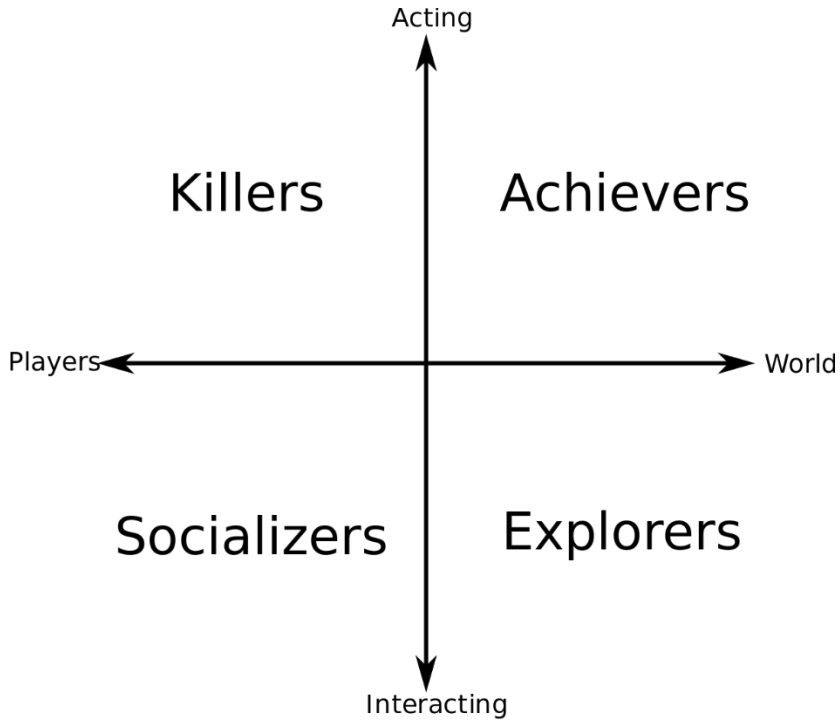

Figure 19 - (Bartle, 1996)'s four types of players

This translates into *killers* who wish to act on players, and *socializers* who wish to interact with players. On the other side of the diagram, we have *explorers* who wish to manipulate, explore, and interact with the virtual world, and *achievers* who wish to act within the virtual world (Bartle, 1996). On the *acting* half of the diagram, we have players who look for a test of skill, while on the *interacting* half players seek someone or something to interact with. From here we can comprehend how different players may look for certain kinds of agency.

(Grosso, 2015) mentions how Dark Souls (From Software, 2011) is a game capable of offering agency to the four player types of Bartle, despite being heavily pointed towards the acting side of the diagram. The game's true test of skill, with its lethal combat and tense exploration, make it certainly capable of delivering an aesthetic experience, be it of disempowerment or frustration, or of challenge, achievement, and discovery. Additionally, the game also allows for offline interaction with NPC's and online interaction with other players through the hints left on the world, as well as through the summoning's and invasions.

On a different degree, we have games such as Fallout: New Vegas (Obsidian Entertainment, 2010) which does not force players into combat and lets them take progression in the game through many ways, like for example through charismatic interactions. This does not make one game better than the other, it just creates different types of experiences through gameplay, which of course will appeal to different players.

Either through narrative or gameplay, videogames allow for the feeling of agency, giving certain amounts of control, influence, and power to the player (Eng, 2020). Game mechanics are how players play with the game and if not for meaningful decisions, interaction with the game would be always the same. Moreover, agency and this sense of control promotes well-being in our lives (Thompson, Armstrong *et al.*, 1998).

At times, agency can be something hard to communicate to players, bringing to mind the questions of: how much agency is enough and what is the most efficient way to convey it to players, so that they are moved by it? (Thue, Bulitko *et al.*, 2010) distinguish theoretical agency from perceived agency, because it is one thing the control and influence players possess, and another the amount of control players are actually aware about and have at the tip of their fingers. Fasih Sayin mentions in his "User Responses to Narrative-Driven Games" GDC talk, a few cases in videogames where this is noticeable. In Beyond: Two Souls (Quantic Dream, 2013) players had the ability to miss entire scenes from the narrative. However, not many players noticed it, as everyone played linearly (Sayin, 2014). Because expectation and action are connected, the way players perceive agency fluctuates with their intentions (Thue, Bulitko, Spetch, & Romanuik, 2010).

(Thue, Bulitko *et al.*, 2010) refer that intention and action are dependent on four elements of agency: *foreseeability*, *ability*, *desirability*, and *connection*. Foreseeability consists in the way players see the possible options and decisions the game provides. It ranges from dialogue options displayed on the screen to affordances in the level.

Figure 20 - The Walking Dead (Telltale Games, 2012) narrative decisions and Hollow Knight (Team Cherry, 2017)'s environment with multiple directions to take

Ability, as the name suggests, is related to the ability the player has, in a certain moment, of performing an action. Can he consume a certain item? Can he follow a different route or change objective entirely? If he can, then he possesses ability.

Desirability relates to players' motivation, reasons, and desired actions. In "A Bestiary of Player Agency", (Ashwell, 2014) refers to subcategories of agency in relation to the player. From the listed subcategories, we can better comprehend how different games are capable of providing different types of experiences.

