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Grau en Disseny i Producció de Videojocs

Creation of a Set of Game Balance Heuristics for the Genre of Multiplayer Shooter Video Games

THESIS

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Abstract

Currently, a relevant part of the games that are released is abandoned by their player communities because they are not balanced correctly. This project aims to develop a set of heuristics for multiplayer shooters to help developers avoid dominant strategies. This has been done through an investigation of the balancing problems that exist and has existed in this genre. We believe that these heuristics, incorporated in the development phases, can be very useful, preventing relevant problems and revisions in the post-release phase, resulting in economic savings for developers.

Resum

Actualment, una part rellevant dels jocs que surten al mercat són abandonats per les seves comunitats de jugadors per no estar balancejats correctament. L'objectiu d'aquest treball és desenvolupar un grup d'heurístiques per als shooters multijugador, que permeti ajudar els desenvolupadors a evitar estratègies dominants. Això s'ha realitzat mitjançant una investigació dels problemes de balanceig que hi ha i hi ha hagut en aquest gènere. Creiem que aquestes heurístiques, incorporades en les fases de desenvolupament, poden ser de gran utilitat, prevenint problemes rellevants I revisions en la fase post-release, resultant en un estalvi econòmic per les desenvolupadores.

Resumen

Actualmente, una parte relevante de los juegos que salen al mercado son abandonados por sus comunidades de jugadores por no estar balanceados correctamente. El objetivo de este trabajo es desarrollar un grupo de heurísticas para los shooters multijugador, que permita ayudar a los desarrolladores a evitar estrategias dominantes. Esto se ha realizado mediante una investigación de los problemas de balanceo que hay y ha habido en este género. Creemos que estas heurísticas, incorporadas en las fases de desarrollo, pueden ser de gran utilidad, previniendo problemas relevantes y revisiones en la fase de post-release, resultando en un ahorro económico para las desarrolladoras.

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1. Introduction

Game Balance is one of the most important parts of game design. With a good balance, games feel fairer and more engaging in the long run. But balancing a game is easier said than done. It is almost impossible to content everyone with the balance of a game, especially if we talk about games with multiple strategies. Making each one of these strategies as interesting as the rest is complicated, and sometimes players can discover dominant strategies that can unbalance all the gameplay.

From a more economic perspective, developing features that are never going to be used, because they are not good enough for the players to choose them, is a waste of time and money that many companies cannot afford. Some developers work with very scarce resources, and losing time, means losing money, which leads to bankruptcy. Two examples of first-person shooters that failed are Evolve, which had great marketing and great expectations but failed to deliver exciting gameplay, and Lawbreakers, which had the director of the Gears of War saga but failed to match the expectations. For these reasons, we find it necessary to help developers identify possible dominant strategies in the design process.

The genre that we are looking for is shooter video games with competitive multiplayer. There are two reasons to choose this genre: first, they are really popular nowadays; five of the top ten most-watched categories on twitch are from this genre. Valorant has a watched time of 5.3%, Counter-Strike: Global Offensive a 3.8%, Apex Legends a 3.7%, Fortnite a 2.8% and Call of Duty: Warzone a 1.8% (TwitchTracker, 2022). They achieve 17 per cent of the total time that users spend on Twitch. The second reason is that they are not a popular new genre, they have been around since the first days of Doom and the first tournaments of Unreal tournament. We also have the case of Counter-Strike: Global offensive, which is a game of 2012 and enjoys good popularity nowadays.

The **main goal** of this project is to create a set of heuristics that can help developers with some decisions in the design process of the gameplay mechanics and balance. To do this, we have searched for balance problems that led to dominant strategies in

recent and older games. Then, we have categorized these issues to help with the creation of the heuristics. Once we had finished the heuristics, we have showed them to a group of designers that have evaluated them. With the suggestions and comments of the designers, we have written the final heuristics.

This document is divided into eight chapters: the first is the introduction, the second describes the objectives and scope, the third is the state of the art and what is the research on the different topics until today, the fourth is the theoretical framework of the project, the fifth describes the methodology used, the sixth is the results of the research, including the problems found, the heuristics, and the validation, the seventh is the conclusion and future investigations, and the last chapter is the bibliography used for this final degree project.

2. Objectives

This **project aims** to generate a set of heuristics to try to avoid dominant strategies for the multiplayer shooter genre and contribute to the study of heuristics applied to game balance by creating a list of problems found in the genre. We believe that these heuristics can function as a guideline for all the developers that are creating multiplayer shooter video games and ease their decisions in the design process.

To ensure the fulfilment of the main goal, we propose the following three secondary goals:

1. Contrast the information about these dominant strategies that exist or have existed from the beginning of the multiplayer shooter genre to this day.
2. Generate a library of game balance problems found in multiplayer shooter games and classify them into different types according to game balance.
3. Define a wide number of heuristics to cover a comprehensive list of areas where dominant strategies may appear.
4. Validate the heuristics with a group of game designers.

3. State of the art

This chapter discusses the precedents that exist nowadays for the study of this project. It starts with analysing the Game Balance state, continues with the shooter video game genre, and ends with the heuristics state.

3.1 Game balance

Game balance is a part of game design that has not been studied as an independent subject in many investigations. Recently on August 17, 2021, it was released a book called Game Balance (Schreiber & Romero, 2021), which is one of the first books to deal exclusively with this topic. This book is an iteration of a web page (Game Balance Concepts, 2022) where the authors talked about game balance.

The rest of the studies about game balance can be found in independent chapters in books about game design. Examples of these books are Game architecture and design: a new edition (Rollings & Morris, 2003), Game Mechanics: Advanced Game Design (Adams & Dormans, 2012), The Art of Game Design; A book of lenses (Schell, 2008), and others.

Nowadays, we can find game balance information in different types of content, for example, is common to discover YouTube channels that talk about this subject. Good examples of these channels are the GDC (GDC - YouTube, 2022), which are mainly conferences of people working in the industry, and Game Maker's Toolkit (Game Maker's Toolkit - YouTube, 2022), which is a channel focused on game design in general.

3.2 Shooter video game genre

Even though shooter video games are and were one of the most popular video game genres, thanks to titles like Doom, Quake, Counter-Strike, Half-life... There are almost no specific gameplay and mechanic-oriented studies about them. The most prolific studies that involve shooter games investigate the relation between these types of games and if they make people more prone to violence.

In general, game design books investigate and write about games without considering the differences between genres. Most of the concepts studied can be applied to

shooter games, and only in specific parts of the books they specify differences between the genres. For example, in Practical Game Design (Kramarzewski & De Nucci, 2018) Kramarzewski and De Nucci make a list of common game mechanics, and list shooting as one of them. This mechanic is almost exclusive to shooter games, but there are other mechanics like resource collection or different types of movements, that are used in many different genres.

Even though authors tend to abstract the concepts from the different genres, we managed to find one book that focuses exclusively on this one, Fundamentals of Shooter Game Design (Adams, Fundamentals of Shooter Game Design, 2014). The book is an in-depth analysis of shooter games, and aboard aspects from the definition, which are the fundamentals that describes the genre, and the differences between 3D and 2D shooter games.

3.3 Heuristics

Heuristics have been around for a long time in human history, in Methods of Heuristics (Groner, Groner, & Bischof, 1983), Groner studies the evolution and origin of the heuristics, he starts by saying that in ancient Greece they applied a method similar to a heuristic. But for the scope of the project, we will focus our attention on some usability heuristics and game heuristics.

One of the most well-known heuristics in the field of User Experience are the 10 usability heuristics for user interface design (Nielsen, 2006). These heuristics define which are the rules to follow when designing a user interface to make it as usable as possible. Although these were created with user interfaces in mind, they are used in video games and are a huge reference for all the other studies that want to create heuristics in the video game field.

One of the first set of heuristics to evaluate the playability of video games came in the article called Using Heuristics to Evaluate the Playability of Games (Desurvire, Caplan, & Toth, 2004), there were a total of 42 heuristics grouped into different categories: gameplay, game story, mechanics, and usability. This work continued in another article called Game Usability Heuristics (PLAY) For Evaluating and Designing Better Games: The Next Iteration (Desurvire & Wiberg, 2009), in this iteration, they came up with 50 heuristics, but just three categories: gameplay, coolness / entertainment / humour /

emotional / immersion, usability and game mechanics. Each of these categories had a set of subcategories. In the paper, they say that these heuristics have been used in several design teams.

4. Theoretical framework

To develop heuristics to avoid dominant strategies for shooter video games, it is necessary to talk about a few key topics in the theoretical framework. First, it is necessary to make an introduction to Game Balance and its vocabulary. Then it is important to describe the shooter genre to understand the scope of this project. And finally, it is crucial to explain what a Heuristic is and how it can be useful.