The first subcategory (Ashwell, 2014) lists is the one of *big decisions*. Big decisions are, most of the time, seen as great moments of choice. Choose the good side or the bad side, choose who to save or who to kill. Clear examples of this are the Mass Effect (Bioware, 2007 – 2017) series where players can choose Paragon or Renegade dialogue options. In these types of interactions, it is always suggested that the choice made will have irreversible consequences in the narrative and its upcoming moments. Agency in a big decisions form can have the advantage of being clear and noticeable for the player, which therefore will not have any doubt if he is before a critical and important moment or not. Still, at times, this creates expectations that something big is about to happen. These decisions are presented as game changing moments, and the anticipations players build might make the outcomes harder to deliver (Ashwell, 2014). In a game such as Far Cry 3 (Ubisoft, 2012), deciding moments show that the game is coming to its end. This does not make it a worse or better game, but it might break players' suspension of disbelief if it comes up out of nowhere, as it is just one of a few total deciding moments that exist during the whole game. Additionally, we can look at its ending where, in our opinion, was not the best adoption of a big decision moment. The reason for it is that

during Far Cry 3 (Ubisoft, 2012)'s playthrough we have been following the linear story of Jason Brody and the adventures he goes through in order to save his friends. We experience his transformation from a hesitant and ordinary person to someone fearless, confident, and slightly deranged (Far Cry Wiki | Fandom, 2021). However, in the final moments of the game, we are given the choice of staying on the island or saving his friends. Despite being given a moment of agency, because we have been viewing Jason's journey from the outside, without a way to change the greater narrative set-pieces, being given the binary choice of embracing the jungle and leaving our friends behind versus saving our friends and going back home, is somewhat underwhelming as we wanted to know the choice Jason would make, after all that he went through. Would he keep his promises and rescue his friends, or did the struggles he went through made him truly an insane person, consumed by the jungle and all that it involved? This goes in hand with (Pereira, 2018) reflections on the type of emotional experience The Last of Us (Naughty Dog, 2013) is.

"Agency is about cause and effect (…) and cause and effect is a relationship in time" (Ashwell, 2014). In most games, we have the side-by-side progression of gameplay with the unfolding of the narrative. (Ashwell, 2014) refers to this as *velocity* in the context of agency. It comes to show how as a game and its storyline progress, new types of decisions for the player emerge. In metroidvania games such as Hollow Knight (Team Cherry, 2017) and Ori and the Blind Forest (Moon Studios, 2015) this is very common, for the fact that as the game progresses, players are given new abilities and skill sets. At times however, designers are simply tempted to push the game's difficulty in order to match the high climatic narrative moments (Ashwell, 2014). This can make the game unbalanced in terms of challenge and triumph, breaking the player's flow state, possibly even leading to him giving up on the game entirely. We consider Ori and the Blind Forest (Moon Studios, 2015) to suffer from this in the "Ginso Tree" section's ending. The player must enter the Ginso Tree to retrieve the "Water Vein" inside it. During his exploration, he will unlock the "Dash" mechanic, which allows him to reach higher places as well as to dodge projectiles (Ori and the Blind Forest Wiki | Fandom, 2021). When the player finally finds the Water Vein, a water flood is triggered from which he will have to run away. During this specific moment of the game, difficulty goes up drastically, putting players' skill to the test by making them use all the powers and abilities acquired until that point. But this sudden change of difficulty gets players to die much more easily, making them repeat the climatic segment again and again until they succeed. The set-piece ends up becoming a series of trial-and-error attempts, creating frustration that ends up breaking players' connection both to the narrative and to the gameplay.

Another shape agency can take is the one of *grasp*. It merges with traditional definitions of agency, as it consists in the need and desire of getting a hold of the game's world to some degree. It is the feeling and capability of knowing that our actions may originate something different or new in the world (Ashwell, 2014). These actions are based on expectation; therefore, games must maintain their coherence and consistency, more specifically in its rules and mechanics. Because it can be seen in the simplest of mechanics, it does not require a particular narrative context. When we jump, we expect our character to fall to the ground again. If this rule is kept during the game, it will contribute to the game's overall consistency and player's expectation. Of course, that the same way we can remove player agency in order to generate a certain aesthetic, we can also break player's expectations.

Focus is another subcategory of agency and is more easily seen in open world and RPG games. It exists when the game offers various paths and choices to the player but forces him to pick just a single one of them, and to carry it until the end of the game (Ashwell, 2014). This must not be confused with the simple classic examples of taking the trail to the left or to the right, as it is more related, for example, to the level up system seen in Fallout 3 (Bethesda Game Studios, 2008).

Figure 21 - Fallout 3 (Bethesda Game Studios, 2008)'s level up menu

The player has a certain number of points to spend, and he must choose where to invest them. Will he focus on the skill of lock picking because of a certain safe he wishes to open, or will he go for explosives in order to follow an opportunity that was suggested to him? Focus agency performs the best when multiple options are given to the player, but he can only direct his attention to one – "Focus choices are more compelling when they are choices between alternatives, when you have to

dim the emphasis on one element if you want to pay attention to another" (Ashwell, 2014). Rimworld (Ludeon Studios, 2018) can also serve as a good example for this categorization of agency. As we upgrade and develop our base, we will need to appoint the settlers to specific tasks, to be as productive as possible. If one settler already has good farming skills, then we will appoint him to that task and not to another which will take him much longer to learn and master. Focus does not allow us to establish a specific aspect of the game; rather it allows us to pick what characteristics of it we wish to concentrate on (Ashwell, 2014).

Certain players look for games that allow them to express themselves and their personalities through gameplay. This type of agency is labelled as *identity and self-insertion* and clashes with games that have a linear narrative and hero (Ashwell, 2014), such as the Uncharted (Naughty Dog, 2007 – 2017) or Splinter Cell (Ubisoft, 2002 – 2013) series, whose heroes' identities are fixed, forcing players to adopt them when playing. Of course, this does not make these games better or worse, in fact, we believe that the more a hero's character is well defined, the more consistent his story can be. Nevertheless, we can compare these games with Dishonored (Arkane Studios, 2012), an action-adventure game with a narrative, that on the contrary to Uncharted (Naughty Dog, 2007 – 2017) and Splinter Cell (Ubisoft, 2002 - 2013), never shows Corvo's look and voice, making it easier for players to be and identify as the hero. A slightly different case that also fits the identity and self-insertion discussion is the comparison between the beginnings of Fallout 3 (Bethesda Game Studios, 2008) and Fallout: New Vegas (Obsidian Entertainment, 2010). In the former, our character is contextualized as a vault boy who is on the search for his father, while in the latter we are a carrier that lost his memory. Despite both games offering expression through play, the context given at the start can make the experience more cohesive and easier to relate in terms of identity.

One other agency form (Ashwell, 2014) refers to is *aesthetic* agency. It refers to customization, such as naming our character, painting our car, selecting our outfit. Even if not affecting gameplay, these aesthetic choices contribute to a sense of expression and ownership, as well as for building investment on the player's side.

Agency as *challenge* can also be distinguished when the game progresses due to player's skill and his comprehension of it. It involves learning and mastering a certain component of the game, which then provides a sense of agency when successfully performed (Ashwell, 2014). Some games may be easier to learn than others, comparing for instance Hollow Knight (Team Cherry, 2017)'s gameplay with Session (Crea-ture Studios, 2019 Early Access), where learning to play is a lengthy process. Nevertheless, both these games can create a great sense of achievement when a test of skills has a positive outcome. As (Ashwell, 2014) puts it "[p]eople are likely to have more attachment to

something that they feel they earned than to something they were merely given, so successfully negotiated challenge can build investment in the progress of a game."

Tactics and strategy is a form of agency related to how challenges presented by the game can be beaten. It is connected to the way players can approach the obstacle they face, and if the several moments of play result in the expected outcomes (Ashwell, 2014). Rimworld (Ludeon Studios, 2018), XCOM: Enemy Unknown (Firaxis Games, 2012) and other management or turn-based games are clear examples of this, as each move the player makes will add up, turn by turn, to a certain outcome in the future. While in Halo: Combat Evolved (Bungie, 2001) we can choose to fire our weapon or throw a grenade at almost any time, XCOM: Enemy Unknown (Firaxis Games, 2012) players must think of the best strategy in order to defeat the enemy team. We should note that when playing Halo: Combat Evolved (Bungie, 2001), strategy is also involved, as we can choose what weapon to carry and how to act in the battlefield, if in a defensive or offensive way for example. However, tactical and strategic games, as expected from their name, just more clearly illustrate this agency type.

If we think about it, cheating can also be a form of agency, as players gain control over certain parts of the game. Be it invincibility, infinite ammo, or a console command, "cheating gives players a very direct control over the game" (Ashwell, 2014). Resorting to a walkthrough or tutorial also provides a sense of control to the player, despite the reason for it, at times, coming from frustration.

Interactions which lack meaning can be considered weak (Murray, 1997, p. 128) (Ashwell, 2014) (Pereira, 2018). If people are invited to interact with an artwork, without having a reason for what they are doing, be it because it does not provide any type of agency like grasp, velocity, or challenge, they lose interest and move to another activity. Nonetheless, it should be noted that some moments of weak interaction can be used to maintain a game's pace and not to overwhelm players with constant significant choices.

Exploratory agency is also mentioned as a subcategory of agency. It is attained by having freedom of movement and navigation within the game's world. It is the feeling of uncovering and seeing all the world's locations and feeling like we know, understand and are able to return to those places (Ashwell, 2014).

It can then be acknowledged that different types of players will prefer different types of games because of the types of agency they offer. Understandably, as a game can deliver several forms of agency, which mix and blend together, they create unique experiences (Eng, 2020).

Despite not having measured the most efficient way of conveying agency to players, we know in what different forms agency can get to players.

The remaining sub-component of agency (Thue, Bulitko *et al.*, 2010) refer is connection. It is formed when the player receives the outcome of his action, be it a reward, a punishment or simple feedback. When players act and see its result, an emotional response is triggered, even if it is very small.

The creation of meaningful decisions is something hard to achieve, as a balance between freedom and constrains must be established. Giving players the full control of the game could make it trivial and non-challenging so games should aim to provide agency, but should also know when to limit it, to create expectation and challenge. Games should not provide one hundred percent of agency one hundred percent of the time, as that would not deliver a meaningful experience to players. Within the game, players' agency should be balanced according to the developers' desired experience. Just Cause 2 (Avalanche Studios, 2010) lets us explore its vast world by giving freedom to the player through its open-world and locomotion mechanics. Alien: Isolation (Creative Assembly, 2014) would not be such a scary game if the player had the same amount of freedom he has in Just Cause 2 (Avalanche Studios, 2010).

Agency in games is at its maximum level when the four listed components exist, however it does not ensure its perception (Thue, Bulitko *et al.*, 2010). Developing a great videogame experience is difficult due to finding the balance between challenge, freedom, action, and choice, and being able to provide players with meaningful decisions to take, however, the question of what moments of play require agency, and which ones benefit from it being toned down or entirely removed (Pereira, 2018) persisted. Nevertheless, the categories, factors and labels discussed can certainly help answer this question and in supporting future videogame development and analysis.