4.1 Game balance

It is difficult to give a concise and precise definition of the term game balance because there is not a single definition of the term in the literature on this topic. Each author has a different approach to describe it and they have not yet reached an agreement.

Some authors like Adams (Fundamentals of game design, 2013) talk about fairness and maintaining the player engaged in the action, the game can be neither too easy nor too hard. Other authors like Oxland (Gameplay and design, 2004) put the focus on the different elements that conform the system and how they work together. And examples like Fullerton (Game design workshop: a playcentric approach to creating innovative games, 2004) are more concerned about the desired experience that the designer has ambitioned.

Though we have seen that the definition and ways to approach game balance differ from author to author, most of them agree on three basic things:
1. It is a crucial part of game design.
2. Makes the game enjoyable.
3. There is balance when all the systems of the game work as one

With this definition of game balance, we can see what are the different methodologies that designers use.

4.1.1 How do we balance a game

Both Sellers (Advanced game design: a systems approach, 2017) and Schreiber (Game Balance, 2021) agree, though with different names, that there are four ways of

balancing a game: the designer experience, playtesting, analysis, and mathematics. They also agree that designers can not only pick just one, they should use all of them because each one has virtues and vices.

Designer Experience

"*For many people, this has long been a core part of what makes a good designer. Can you tell when a game "feels right?"* " (Sellers, 2017). It is the ability that someone has to say if a game is balanced or not just by looking or playing at it. For the most experienced designers, this can be a method to save time, because they already know by intuition that something feels odd without having to use other methods to prove their hypothesis.

Even if this method is valuable, if a designer just uses this method, the result can be horribly wrong. It also can have a big impact on a team of designers when all of them want to use their criteria.

Playtesting

This second method is useful when the game is in development. A player that has nothing to do with the game, plays it (the designer can be watching the gameplay, but without giving instructions) and then gives feedback to the designer. It is useful to eliminate the biased perspective of the designer, and know if the game is played as the designers had thought, or if there exist other ways to unbalance the game.

This can be a problem when designers are overshadowed by the feedback of the players. Sometimes the decisions are made only based on the opinions of the players. It is important to remember that the player is not a designer and does not know what is best for the game.

Analysis

This is the first of the quantitative methods. It consists of collecting data from a big number of players while they are playing the game and evaluating the data. For example, in a game like Counter-Strike, the designers can collect data from the deaths

of both teams when for example, they go through a specific route. If the members of a specific team are dying every time they go through that path, it could mean that the path will not be an option for that team, therefore eliminating a decision. But it is important to consider that much more data and a big enough dataset is important to decide what to do with that option.

Mathematics

This method is important when creating multiplayer games because it can assure that the numbers of the game are balanced on paper. For example, in an RTS, the power of a unit can be defined by a relationship between its cost, its damage and its life. All these calculations output a number that can be easily compared with the outcomes of the rest of the units to know if a unit has bigger numbers than the rest. But this perfect balance on paper is not written in stone. At the end of the day, balance is a sensation and if the players think that a unit is unfair, it is important to look at it.

The next step that we are going to analyse is the purpose of balancing a game and its importance.

4.1.2 Goals of balance

Depending on the author that we are looking for, each one has a different perspective on the goals. For example, Sylvester (Designing Games: A Guide to Engineering Experiences, 2013) states that there are two main reasons to balance a game, fairness and depth. The first one is to ensure that players feel that they have an opportunity to win (player equality), and the second one ensures that the game can provide meaningful decisions even with advanced knowledge of the systems (interesting strategies).

Other authors like Adams (Fundamentals of game design, 2013) distinguish between goals from player vs player or player vs environment and some that they have in common. For the common ones, he describes that the game must provide meaningful choices (interesting strategies), the players must perceive the game as fair (player equality), and the chance is not as meaningful as the player's skill. In the PvP part, the

goals are that players can recover from a bad start (sustained uncertainty) and that the game never ends in a stalemate. And for the PvE, he says that the goal is to make the difficulty of the game consistent.

Rollings (Game Architecture and Design: A New Edition, 2003) defences a similar categorization as Adams does, by dividing the types/goals into three categories, Player/player, Player/gameplay, and Gameplay/gameplay. In the first one he says that any advantage that a player has over another must come from the difference in skill (player equality), on the second one, he thinks that the player has to keep learning and evolving by internal rewards of the game (sustained uncertainty), and on the last one, he aims to balance all the features of the game against each other (interesting strategies).

From the last three authors, we can abstract three main goals for game balance:
1. **Sustained uncertainty**: the game must maintain the challenge until the end.
2. **Player equality**: a player's victory must come from the mastery of the game, not from the game itself.
3. **Interesting strategies**: there cannot be dominant strategies, there must exist different ways to achieve victory.

Having the goals in mind, we can proceed to analyse them a bit further to better understand the three main goals.

4.1.3 Sustained Uncertainty

Greg Costikyan (Uncertainty in Games, 2013) considers uncertainty to be one of the primary characteristics of play. He states that a game is not fun if the player knows the result of the match before it even started. To emphasize this idea, he gives different examples. One of these examples is a boy who, when matched in a race with his brother, the brother always wins; In the end, the boy will not compete against his brother because the outcome is certain.

When deleting the main component of uncertainty, the player can always know the result of the game, thus eliminating the excitement of play. Of course, uncertainty is

defined more than just by the game itself. For example, in a match of three in a row, there is no uncertainty; the game is solved and has limited options, but inexperienced players that have never played the game, can find it engaging because they do not know that the game is solved. Uncertainty then has different ways to manifest, and Greg Costikyan defines various sources:

- **Performative Uncertainty:** the ability or skill required to overcome a challenge.
- **Solver's Uncertainty:** the uncertainty is generated by the algorithm of the game.
- **Player Unpredictability:** how players can affect each other.
- **Randomness:** all the elements which are decided by chance.
- **Analytic complexity:** the same game can have many branches and variations.

From the different sources of uncertainty, we find that the challenge and the unknown information are two factors that come into play. Challenges can arise from the abilities of the player, what the game presents to the player or both. Having more demanding feats that the player can accomplish makes the game interesting until the end. If the task to accomplish always requires the same level of skill and the player has already mastered it, in the end, the player will have no reasons to play it.

The concealed information is an element that the game presents in the form of randomness (which weapon is in the box) or by hiding some valuable information (damage in the different parts of the body). But we can find hidden information when other players come to the game. Players have to take actions that will probe beneficial if they have guessed the other player's intentions. These elements add aspects that the player cannot control and make each game unique and exciting.

Once the game has uncertainty, designers need to think about the differences that can exist between the players. They must ensure that all players with similar skill levels have an equal or similar opportunity to win regardless of the initial conditions.

4.1.4 Player equality and fairness

To ensure that players have similar opportunities to win, the initial conditions of the game must be the same or similar for all the players. Andrew Rollings (Game Architecture and Design: A New Edition, 2003) states that the simplest way to ensure the perfect balance between players is to have Symmetry between them.

In symmetric games, players share the same beginning state, follow the same rules and have the same goal. An example of a symmetric game is checkers; in this game the board is symmetric, and the players start with the same game state, they all have the same tokens, the same rules and the same goal.

But although symmetric games grant perfect balance between players, they can be boring and uninteresting for the players. In asymmetric games, on the other hand, players can have different initial states, whether it is a different weapon, character, position, etc. It is not necessary to follow the same rules, and they do not have to share the same goal. For example, in Overwatch, the players have to choose between characters with different roles, both teams have different objectives, and the maps are not symmetric.

Due to the nature of asymmetric games, players have different strategies to win the game, which can create an imbalance between the players. To balance all this, we have to talk about the concepts of transitivity and intransitivity.

A transitive relationship is one in which object A is better than object B, object B is better than object C, thus making object A better than C. For example, a spell that deals 20 damage is better than a spell that deals 10 damage and is also better than a spell that deals 5 damage.