Videogames can make us care about a particular thing through its rules. Not a general thing like world hunger or politics, but something a bit more specific. When we play chess, we worry about losing our playing pieces, when playing football we care about getting the ball past the goal line, in Battlefield 1 (DICE, 2016) we care about the control points we are capturing. During play, goals, abilities, and obstacles become fundamental and influential to our decision making.

"The [game's] goals, combined with the game's mechanics, tell us whether we are to manipulate our opponent or bargain with them, whether we are to cleverly profit off their actions or simply attack them. A game's goals tell us what to care about during the game. When we play a game, we simply take on the goals it indicates, and acquire the motivations that the game wishes us to acquire." (Nguyen, 2020, p. 16)

A great example of this is how Monopoly's money only has value when we are, in fact, playing Monopoly. When we begin playing, our focus changes and we take on a new goal, along with its required concerns.

Additionally, unlike in real life, it is much easier to change who we are and care about when immersed in a videogame. Let us take as an example the act of cooking. It is 7 o'clock in the afternoon and we just got home after a long day of work. It is almost dinner time, and we are already feeling hungry, so we decide to start making dinner. However, the kitchen is a mess and there are no ingredients to cook with. We can describe this sensation as demotivating, frustrating and even tiring. But imagine that when we had arrived, the kitchen was all tidied up and cleaned, with all the necessary ingredients and tools required to cook a delicious lasagne on top of the table. The emotions felt would be completely different. We would be excited and relaxed, as life would be simplified. During several moments of our daily lives, we feel the same type of emotions as when the kitchen is messy. We feel as we do not have the control and influence to adapt the world around us to our needs. When we turn on a videogame, it is as if we would have entered the fully prepared kitchen. Videogames, at their core, provide this sensation of control we cannot always get in real life (Stuart, 2015).

Most of our daily chores are accomplished with a final objective in mind. In videogames, we play simply for the act of playing (Murray, 1997, p. 128). Games are to be enjoyed as means rather than an end, because it is the process of playing that is enjoyable, not necessarily its final result (Nguyen, 2020, p. 1).

For (Nguyen, 2020) playing a videogame involves taking a new form of agency. However, games are made by designers and developers so, when we play, we let them, through the game, tell us how

to act and what to care about. This comes as an argument as to why videogames might injure our feelings of autonomy. (Sicart, 2014) suggests that true play must be unstructured, and that game creators should only provide a context that creates play, and not try to conduct and control the player towards a specific objective (Sicart, 2014, pp. 86-91). The idea that remains from here is that in order for players to feel autonomy, they should be given the most freedom possible. However, as (Nguyen, 2020, p. 76) argues, the restrictions and features games provide, allow for the enrichment of our long-term freedom and autonomy. For games to communicate agency, some restrictions must be imposed. "Playing games isn't an intrusion of autonomy (…), [it] is a way for us to receive and experience modes of agency that have been prepared by another." (Nguyen, 2020, p. 76). (Sicart, 2014)'s argument is based on a view which defends that autonomy is at its greatest level when users are left alone. However, just as (Elster, 1977, pp. 470-475) defends, for one to be autonomous, constraints and willpower are necessary. We can comprehend how one's freedom can be increased the more options they have to choose from however, we must also recognise how restrictions can generate more possibilities and therefore increase freedom.

> "Imagine that I am standing alone in an empty field. My range of movement is relatively unrestricted. Imagine that we add some walls, a door, and a roof. Now there's a house in the middle of the field. In a very simple sense, my movement has been restricted. There are walls now; certain paths of movement are now impeded. But those simple restrictions themselves also help constitute a set of richer, more substantively different options. Now I can be inside or outside, sheltered, or exposed. Restrictions can constitute new options, and these new options can be more richly meaningful than whatever options were lost." (Nguyen, 2020, p. 77)

Games are built upon restrictions. Football has the rule of only being able to transport the ball with our feet, Super Mario Bros. (Nintendo Research & Development No.4 Department, 1985) only lets us run and jump. Would it be the same experience if we could blow up Goombas with a rocket launcher? No, but it would theoretically provide more freedom. Nonetheless, these two simple mechanics allow for a numerous range of dynamics, creating a specific type of freedom and feeding our autonomy needs. Restrictions in videogames provide the development of independence, it is just that different games and their underlying agency, provide different ranges of it.

In order to complete a certain task, led by objectives and restricted within a set of abilities, we must enter an agential mode (Nguyen, 2020, p. 78). During our daily lives we are constantly switching between agential modes, for instance when driving we are focused on the road, with our destination in mind, while making use of our driving abilities. When in a meeting at work, we are

focused on finding a solution, using our communication skills. Likewise, a task may require the use of multiple agential modes. (Nguyen, 2020, p. 79) mentions how when writing he switches between research modes, creative modes, rigorous modes, communicative modes, among others. Videogames make use of very particular agential modes and their requested abilities, to reach a goal set by the developers. But the player should not just simply be asked to comply with the game's systems, he first is to be immersed and pulled into their context, and only after that will he feel free to embrace the necessary agential modes. The same way a traditional storytelling media narrative pulls audiences into experiencing separate lives and emotions, videogames allow audiences to know about and experience new types of agential modes, as well as putting to practice new and different sets of skills. Additionally, the more agential modes we are familiar with, the wider our range of possibilities, either in game or in real world situations is (Nguyen, 2020, p. 89). An example that illustrates this is the one of the intrinsic activity of rock climbing. Despite the author giving this example, we had also thought about it for the same reason. One time, in a birthday afternoon activity, we went rock climbing. On our way back home, everywhere we looked there were objects and obstacles that could be climbed, which before that day were never seen as such. Going rock climbing unlocked an agential mode for moving through space, and the possibility of going from home to our workplace in a straight line opened up, despite not being the most socially responsible and safe way of going about. The restrictions we succumbed ourselves to and the agential mode we were compelled to use during that afternoon, ended up increasing our long-term freedom of movement, due to the fact that the options one possesses are directly linked to our perceived freedom (Sripada, 2016, p. 2924). Videogames provide a similar type of experience by showing players new forms of agency. By playing different types of games and experiencing the various kinds of agency they offer, players can learn and acquire new ways of treating a situation.

(Mateas, 2006, p. 21) refers how a feeling of empowerment is generated when an intentional action by the player generates responses and reactions. Because agency is the feeling of having control over an environment's situations and happenings (Stuart, 2015), and videogames provide it to players by letting them skilfully utilize a game's input device, it results in players being able to explore virtual environments, engage with virtual characters, and overcome obstacles as they emerge (Thue, Bulitko *et al.*, 2010, p. 210). This translates in players' range of possibilities for self-determination being developed, directly shaping their psychological human need of autonomy (Nguyen, 2020, p. 98).

6. Celeste (Extremely OK Games, 2018)

Celeste (Extremely OK Games, 2018) is a 2D platforming indie videogame, largely acclaimed for its great fluid controls and remarkable challenges, along with its simple yet moving narrative. It won the awards for Best Independent Game and Games for Impact at The Game Awards 2018, as well as being nominated for Game of the Year.

Given what we analysed through our theoretical review, we will breakdown Celeste (2018) and try to understand what makes it the experience it is. We will start by looking at its narrative, which even though not too complex, can provide a great emotional connection, as well as a context for the game. After that, we will assess its vividness and mapping factors, the game's mechanics, dynamics, and aesthetics, as well as the forms of agency it presents.

6.1. Narrative

Celeste (Extremely OK Games, 2018) tells the story of a young girl named Madeline, whose goal is to reach the top of Celeste Mountain. However, Madeline suffers from anxiety and confidence issues, which take form as the antagonist known as *Part of Me* or *Badeline*. The story shows the struggles Madeline has, dealing with negative thoughts and commentaries that keep telling her she is not strong enough to reach the mountain's summit. At a certain point, Madeline understands she must confront Badeline about her negativity and the weight she has been for her, and the way she always drags her down. Although at first Badeline rejects the reconciliation Madeline pretends, she later agrees to help her in her journey to the top. From here, they both cooperate and work together to reach Celeste's peak, where they achieve peace of mind and tranquillity with one another.

Celeste (2018) narrative shows the struggles one can have with mental health issues, such as anxiety and depression, and shows through plot elements the several stages one can go through, from isolation, anger, and self-doubt, to acceptance, and positivity, without forgetting relapse.

The game's mechanics are running, jumping, air dashing and climbing, and still work without a narrative. The game provides the choice of skipping every cutscene if we wish to, however the narrative set pieces deliver a context for the events of the game.

6.2. Vividness

As we saw, we can characterise a medium's vividness based on its breadth and depth factors. Celeste (2018) delivers on the visual and auditory perceptual systems, as well as the haptic system if played with a gamepad.

In terms of visual depth, the game features an 8-bit pixel-art art style with its total resolution being, according to the developers, 320 x 180 (Thorson, 2020). However, despite its low resolution, the visual style contains lots of intricate details which make the world seem populated and alive. We can distinguish and make clear of the several sections of the levels and their foregrounds and backgrounds.

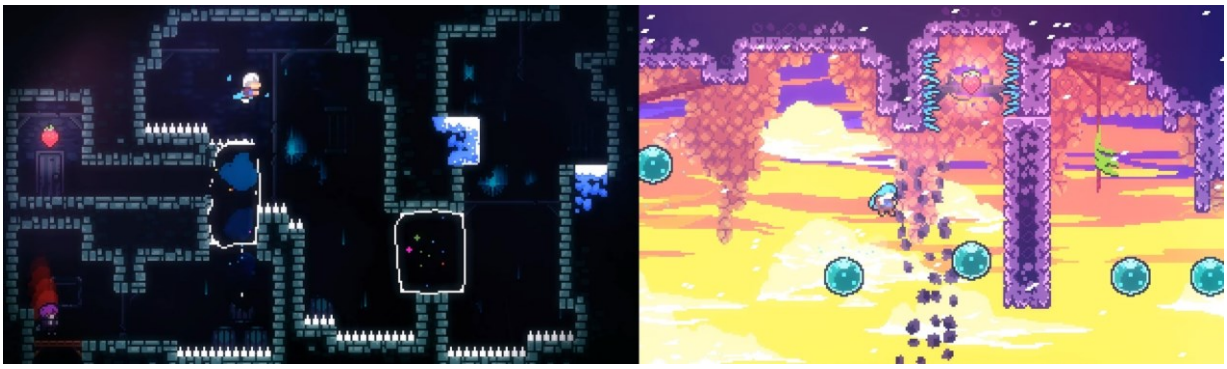

Figure 22 - Chapter 2 "Old Site" and chapter 4 "Golden Ridge" visual style

The image to the left is a screenshot from chapter 2 "Old Site", which resembles an old mining facility, with mixes of stone and wooden platforms and a worn-down background, with broken wooden structures, barrels, and doors. The image to the right is taken from chapter 4 "Golden Ridge", an open section where we see multiple trees and roots hanging, as well as dangling pieces of cloth, known as prayer flags, which are commonly found in mountain trails. These types of objects complement the visuals, adding motion and character to the world. Additionally, Madeline's movement contains lots of polish, something (Swink, 2009, p. 5) refers to as effects which artificially enhance interaction. These polish effects increase the game's appeal and feel, simply through its visuals, without needing to change gameplay under the hood. Polish effects such as Madeline's