On the other hand, an intransitive relationship is like the rock paper scissors game. The rock is better than the scissors, and scissors are better than paper, but in this case, as it is an intransitive relationship, the paper is better than the rock and not the other way around.
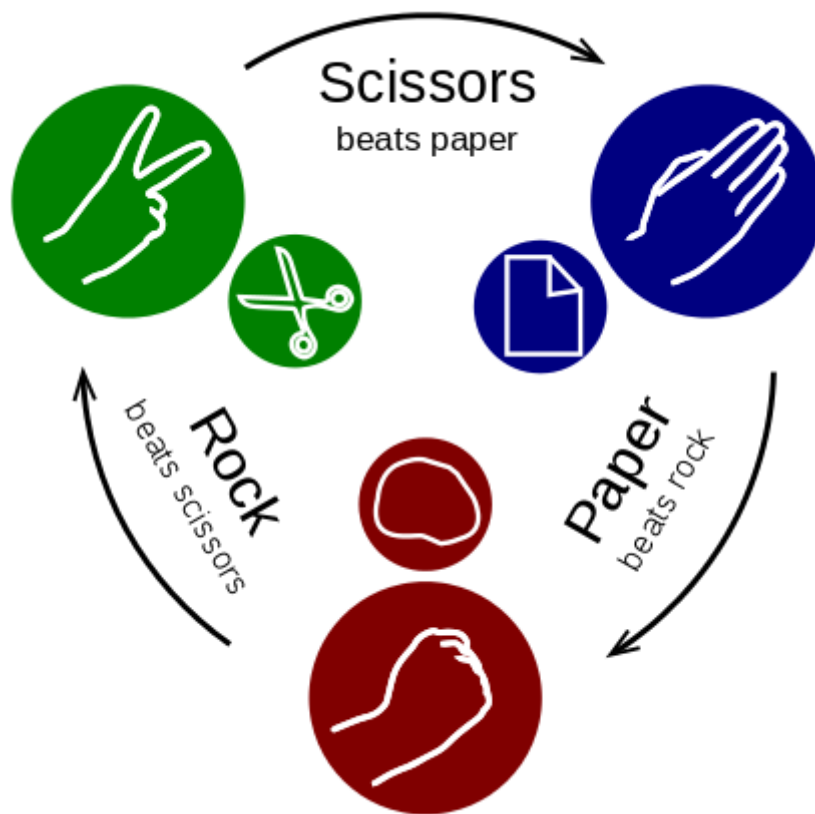
Figure 1: Example of intransitive relationship. Source (Transitive relation, 2022)

When dealing with asymmetric games, it is preferable to use intransitive mechanics. Andrew Rollings (Game Architecture and Design: A New Edition, 2003) says that intransitive game mechanics guarantees balance because each of the possible strategies has at least one counter and a neutral encounter, which ensures that there are no dominant strategies.

4.1.5 Interesting strategies

Authors like Tracy ¨Fullerton (Game design workshop: a playcentric approach to creating innovative games, 2004), Andrew Rollings (Game Architecture and Design: A New Edition, 2003) and Ernest Adams (Fundamentals of game design, 2013), all agree that dominant strategies are a problem because the fact that they are so powerful and have no counter, forces other players to use exclusively the dominant strategy. They also agree that what makes a game exciting, and challenging is the fact that it offers different interesting strategies.

A way of providing meaningful choices can be using triangularity. Jesse Schell (The Art of Game Design: A book of lenses, 2008) defines triangularity as one of the most exciting and interesting ways of making choices because it involves whether the player wants to take risks or prefers to play more conservatively. With triangularity, the player decides to take a risky action that can grant high rewards, or a safer approach, that will not be as beneficial as the other one.

An example of triangularity in a shooter game can be an elevated shooting spot on the map versus the normal grounded route with cover. The elevated spot can grant a huge advantage to the players because they can see and cover all the grounded route, but to reach there, they may have to climb stairs and be vulnerable to fire from the ground. On the other hand, players that stay on the ground will have cover, which leaves them less exposed, but they will not be able to see if there are enemies ahead.

When games do not respect the principles of triangularity, we can find high reward actions that do not have an equally high cost. This can degenerate into a dominant strategy. A fighting game that allows players to perform an attack that if blocked, leaves them in a state where they can perform the same or another attack, while the defendant players cannot exit from the defence state, can be a candidate for a dominant strategy.

Even though dominant strategies can ruin the fun of a game, players will always search for the easiest ways of winning. They make this by interacting with each other and creating the metagame.

4.1.6 Metagame

The metagame concept, as described by Ian Schreiber (Game Balance, 2021), is the game formed around the game. This means that players continue with activities about the game outside the boundaries of the game itself. Normally these activities are done to better understand the game and have better chances of winning in a real match. This is prominent in trading card games like HearthStone, where the players construct new decks to overthrow the most popular decks at the moment.

This metagame leads to ranking systems of the objects and possible strategies, which then are punctuated by the players to see what the best options are. In the most

competitive scenes like tournaments, the meta options are prominent, because they want to win at all costs and those options have proven to be the best to achieve victory.

The next chapter introduces the theoretical framework of the shooter genre and its peculiarities.

4.2 Shooter genre

The shooter video game genre is a subgenre of action video games but deviates from it in how the action takes place. Normally in this genre, the action is done with the help of firearms. Some examples of this genre are games like Call of Duty, Doom or Gears of War.

As stated in the state of the art chapter (Section 3.2), there are not many studies that analyse exclusively shooter video games, but many of them have described the genre. In Gameplay and design (Oxland, 2004), Oxland defines the genre as a subgenre of the action video games; it also remarks the fast pace of the gameplay. In Advanced Game Design: A Systems Approach (Sellers, 2017), there are also described as games with fast action. On the other hand, Adams (Fundamentals of Shooter Game Design, 2014) describes them without emphasizing the tempo, he emphasizes the action that is taking place, shooting.

Most shooter games indeed have fast-paced gameplay, but there are examples like Portal, where the quick reactions of the player are not that relevant, but it is considered a shooter because, in the end, the player must shoot a weapon to advance through the game. So, the first and principal characteristic that describes this genre is that players use a device to aim at targets whether they need quick reactions or not.

Even though the focus of each game is different, Adams (Fundamentals of Shooter Game Design, 2014) define the fundamentals that each of these games shares. The first fundamental is the elements of shooting, and the second one is the shooting devices.

4.2.1 Elements of shooting

Adams (Fundamentals of Shooter Game Design, 2014) thinks that shooter games are based on the interaction between the physical representation of the players and one or more targets. For this reason, the interaction between these two agents is key to describing the shooter game. He defines three elements that compose this relation: the nature of the interaction, the nature of the targets and the nature of the avatar.

The nature of the interaction explains why the players are taking those actions and what they are trying to achieve, the goal of the game. In most shooter games, players must deal damage to the enemies, and they use a weapon to try to eliminate them. In some other games, players must shoot, but maybe their goal is just to stop a fire, or they use a more futuristic weapon like in Portal, where the weapon is used to open portals and resolve puzzles.

The nature of the targets describes the consequences of hitting the target and what this target represents. If the player hits the target, this action needs to have a visual representation in the game, maybe the target vanishes, it stays still on the ground, or it just shows that the player has earned more points. It is also important that the visual representation of the target behaves as intended. If the target is an animal, it can move erratically and fight back, but if the target is a balloon, it will follow a predictable trajectory and it will not have the possibility of attacking the players.

The nature of the avatar is how the character that players control is represented in the world; the representation of the avatar influences the actions that players can make. If the character is a ghost, maybe players can go through walls and float, but if the character is a plant players won't move around the map, they will be in place aiming at the targets.

4.2.2 Shooting devices

Despite the uses of the weapon or device, Adams (Fundamentals of Shooter Game Design, 2014) define some elements that are common to describe the behaviour and possibilities of the player: accuracy, range, magazine size, damage, rate of fire,

spread, recoil, handling, reload time, firing modes, the propensity to malfunction, weight, and accessories. All these characteristics of the weapon make it unique and are vital to determine the strength of each one.

Depending on the previous characteristics and the type of interaction with the game, some weapons will be stronger than others, and some strategies can become dominant. For example, a weapon that has a big reload time and a small magazine, will not be viable in a game where the player encounters enemies everywhere, despite having high damage, but if the player encounters an enemy sporadically, it can be a good option.

Determining the strength and viability of a weapon comes from the situation where it is used, and this situation is often given by the style of the gameplay.

4.2.3 Gameplay styles

Adams (Fundamentals of Shooter Game Design, 2014) describe five different gameplay styles: shooting gallery, rail-shooters, tactical shooters, survival horror, and arena games. The shooting gallery and rail-shooters are styles that are not seen very often nowadays and are not designed to be played in multiplayer games. The other three styles are still popular and can be applied to multiplayer modes with relative ease.

Tactical shooters

For Adams, this type of gameplay is characteristic of games that try to simulate real-life combat. They tend to have more realistic encounters where each scenario must be well planned to progress, and they also try to emulate real physics in the firearms. Making this experience less appealing to more arcade players. An example of this type of gameplay is Arma III.

Survival horror

In this type of gameplay, the player must survive in a hostile environment surrounded by enemies and scarce resources. Some of these games reduce the mobility of the player and make it difficult to aim to make him feel powerless. They tend to use graphic

scenes with blood and gore. Good examples of survival horror games are The Evil Within and Resident Evil 2.

Arena games

These games are designed to be played exclusively in multiplayer mode against other players, or in teams where each side has a different objective. The core game loop revolves to playing against other people, so all the options must be well balanced, from the map to the weapons and characteristics of the character chosen by the player. If they are well balanced and appealing to the public, they can last for many years like Counter-Strike: Global Offensive released in 2012, which continues to have a strong community dedicated to the game.

4.2.4 Player's actions

In his book, Adams considers three main different types of actions that players can perform: moving, observing, and aiming/firing.

Moving

Normally the character moves with directional input, on pc with WASD and on game consoles with a joystick, can run, jump and crouch, and in fewer games, the character can perform a lateral movement to peek behind cover. It is not necessary that the game has all these different types of movement nor to limit its options to these. For example, in Doom Eternal, the avatar can neither crouch nor peek from behind cover, but it has the option to dash because its rhythm engages fast-paced movement.

Observing

It is a key part of the gameplay. Is the ability that the player must identify possible threats or safe zones. This aspect is where the key difference between a first-person perspective and a third-person one is most clear.

In a first-person camera, the angle of vision is defined by the field of view that is governed by two axes, the vertical and the horizontal. In most cases, the horizontal angle is wider, but as the camera is set in the eyes of the character, the player just sees what the avatar can see, losing peripheral vision and may not see incoming attacks coming from behind.

In a third-person point of view, the field of view is also decisive to determine what does the player see, but in this case, it is going to be higher than in a first-person perspective, because the camera is set away from the character, showing the player the entire avatar, some visibility of incoming threats from behind, and typically the player can move the camera around the body of the avatar more freely than in a first-person shooter.

Aiming/Firing

In almost every shooter the direction where the avatar is pointing is defined by a mark on the screen that is represented by a crosshair. This crosshair displays the possible directions the bullet can go through and narrows or widens depending on the spread that the weapon has at that moment.

In first-person shooters, the crosshair is mostly placed in the middle of the screen and never changes its position. So, the avatar and the player are always looking at where they are going to shoot and there is no nuisance.

In third-person shooters, the crosshair has the same functionality that in the first-person counterpart but here the character may look to someplace and the player to another one. Also, the avatar can hinder the player's vision. For this case, in some games like InFamous, the game allows the player to switch sides during the action. So, if the avatar had its gun on its right side, it would make a move to change the weapon to its left side.

It is important to notice that PC players have a natural aiming system (the mouse), while game console players have a more difficult system to aim. To address this issue, some games implement different aiming assist systems that make it easier to console players. The different aiming assists are:

- **Reticule magnetism:** If the crosshair is near an objective, it snaps to it in a subtle way.
- **Bullet magnetism:** The bullet trajectory changes a little bit to hit the intended enemy.

- **Target size:** The hitbox of the target is enlarged, so when it seems that the player has hit an enemy but barely chooses it, hit the enemy.
- **Lock-on:** This method locks the aim directly to an enemy, some games like Grand Theft Auto have this feature, but it is not very popular.

4.3 What is a heuristic

A heuristic is a qualitative and practical method to find a solution, which will not be optimal, but through validation seems to work and address most of the problems the optimal solution would take care of. The advantage is that it is not necessary to be as precise with the methodology to reach a similar result as the rather expensive optimal solution.

They do not pretend to be very specific nor unable to be broken. Jakob Nielsen (Ten Usability Heuristics, 2006) describes them more like rules to have in mind while designing, but that cannot be used blindfolded because each project is different and has different needs. They are just guidelines to make a first evaluation to know if we are going in a good direction.

4.3.1 UX heuristics

The User Experience field uses heuristics to evaluate if an interface is usable or it is not. The most famous heuristics from this field are the Usability Heuristics of Jakob Nielsen. In total they are ten principles for the user interface design field:

- **Visibility of System Status:** The system should always tell the users what is happening at the moment with it. For example, instead of showing a frozen screen, it can show that it is loading.
- **Match Between System and the Real World:** The information that is presented to the user has to be shown in a way that the user can understand.
- **User Control and Freedom:** The user can make mistakes, but undoing and redoing things has to be easy for the user. The system can not allow the user to go through unending text just because the user has made a mistake.

- **Consistency and Standards:** It is important to keep consistency and follow the standards, to not confuse the users. For example, Word has kept the same colours and disposition through the years.
- **Error Prevention:** The interface should prevent errors from occurring, for example, if the users are filling out a form, where they have to put their email address, the system should not allow anything that does not resemble an email, thus preventing the rise of an error.
- **Recognition rather than recall:** Users should memorize as little as possible, the options and consequences should be shown to the users to ease the navigation to the user.
- **Flexibility and efficiency of use:** Let the users perform at greater speeds by allowing configuration and shortcuts to the tasks. A great example of this is all the different keyboard shortcuts that are found in all the programs, allowing from undoing an action to creating whole projects without leaving the fingers from the keyboard.
- **Aesthetic and minimalist design:** The layout should respect the principles of contrast, repetition, alignment, and proximity (Nielsen, 2006) to make it more clear to the users.
- **Help users recognize, diagnose and recover from errors:** All the errors should be explained to the users in an easy way for them to understand what is the problem and how to address it. It is not useful to show the player an error of the SQL database.
- **Help and documentation:** Even though it would be perfect to have no need for help or documentation when using a system, it has to be detailed and easy to understand.

4.3.2 UX heuristic evaluation

Heuristic evaluation is a method used to find problems presented in a UI design in an iterative process. It revolves around having a small group of evaluators and examining the subject using recognized heuristics.

It is difficult to carry out a heuristic evaluation just with one person because this person might not be able to find all the usability problems alone, but a group of evaluators might be able to find more problems. To calculate the number of persons needed to

perform a heuristic evaluation it is needed to calculate the costs of each added person to the group, the costs of the risks of leaving one of these usability errors to escape and the costs in terms of time. Sometimes it is better to focus on critical errors only and leave the non-critical parts without cover. But it is recommended to have between 3 and 5 experts.

To perform a heuristic evaluation, an evaluator will go through the system analysing it and focusing on the parts that he considers may have a problem. Sometimes it can have the help of a person that knows how it works, to help with answers to the questions that this person might have. The result of the evaluation will be a list of usability problems that references one of the usability heuristics mentioned in the previous chapter.

4.3.2. Game design heuristics

In the Game Design field, they also have tried to create heuristics to help with the development of the game design. An example of a heuristic is the PLAY game usability heuristics (Desurvire & Wiberg, Game Usability (PLAY) For Evaluating and Designing Better Games: The Next Iteration, 2009). These heuristics consist of a list of 48 significant game design principles. Some of them are:

1. Game Play
    a. The player finds the game fun, with no repetitive or boring tasks
    b. The players should not lose any hard won possessions
    c. Challenge, strategy and place are in balance
    d. Easy to learn, harder to master
2. Coolness/Entertainment/Humour/emotional Immersion
    a. There is an emotional connection between the player and the game world as well as with their "avatar"
    b. The game offers something different in terms of attracting and retaining the players' interest
    c. The game uses humour well
    d. The game utilizes visceral audio and visual content to further the players' immersion in the game
3. Usability and Game Mechanics

a. Player does not need to read the manual or documentation to play

b. Game Controls are consistent within the game and follow standard conventions

c. The game does not put an unnecessary burden on the player

d. Navigation is consistent, logical and minimalist

5. Methodology

This chapter details the steps to follow in an effort to develop a set of heuristics for the shooter video game genre. It also describes the tasks to achieve it, and the time needed for each task.

5.1 Multi-step process to create heuristics

There is no standardized methodology when designing a set of heuristics. Each of the academic works that have dealt with this topic has done it in a way that better suits their domain and features. But Quiñones and Rusu (Quiñones & Rusu, 2017) tried to identify the approach that is used to create usability heuristics. In the paper, they review 7 methodologies and search how many studies have used explicitly those methodologies. They reach to the conclusion that the most used methodology comes from a paper titled "A Methodology to Establish Usability Heuristics" (Rusu, Roncagliolo, Rusu, & Collazos, 2011). This methodology consists of 6 steps:

1. **Exploratory stage:** collect bibliography and information related to the subject.
2. **Descriptive stage:** point out the most important parts of the previous stage.
3. **Correlational stage**: identify the characteristics that a usability heuristic must-have.
4. **Explicative stage**: formalization of the proposed heuristics.
5. **Validation stage:** validate the new heuristics against the old ones through heuristic evaluations performed on selected case studies, complemented by user tests.
6. **Refinement stage:** refine the heuristics based on the feedback from the previous step.