animation, dust trail effects, and camera shake[10] better connect players' actions with the actions on screen. Despite the low fidelity of the art style, all these factors contribute to a greater sense of immersion.

In terms of audio, the game features 61 songs in total. 34 as the main levels' background, 18 as more subtle ones, 8 B-Side remixes, and a bonus track which is not included in the game (Celeste Wiki | Fandom, 2021). Within the diegetic world, there are a variety of sounds for its ambience and gameplay. Diegetic relates to the world of the character and is a part of it. A soundtrack or tutorial hint are usually non-diegetic, as they are solely for the player, without the game's characters being aware of them.

Each zone contains its own type of atmosphere, which adds a lot to the game's overall tone. In chapter 3 "Celestial Resort", we can hear the wind whistling through the wooden planks and broken windows, as well as creaking wood. Moreover, most interactable objects have their own audio, such as the "Star Blocks" in chapter 2 "Old Site", which before activated, will make a glass sound when stepped on, and after being activated and when dashed through, will make a satisfying starry jelly shaking noise. There are many other well executed sounds, such as the moving traffic light conveyor belts, the sludge growing in platforms, or the waking up grunt angry platforms make.

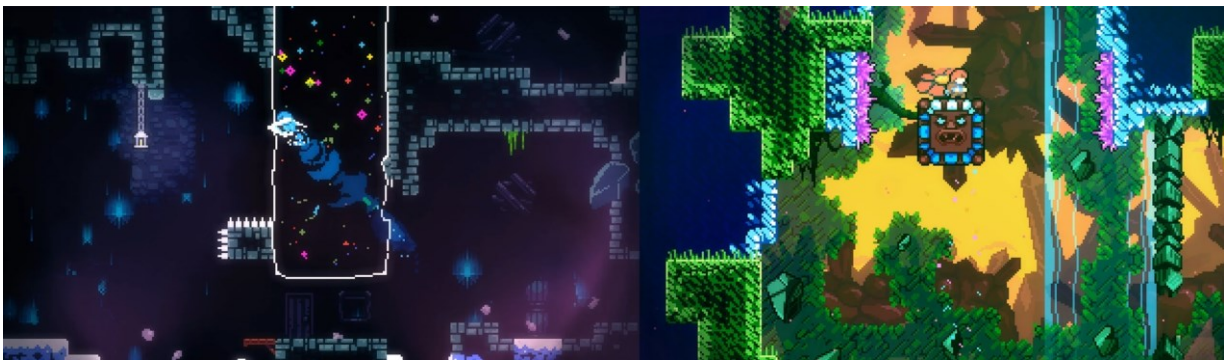

Figure 23 - Chapter 2 "Old Site" star blocks and chapter 6 "Reflection" angry platforms

Every single surface of the game has its own respective contact sound, such as rock, dirt, stone, wooden floors, metal beams, and moving platforms, as well as its game mechanic variation.

[10] A feature which consists in shaking the player's camera when certain actions happen. If we are near an explosion, we can make the camera shake violently in order to emphasize it and making the player feel it more.

Climbing a rocky surface will sound different from running on top of it, the same applying for most other materials.

The game's audio and visuals add up to a very lively and dynamic world, which along with the mapping we will analyse, facilitate the sense of being within its world.

6.3. Mapping, mechanics, and dynamics

The game's basic mechanics are simple and accessible, using directional natural mapping. They are running, jumping, dashing, and climbing. When playing with a gamepad, we move the left joystick in the direction we want to move the character, and we jump and dash with a simple push of a button. If playing with a keyboard, the jump and dash are accomplished the same way, but the character's movement is done within the "WASD" scheme. We should note that all controls are bindable, which means players can adjust them to their personal preference. However, we perceived the default set up controls as natural, without needing to adjust any of them.

Figure 24 – Game's control scheme (directional natural mapping)

Despite their naturalness, the developers took a further step and polished the mechanics in a way that even greater feelings of control could be accomplished by the player. In a twitter thread, Maddy Thorson breaks down some of the tweaks the game's mechanics contain, to empower the player, even if they make "mistakes" during play.

A few frames after the player character takes off a ledge running, it can still jump. This is referred to as *coyote time* and leaves a margin for players to react. When landing of a jump, if the jump button is pressed a few moments before the character is grounded, it will jump as soon as it lands. This also makes the controls feel more responsive. Furthermore, the character is also capable of wall jumping if standing 2 pixels far away from the wall.