In step 4 they use a template to formalize the heuristics:

- **ID, Name, and definition:** the identifier, name and definition
- **Explanation:** detailed explanation and reference to usability principles
- **Examples:** examples of problems that justify the existence of the heuristic, plus examples that use the indications of the heuristic with satisfactory results.
- **Benefits:** expected improvements when it is applied

- **Problems:** possible misunderstandings of the heuristic

Although this method was thought with usability in mind, which is not the scope of this project, almost every study about heuristics and video games is related to usability. There are some exceptions like "Using Heuristics to Evaluate the Playability of Games" (Desurvire, Caplan, & Toth, Using Heuristics to Evaluate the Playability of Games, 2004) where they gather a set of heuristics that focuses on Game Play, Game Story, Mechanics, and Game Usability. But this study just validates them with the creation of a video game.

Another relevant usability heuristics study about videogames (Pinelle, Wong, & Stach, 2008) takes a similar approach to the Rusu et al. (2011) work. But instead of six steps, they use three:

1. Identify problems in game reviews
2. Develop categories that group problems
3. Develop game heuristics

Comparing these three phases with the 6 phases from the previous work, we can see some familiarities. Both have phases that try to identify problems using all the information available, they share phases where the information is used to elaborate the heuristics, but in the first study, they make an evaluation of the heuristics and the other one does not.

Due to the lack of references in the development of heuristics about gameplay, it is considered the Rusu et al. (2011) study and the Pinelle et al. (2008) as a good starting point to develop the heuristics for this project. This project follows the three steps described in the Pinelle et al. (2008) work because fits better with the scope of the project, but takes ideas from the Rusu et al. (2011) study and adds two more phases.

5.2 Approach

The methodology followed in this project is a proposal that takes into account the two previous methodologies. Our approach consists of five phases: a first phase of

identifying possible problems (subsection 5.2.1), which focuses on collecting all the available information on balance problems; a second phase of category development (subsection 5.2.2), where all the previous problems are categorized according to the type of problem (time, space, character,…); a third phase (subsection 5.2.3), that is mainly focused on the development of the heuristics; a fourth phase of validating the game balance heuristics (subsection 5.2.4); and a last and fifth phase of refinement of the heuristics (subsection 5.2.5), taking into account the feedback from the previous phase.

5.2.1 Identify problems

This phase consists of searching for information about all the documented problems in shooter games that lead to dominant strategies.

The shooters that are considered for this project are multiplayer shooters that have some balance problems. The information is gathered from multiple sources, like Reddit, official forums of the game, patch notes, articles from a magazine and web pages with databases that can be useful to describe a problem.

The selection of a problem will take into consideration the next criteria in order of importance:

1. There is visual information to detail and replicate the problem
2. There is a consensus among the community that it is a balance problem
3. The developers have already addressed the problem or have mentioned that will take measures to deal with it

5.2.2 Develop categories that group problems

The information previously gathered is used to develop different categories and subcategories. These categories consist of:

- The name of the category
- The name of the subcategory
- The key issues that it addresses
- An exemplification of the category
- The enumeration of all the problems that fall into this category

5.2.3 Develop game heuristics

To formalize the heuristics, it is considered the structure used in step 4 from the Rusu et al. (2011) study, but eliminating the benefits columns, because the benefit of all the principles is the same, eliminate dominant strategies:

- **Descriptive name:** name of the principle that makes a general description of it.
- **Explanation:** detailed explanation of the principle.
- **Examples:** examples that show problems found in video games that could be avoided following this principle
- **Problems:** clarifications and disclaimers about the principle.

5.2.4 Validation of the heuristics

There is a validation of the heuristics developed in the previous phase. The validation is done by giving the heuristics to a group of video game designers. These designers have to respond to a set of questions about the heuristics that evaluate the value of applying this principle in the making of a game. Whether they agree with the heuristic or not, they can leave comments on each one of them.

5.2.5 Refinement of the heuristics

This last phase takes all the feedback from the game designers and uses it to improve the initial heuristics. It tries to correct some central aspects or minor things to make them more accurate.

5.3 Chronogram

	November	December	February	March	April	May	Jun	July
Introduction			▓					
Objectives			▓					
State of the art	▓▓▓▓	▓▓	▓					
Theoretical framework	▓▓▓▓	▓▓	▓					
Methodology			▓					
1st Delivery			▓					
Corrections				▓▓▓▓	▓			
Identify problems				▓▓▓				
Develop categories that group problems					▓▓			
Develop game heuristics					▓			
2nd Delivery					▓			
Corrections						▓▓▓▓		
Develop game heuristics						▓▓		
Validation of the heuristics						▓		
Refinement of the heuristics							▓	
Final Delivery							▓	
Prepare presentation							▓▓	▓
Presentation								▓

Figure 2. Timetable of the project

The chronogram is divided into four phases, a first delivery, a second delivery, a final delivery, and a presentation. In each of the three deliveries there are different tasks to accomplish:

First delivery:

- **Introduction:** write the introduction to the project
- **Objectives:** specify the objectives of the project
- **State of the art:** write about the previous studies in the field
- **Theoretical framework:** redaction of the theory that is behind this work
- **Methodology:** Write the steps that are going to be followed to reach the goals of the project

Second delivery:

- **Identify problems:** search for problems that lead to dominant strategies
- **Develop categories that group problems:** having the problems, categorise them to extract conclusions
- **Develop game heuristics:** with all the categories, extract principles that can be applied to find dominant strategies in shooter video games

Final delivery:

- **Develop game heuristics:** with all the categories, extract principles that can be applied to find dominant strategies in shooter video games
- **Validation of the heuristics:** show the set of heuristics to a group of game designers to validate the hypothesis
- **Refinement of the heuristics:** use the feedback from the designers to give the final touches

Presentation:

- **Prepare presentation:** prepare the defence of the project
- **Presentation:** defence of the final degree project in front of a tribunal

6. Analysis and results

This chapter focuses on the analysis of the process and results obtained during the development of the heuristics. It is divided into five sections, which match the steps described in the methodology approach (subsection 5.2). By making this division, we can make a better description of the process and the results of each of the phases.

6.1 Identify problems

During the investigation, we have been able to find 45 initial problems. These problems have been extracted from multiple sources. One of the most useful sources to find general information has been Reddit. On this web page, we can find information, opinions, and news that users all around the world share with each other. Also, we can find specialized forums for a specific topic like a particular video game. It has been on these forums where most of the initial traces have been found.

With this initial trace, we have searched for official patches to that problem, news in reliable magazines, and more people talking and showing the problem. Once the information met the criteria mentioned in the methodology (subsection 5.2.1), we added this problem to a spreadsheet.

Most of the problems found are from relatively recent games like Apex Legends, Valorant, Fortnite or Overwatch. But there are also old games like Counter-Strike, Halo and Team Fortress 2. There is a predominancy of newer games due to the available information. Nowadays players are more concerned about game balance and the meta of the game, making this a topic of discussion in the forums.

The list of problems is presented already categorised to ease the understanding of the problems. The categorization is explained in the next section (Section 6.2)

List of problems:

Character – Movements

1. **Player's Unknown Battlegrounds: Players can avoid shots by spamming the crouch button, forcing players to aim at the lower section of the body.**

Player's Unknown Battlegrounds is a battle royale where surviving is the key. In 1v1 matches players can spam the crouch button to be more evasive and survive longer in a battle. By changing from a standing position to a crouch position, they are able to dodge some bullets that give them the advantage over the other player. Some players also use macros to make this movement even faster (Afiq Chii - PUBG Crouch Spam, hack or glitch? - YouTube, 2022) (Reddit - Guys using macro program spamming crouch. : PUBATTLEGROUNDS, 2022) (Reddit - Does crouch-shooting really work? : PUBGMobile, 2022).

2. Rainbow Six Siege: Players abuse crouch to avoid getting hit.

Rainbow Six Siege is a tactical shooter that players like to play because it is fairly accurate. During combat encounters, players can use the crouch button repeatedly to increase their chances of avoiding damage. In the case of Rainbow six siege, players also abuse the lean action, which allows them to look from a corner without exposing themselves. Ubisoft has addressed the problem in an official post on Reddit (figure below). (crouch spam - Twitch, 2022) (Reddit - The duck-lean-spam needs to fucking die : Rainbow6, 2022)

Publicado por **Former Ubisoft Community Manager** u/UbiNoty hace 3 años   🟧 🌐 Ⓢ 4

12.3k **Crouch and Lean Spamming**

[Ⓞ Official]

Recently, we have seen a rise of players encountering abusive crouch and lean spamming. To counter this, the team is actively working on how we want to approach the problem and planning our next steps.

We are currently prototyping a few systems to address this. More details will be shared about our exact methodology as we draw closer to a final version.

💬 1.1k Comentarios   ↗ Compartir   🔖 Guardar   ⊘ Ocultar   🚩 Reportar   94% upvoteado

Figure 3: Official comment on Reddit from Ubisoft. Source (Reddit - Crouch and Lean Spamming : Rainbow6, 2022)

3. Rainbow Six Siege: Drop shotting.

Drop shooting refers to shooting while laying down on the ground. The community considers this tactic annoying because when a player changes from a standing position to a laid position, the hitbox is not as accurate as it should be. The player can miss the shot even if it hits the enemy character. It also allows the player to

keep the accuracy of the weapon, even when it is moving. (Reddit - What is dropshotting? : Rainbow6, 2022) (Reddit - The Topic of Dropshotting in R6 : Rainbow6, 2022). Ubisoft has also addressed the issue (Se acabó el dropshot en Rainbow Six Siege. ¿El cambio más importante hasta ahora?, 2022)

4. Escape from Tarkov: Jiggle peeking, players look from the corners fast and return to cover.

Escape from Tarkov is a shooter like Rainbow Six Siege, but players can buy weapons and armour like in Counter-Strike. It is also viewed as a realistic experience. Jiggle peaking consists of fast and little movements done around a corner. With these movements, the player can look if there are players exposed behind the corner without being open to fire for too long. They also use this technique in battle encounters. Players complained that it was not realistic and that was not fair. The developers addressed this problem in the 12.12 patch. (Reddit - Jiggle peaking? : EscapefromTarkov, 2022) (Reddit - A short video that (I hope) will help less experienced players with close quarters engagements : EscapefromTarkov, 2022) (Reddit - "That's why you always jiggle peek" : EscapefromTarkov, 2022).

5. Escape from Tarkov: Moving in an erratically way.

Players move in unpredictable and not realistic ways to avoid damage. They can make turns of 180 degrees while running at full speed. These movements are possible because the game does not consider inertia to calculate the velocity. Players feel it is unfair and unrealistic, and the developers have tried to deal with this problem in patch 12.12. (Reddit - Anyone else loves to play Tarkov but hates the meta FPS mechanics required to be competitive? : EscapefromTarkov, 2022) (JesseKazam - The End Of Tarkov Jiggle Peeking? - Inertia Before & After Breakdown - YouTube, 2022).

6. Battlefield V: Prone meta.

Battlefield is a game with large maps and multiple objectives, where players have to keep moving. Prone defines the act of laying down on the ground. Some players in Battlefield V use this available option to hide from the enemies instead of moving

and using intelligent positioning. Due to the poor visibility of the maps, the camping spots and some weapons that are better when they are in bipod stand, there are lots of players that use this strategy. (Reddit - The Prone Camping Problem In BFV! : BattlefieldV, 2022)

7. Quake: Circle strafing.

Circle strafing is a technique used to gain an advantage over a player. To perform this tactic, the attacker moves around a victim in a circular pattern. While moving, the attacker can shoot continuously at the victim while evading the possible attacks from the player in the inner circle. This tactic is especially effective when the victim uses weapons with projectiles instead of hitscan weapons. The more time it takes the bullet to hit the attacker, the more difficult it is to aim.

Figure 3: Circle strafing. Source (i.imgur.com, 2022)

8. Planetside: Players spam crouch to become more difficult to hit.

Planetside is a game similar to Battlefield, with large maps and different objectives. The firing battles tend to happen in wide areas. When a player encounters an enemy, the player can start to spam the crouch button to avoid the first shots and stay alive longer (Reddit - Crouch spamming: What are the mechanics? : Planetside, 2022). This spam can be done at high speeds, making more difficult to shoot at the head. Some players have shown their discontent (Spammable

crouching has to go! | PlanetSide 2 Forums, 2022), but the developers have not addressed the issue.

Character – Unique characteristics

1. Valorant: Astra is one of the most used characters and changes the meta.

Valorant is a hero arena shooter that takes elements from Counter-Strike and Overwatch. One of the available characters is Astra. She is a character that players see as annoying due to her abilities. She can generate a field that attracts enemies and explodes, a smoke bomb, confuse enemies, and generates a wall that divides the map. The problem with her abilities is that she can place them everywhere and activate them at will even through walls. She does not need to be near the area that she wants to affect because she can target all areas of the map with her astral form. This range is available with all of her abilities. So to play against her, players have to make her waste those abilities with baits; because once she activates them, though players can see the trap placed, they do not know when it is going to activate. (GameLeap Valorant Pro Guides - Valorant PRO's: "ASTRA Meta is KILLING VALORANT" - Why It's SO Bad - Update Guide - YouTube, 2022)

Figure 4: The icon of the wall is an ability that Astra has placed before that can be activated. Source (Astra Is Just OP | Valorant | Shroud - YouTube, 2022)

2. Valorant: Jett is used in almost every competitive match due to its high mobility and abilities.

It seems that Jett is a must-have in competitive matches, where she has appeared in an 80% of the games in the Valorant Tournament of 2021. It is a character that requires a high skill to be used, but due to its high mobility and powerful ultimate ability players have learnt to use her. The ultimate allows the user to throw knives that have the most accuracy of the game, can kill from one shot in the head, and when the player kills with them, they refill. (Reddit - Jett is ruining the game of Valorant : VALORANT, 2022) (Jett Op Mains are the Worst : VALORANT, 2022)

MAP	#	ATK WIN	DEF WIN															
	71	50%	50%	82%	68%	59%	58%	43%	43%	28%	27%	23%	23%	20%	18%	4%	2%	0%
B Breeze	12	51%	49%	100%	100%	0%	100%	21%	54%	0%	71%	0%	13%	0%	42%	0%	0%	0%
H Haven	12	51%	49%	96%	71%	100%	0%	88%	58%	0%	13%	50%	17%	4%	4%	0%	0%	0%
I Icebox	12	50%	50%	100%	100%	0%	100%	25%	0%	96%	0%	0%	67%	4%	8%	0%	0%	0%
S Split	11	48%	52%	55%	5%	86%	59%	45%	55%	32%	23%	41%	9%	68%	9%	0%	14%	0%
A Ascent	10	45%	55%	95%	100%	100%	0%	70%	30%	15%	30%	0%	25%	0%	35%	0%	0%	0%
B Bind	8	51%	49%	50%	69%	75%	94%	6%	81%	31%	0%	0%	13%	38%	19%	25%	0%	0%
F Fracture	6	60%	40%	58%	0%	75%	50%	33%	25%	17%	67%	100%	0%	50%	8%	17%	0%	0%

Figure 5: Valorant Champions 2021 pick rates. Source (Valorant Champions 2021: Agent Pick Rates and Compositions | Valorant Event | VLR.gg, 2022)