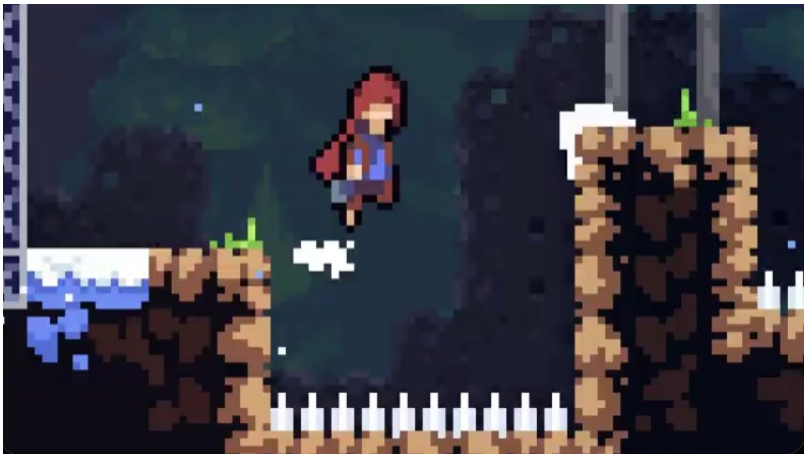

Figure 25 - Coyote time allows the player to jump a few moments after leaving a platform

Additionally, if players hit platform and wall corners when dashing, their trajectory is adjusted, as if they dashed within the right timing.

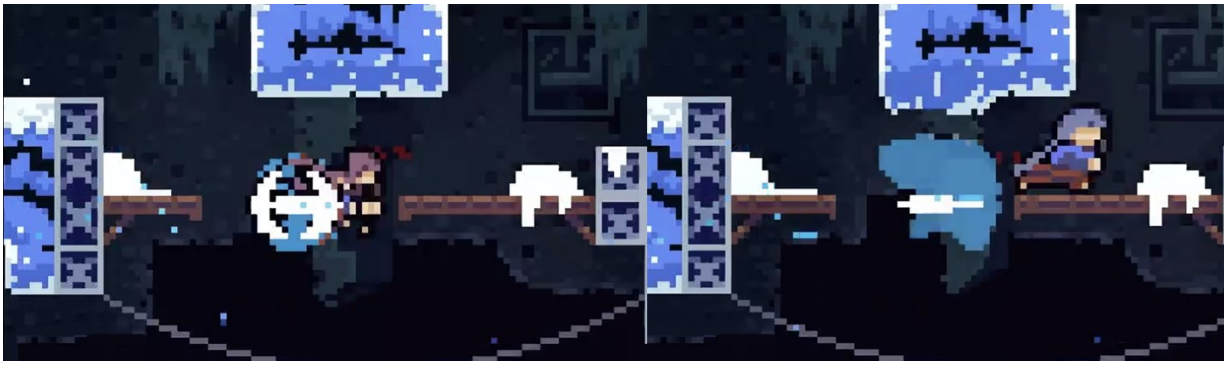

Figure 26 - Even if the player does not dash at the precise moment in order to be on the platform, the game corrects its movement, avoiding frustration and making the controls seem more fluid

These fine tunings[11] contribute to the game's feel and make it more satisfying to play, as it gives margins for players to play inaccurately. We consider these tweaks to lie between mechanics and dynamics, due to the reason that they were made with intention by the developers but can still be compared to a sort of hidden feedback loop, which balances the game and makes it more forgiving without players being aware of it. By giving players more flexibility and control in their movement, they can think about their decisions and time their actions with precision, without ever feeling cheated by the game. As Maddy Thorson explains: "All [the adjustments] are centered around widening timing/positioning windows, so that everything is fudged a tiny bit in the player's favor. I think this is a big reason why Celeste can feel kind even though it's very difficult – it wants you to succeed." (Thorson, 2020)

In addition to these tweaks, the game also contains "lighting fast respawns" (Matt Makes Games Inc., 2018) which do not break players' flow and immersion. It allows them to keep trying over and over again, never leaving time wasted.

Besides the adjustments the basic mechanics include, the game does not contain any other clear dynamics, such as the ones we can find in shooters or racing games. The only one we found is the one of a moving platform adding momentum to Madeline. If we jump out of a moving platform in the way it was moving right when it reaches a full stop[12], the character's jump will be much more powerful than a regular one. This, along with the levels' design, allows us to traverse greater distances in a single step.

6.4. Aesthetics

For us, Celeste (2018) delivers aesthetic experiences of challenge, discovery, and narrative. We could also consider aesthetics of fellowship, because the game is quite popular in the speedrunning community, even if that is not something we are a part of.

Platformers give players the objective of going from point A to point B through suspending platforms and dubious terrain. Their level design often contains a lot of verticality and pitfalls, which

[11] Here we provide a link to the twitter thread where Maddy Thorson explains these tweaks. They come accompanied with GIFS, making it much easier to understand them: https://twitter.com/MaddyThorson/status/1238338574220546049 retrieved July 20th, 2021

[12] Much like in coyote time, the player has a few frames to react after the platform has come into a full stop.

the player must overcome by running, jumping, and climbing. Celeste (2018) follows this genre defining characteristics – its levels and chapters have new obstacles added to them progressively, along with new additions to the already existing mechanics. As these new components are introduced, the game rises in difficulty, requiring the mastery of all its layers, with every death being a lesson (Matt Makes Games Inc., 2018). However, as every time we die, we are almost instantly placed at the section's beginning, the desire to complete it rarely goes away, leaving us with the thought that the next try is the one.

The simple controls and immediate respawns, along with the game's progressive level of difficulty, generate an aesthetic experience of challenge, and feelings of frustration and anxiety are almost all the time overwritten by feelings of triumph and satisfaction.