3. Valorant: Sova is picked up almost in every competitive game, due to its gathering information abilities.

It is the only character with the initiator role whose primary ability revolves around gathering information, the other two initiators have those skills as secondary. The initiator has the responsibility to help the team locate and initiate the combat encounters. His primary ability allows him to shoot an arrow that works as a radar revealing the enemies through the walls. The arrow can also bounce and reach places where the player should not reach (Reddit - Meta Discussion: Sova : ValorantCompetitive, 20222).
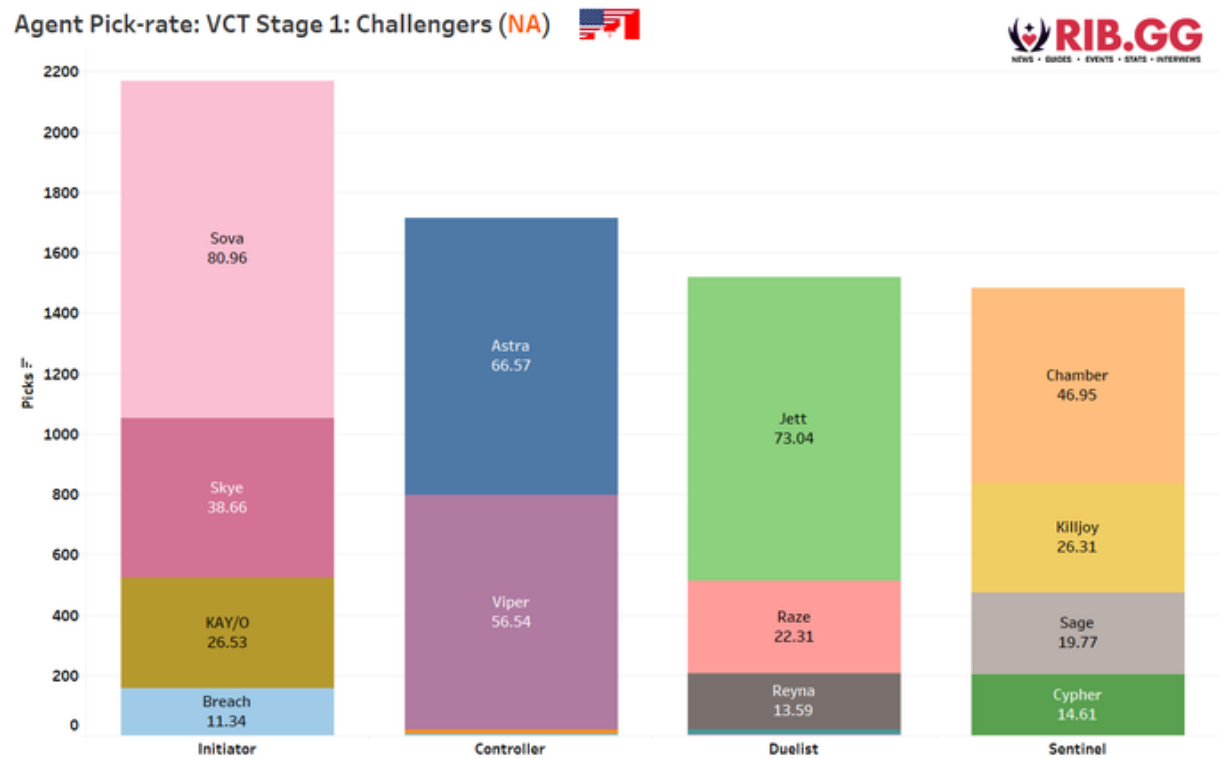
Figure 6: Pick rates by roles. Source (Twitter - Ominous, 2022)

4. Evolve: The monster wraith is the most powerful monster of the roaster.

From all the available monsters in the game, Wraith was the most powerful by difference. Most of the players with the role of hunters had a lot of trouble fighting this monster due to its fast speed, damage, and abilities. With one of these abilities it created a decoy and turned invisible, this does not last a lot of time, but it is enough to escape from an unfavourable match. (Reddit - Wraith is way too overpowered : EvolveGame, 2022). After lots of complaints, the developers nerfed the monster and now is not powerful at all (Reddit - Are you guys happy now with the Wraith Nerf? : EvolveGame, 2022).
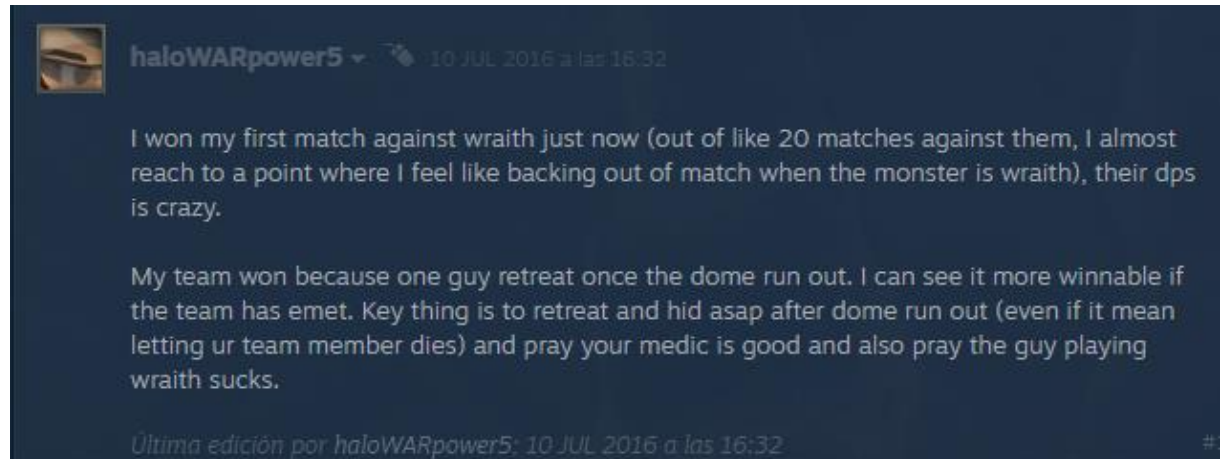
Figure 7: User comment about Wraith. Source (Wraith Op :: Evolve Stage 2, 2022)

5. Apex Legends: Octane can reload without waiting full reloading time.

Apex Legends is a battle royale, where fast movements and good accuracy are needed. Octane, a character from the Apex Legends game, can reload faster than the rest of the characters. While he is reloading, he can activate a unique ability that allows him to interrupt the animation, thus saving time and being ready to shoot faster than in a normal reload. This action saves a lot of time depending on the weapon used. We can see the different times in the figure below.

nj799 · hace 5 m · editado hace 5 m

Super interesting. I wanted to put some numbers behind this so I did some testing in the firing range. Here is the difference between no stim and stim reload times in seconds (s) for a few guns:

Weapon	No Stim (s)	Stim (s)	Difference (s)	Difference (%)
Car	2.10	1.92	-0.18	-8.73%
Flatline	2.92	2.82	-0.10	-3.43%
Rampage	3.20	1.70	-1.50	-46.88%

edit: to clarify, reload time is the number of frames between the frame bullet count hits 0 and the frame of the first fired shot after reloading divided by 60 (recorded at 60 fps).

12   Responder   Compartir   ···

Figure 8: Time saving table from user comment. Source (Reddit- Apex Legends Octane , 2022)

Character – Defence

1. Escape from Tarkov: Leg meta, shooting to the legs is effective and easy.

Escape from Tarkov has a peculiar damage calculation system. Players receive different damage values according to the part of the body hit. Also, these body parts can be destroyed, thus giving a disadvantage to the player. To protect these parts, players can use armour. But most of these armours protect the thorax, the stomach, and in a few cases, the arms.

The leg meta is a strategy used by the players that consist of shooting at the legs of the enemies because it is the fastest way to kill them (Wiki, 2022). Because they are never protected and are a big target, it is easier to damage and break them than to damage and break other parts. As we can see in the images below, they also have more disadvantages than other parts like the arms, which are unprotected most of the time.
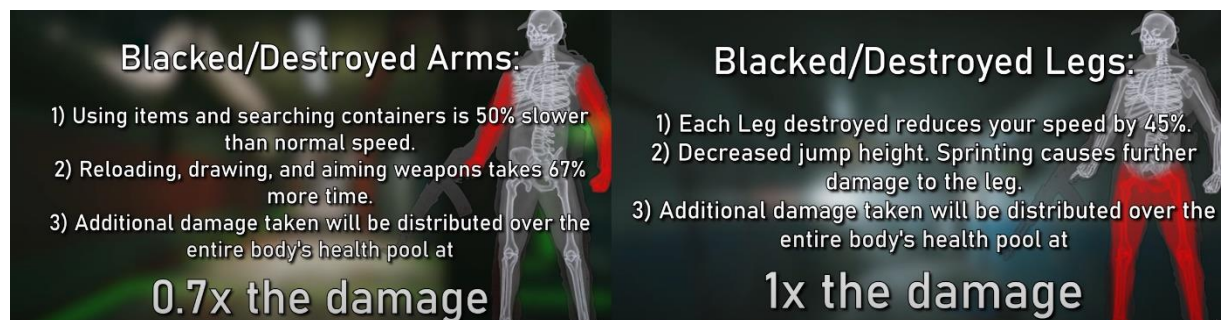
Figure 9: Arms destroyed vs leg destroyed. Source (VoX_E, 2022)

2. Halo: Bleedthrough, insta-kill with melee attack.

In Halo, players have a shield that recharges through time and a health bar that does not regenerate with time. The bleedthrough mechanic allows the damage to pass from the shield to the health bar. For example, if the shield has 20 points left and receives a hit of 30, the 10 points of extra damage will pass to the health.

This mechanic allows players to kill enemies with just two or three shots and a melee attack. This changes how players behave. When bleedthrough is active, they tend to rush at each other because it is easier to get the kill, but when it is deactivated, they tend to play at a longer distance. Some players have expressed their discontent with these mechanic in various comments and denounce that it is unfair. (What Is Bleed Through in Halo: Reach - DoubleXP, 2022) (Reddit - What's Bleedthrough? : halo, 2022). (What is Damage Bleed Through, 2022)

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Let's paint a scenario. There's spartan A, and spartan B.