Besides growing in difficulty, each chapter has its own unique style and atmosphere, which contribute to the aesthetics of discovery, as we move from zone to zone. The levels also feature bonus areas with strawberries to collect, which motivate players to go and find them. Moreover, these strawberries are located in tougher areas of the overall chapter, providing extra challenges for players who may wish it.

Lastly, we also consider the game to deliver a narrative aesthetic experience. Despite being simple, the plot of the game raises awareness about what one can face when struggling with mental health issues, having the story beats synchronized with the gameplay. There are moments where we feel like we are progressing amazingly, only to hit rock bottom and having to fight all the way to the top again, much like when fighting anxiety and depression.

6.5. Agency

In terms of agency, we found Celeste (2018) to deliver it in multiple forms, although of course in varying degrees.

One of the stronger forms of agency we felt was in the shape of velocity and challenge. Velocity as a form of agency exists when gameplay and narrative progress side by side. In Celeste (2018) this is achieved with the different environments and the new variations of interactable objects, which force players to utilize all their abilities, while Madeline fights her inner demons. The frustration and triumph players feel when playing can be compared to the same feelings Madeline experiences through her journey to the top of the mountain. In addition to velocity, the game also delivers agency through the form of challenge, because it only progresses with player skill and the game’s systems comprehension. Learning and mastering the game is part of the experience, and when a test of skill

has a positive outcome, great feelings of success and achievement are felt. Because the game does not commit to any handholding, it requires players to develop their abilities. This, along with the story of Madeline, makes Celeste (2018) capable of triggering very strong emotions in its audience. In our opinion, these two forms of agency play a huge part in making the game the experience it is.

As the game is capable of transmitting the feelings of frustration and anxiety one can feel when struggling with mental illness, it also delivers agency through the form of identity and self-insertion. Even though we perceive Madeline as a young female adult, the obstacles she faces are something we have experienced as well, making her a very relatable character.

Lastly, we also found exploratory agency to be communicated throughout the game, through its different chapters and environment, as well as the bonus strawberries, crystal hearts, and side tapes we can find, which grant us bonus challenges.

6.6. Competence, autonomy, and relatedness

From here, we understand what makes Celeste (2018) the experience it is. It fulfils our needs of competence and skill through its gradual challenge, along with its natural mapping, fluid controls, and instant respawns. The way these factors all work together, allow players to reach the flow zone quite quickly, and to break out of it very rarely, making for very rewarding play.

The game also delivers autonomy through its challenge and velocity agency, that require players to expand their skills. They are empowered when successfully moving from obstacle to obstacle, given the fact that their triumph is purely dependent on their abilities, not any upgrades nor special power ups. Additionally, the extra strawberries and other collectibles hidden in the world push our exploratory agency rewarding our freedom of movement, while delivering new tests of our skill.

Lastly, we consider Celeste (2018) to also fulfil relatedness needs with its simple, yet strong narrative and characters. The subject of mental health and its subsequent concerns communicated and reflected through gameplay make it for a relatable and insightful experience, capable of generating strong emotional connections. Additionally, the game is highly regarded for speedrunning, which holds a very strong community. Despite us not being motivated by speedrunning, relatedness needs can certainly be fulfilled through that matter.

7. Conclusion

With our research, we deconstructed the several components of a videogame and tried to understand how players interact with them.

Through the MDA framework we were able to understand that games generate emotional aesthetics in players through their base mechanics, and that we as humans act based on goals, perception, and prediction.

Videogames should aim to maintain players' expectations, be it of the narrative, the gameplay, or its other features. Moreover, they should try to clearly communicate the way they work, so that players do not spend time figuring out how to play and can just do it freely and naturally. Consequently, by bringing player and experience closer, immersion and presence will be catalysed, generating more powerful experiences.

Perceiving the experience as natural stands in the way of enjoyment and in the formation of presence, however they are not dependent on one another. This means that even if present, a player's enjoyment may not be increased.

Videogames offer players the feeling of agency, that boosts their psychological human need for autonomy as well as providing them with feelings of empowerment and making a difference within the game's world.

Videogames are played for their intrinsic nature and for the challenge and fun they provide. This opens doors to exploring the topic of serious games and how videogames can be used not only for pure entertainment, but also for education and health. Videogames let us try and explore possibilities without the fear of failing and make us accomplish objectives within their rules. They imply attention, learning, and practice, making them a compelling activity.

With our study, we were able to understand how players perceive videogames and how we as developers can create more powerful and meaningful experiences. We are now more capable of seeing flaws in an artwork's design and of reflecting on ways to improve them.

We learned that good design takes care, planning, thought, and an understanding of how people behave (Norman, 2013, p. 23), and that when developing an interactive experience, we should be already thinking of the aesthetics we want to trigger in the users. By having a goal to work towards, we can test and iterate our project and see if the outcomes are the ones we intend.

This Dissertation allowed me to learn a lot about, not only videogames, but also about how we function as humans. It even allowed me to better understand myself at times, and why I was feeling a certain way. It is funny to think about ourselves this way, but we are rational beings with needs, and these needs must be met in order for us to work as expected.

Understandably, this Dissertation revealed a huge number of topics which I can utilise in my professional videogame development career. I would have liked to delve deeper into the subjects of our study however, given their quantity, it became a hard task. Nevertheless, there will be opportunities in the future to research each one of these topics more thoroughly, and this Dissertation was just the first step.

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