A spartan takes 5 shots (with headshot) to successfully kill an opponent.

Three bullets are fired by each opponent.

- Spartan A lands all three of his shots. Spartan B is now 2 away from death, but still has shields
- Spartan B lands only 1 of three shots. - Spartan A is now 4 shots away from death, also still has shields
- Spartan B gets close enough to Spartan A to land a melee - Spartan A now has 1 shot to kill with his shields broken

In retaliation, Spartan A also melees Spartan B. Spartan B is also now 1 shot to kill, his shields are also broken Because Spartan B meleed first, he now has advantage to melee again before Spartan A can. Spartan B melees and wins the battle.

- Spartan A was actually more accurate with his shots, however because of not having bleedthrough, he lost the exchange.
- Had bleedthrough existed, this would not happen as Spartan A would simply bleedthrough shield and kill Spartan B on melee.

TLDR: Bleedthrough oftentimes prevents the better player from prevailing simply because a player can negate any missed shots by meleeing the opponent, causing a stalemate and likely victory becase they melee'd first.

/thread

EDIT: formatting

⬆ 17 ⬇ Compartir   ···

Figure 10: Comment of player explaining why it is an unfair mechanic. Source (Shield bleed through. Shouldn't this be a bad thing? : halo, 2022)

Tool – Weapon

1. Fortnite: SMG can shatter structures and dominates the game.

Fortnite is a battle royale where players can construct structures to avoid damage or to escape from the enemies. The SMG weapon is a submachine gun that can shatter structures and has a low reload speed. This makes it one of the best weapons in the game. Some players prefer it over other types of weapons, like a shotgun because the shotgun is <u>slower</u> in destroying the structures even though both are close-range weapons (Nobody seems to care that we're about to play

FNCS w/ one of the worst competitive metas of all-time : FortniteCompetitive, 2022).

Stingers -- SMG's right now are quite literally the worst item in the game for competitive, I have 0 Ping in VA and I can literally shoot anybody through their wall and then on top of that if me and commandment both spray they literally get hit no matter what unless you double layer it with a ramp and even then your ramp will get broken. With the rate of fire and damage this gun does on top of the damage to builds, if you end up fighting another good duo you will literally just waste all of your mats and shield unless one of you is quick dropped which will barely happen if you are a player who plays to not sell. The time to kill is so unreal compared to the previous SMG's where you can literally kill a duo or kill one and crack the other one and hit him for whites if you hit your shots. Because of how strong the SMG is, it makes the shotgun barely have a point, the only reason I can think of to hold a shotgun in a grand final is that you don't have enough ammo to run double AR/SMG.

Figure 11: Player complaining about the SMG. Source (TwitLonger — When you talk too much for Twitter, 2022)

2. Fortnite: MK7 AR rifle does not have recoil and works as a hit scan weapon.

The MK7 rifle is a powerful weapon that has low recoil, works well from long distances and is almost like a hit scan weapon. These characteristics eliminate the need for longer-range weapons like snipers. This weapon is used in the long and medium-range, without needing a change (Reddit - I really hate the MK7 meta. : FortniteCompetitive, 2022).

3. Valorant: Ares is being used by everyone.

In Valorant, players must buy the weapons they want to use. The more expensive the weapon, the better its stats. Ares is a weapon that has a relatively low cost. In patch 4.0, Riot decided to power up this asset; this buff created an imbalance between the power and the cost of the weapon. So many people started to use it. Players started to complain about the weapon, and in the end, Riot had to nerf the weapon. (Valorant Players Are Upset About Overpowered Ares Gun Buff, 2022) (Reddit - Ares Thoughts for 4.0 : ValorantCompetitive, 2022) (Nate | TSM FTX en Twitter: "this ares shit is the most dumb thing i've seen in valorant https://t.co/LKoK1C9t2H" / Twitter, 2022) (Valorant patch 4.01: The Ares is finally nerfed | ONE Esports, 2022)

4. Valorant: Vandal is picked up in 37% of the matches followed by a 13% pick of the next weapon.

Vandal is an assault rifle from Valorant. The problem with this weapon is that, due to its characteristics, it has a pick rate of 37%, while the second most picked up option has a 13%. This last weapon is also an assault rifle and has an equal cost as the Vandal. Given that their roles and costs are identical, the pick rates should not be that disparate. We can see that the problem is bigger when we look at the total kills of this weapon. It has a 48% of the total kills, followed by the phantom with a 19% (Valorbuff - VALORANT Estadísticas de Armas, 2022).

Weapon		Category	⧉ Cost	Tier	Score	Trend	Win %	Pick %	Dmg/Round	KDA
Tactical Knife		MELEE	⧉ 0	Strong / S	64.71	NEW	50.09%	100.00%	0.16	0.30
Vandal		RIFLE	⧉ 2900	Strong / S	63.21	NEW	54.56%	36.67%	132.03	1.46
Phantom		RIFLE	⧉ 2900	Good / A	57.62	NEW	55.01%	13.91%	125.31	1.47
Classic		SIDEARM	⧉ 0	Bad / D	36.06	NEW	40.17%	10.41%	29.36	0.61
Spectre		SMG	⧉ 1600	Good / A	52.75	NEW	53.85%	9.06%	79.62	1.31
Sheriff		SIDEARM	⧉ 800	Weak / C	37.71	NEW	39.76%	6.53%	71.53	0.92
Ghost		SIDEARM	⧉ 500	Good / A	50.29	NEW	51.72%	5.68%	83.70	1.35
Operator		SNIPER	⧉ 4700	Good / A	56.82	NEW	56.74%	4.41%	130.27	1.44
Marshal		SNIPER	⧉ 950	Fair / B	40.69	NEW	44.10%	2.75%	74.85	0.90
Judge		SHOTGUN	⧉ 1850	Fair / B	45.04	NEW	48.89%	1.60%	72.37	1.03
Guardian		RIFLE	⧉ 2250	Fair / B	45.89	NEW	47.56%	1.44%	110.36	1.14
Bulldog		RIFLE	⧉ 2050	Fair / B	47.05	NEW	49.99%	1.04%	86.35	1.17
Frenzy		SIDEARM	⧉ 450	Weak / C	40.33	NEW	44.25%	1.00%	62.71	1.03
Shorty		SIDEARM	⧉ 150	Bad / D	33.57	NEW	39.01%	0.93%	43.40	0.70
Ares		HEAVY	⧉ 1600	Fair / B	44.06	NEW	47.45%	0.86%	74.09	1.14
Odin		HEAVY	⧉ 3200	Good / A	55.45	NEW	56.33%	0.80%	113.15	1.61
Bucky		SHOTGUN	⧉ 850	Bad / D	35.57	NEW	40.71%	0.57%	51.72	0.76
Stinger		SMG	⧉ 950	Weak / C	36.27	NEW	40.89%	0.41%	57.51	0.85

Figure 12: Stats from the different weapons. Source (Valorant Weapon Stats Patch 4.07 - METAsrc, 2022)

5. Halo: The pistol is a very powerful weapon.

This pistol can kill a player with three shots if the last is on the head, otherwise, it can kill with five shots to the body. This makes it a really powerful weapon in the first Halo game. (Bungie co-founder says he's to blame for Halo's overpowered pistol - Polygon, 2022) (Reddit - Halo 1 Pistol - A Discussion on Balance : halo, 2022)

6. TitanFall 2: Spitfire has higher damage and range than all the other weapons.

TitanFall is a fast game with small maps. The game tries to promote the constant movement of the players. The Spitfire due to its high damage, high range and the help of the aim assist, is one of the favourite options of the players, especially those that tend to stay in a single spot throughout the game. (Reddit - What is it with the

spitfire? (Titanfall 2) : titanfall, 2022) (Reddit - Why is the spitfire so OP : titanfall, 2022)

Figure 13: Players making fun of the balance problem. Source (Reddit - Spitfire needs a nerf : titanfall, 2022)

7. Team Fortress 2: Scorch shot has a great splash damage and after effect.

Scorch shot is a weapon hated by a big part of the community (Reddit - ScorchShotHateClub, 2022). This hatred comes from being a weapon with devastating results which is easy to use. The player does not have to be good at aiming because it has a large radius of effect. The effect is not that powerful, but it can burn the objective, which makes the player vulnerable to other types of damage and makes him lose life over time, and has a series of advantages that are explained in the figure below by a Reddit user. (Reddit - Scorch shot is beyond overhated : tf2, 2022).
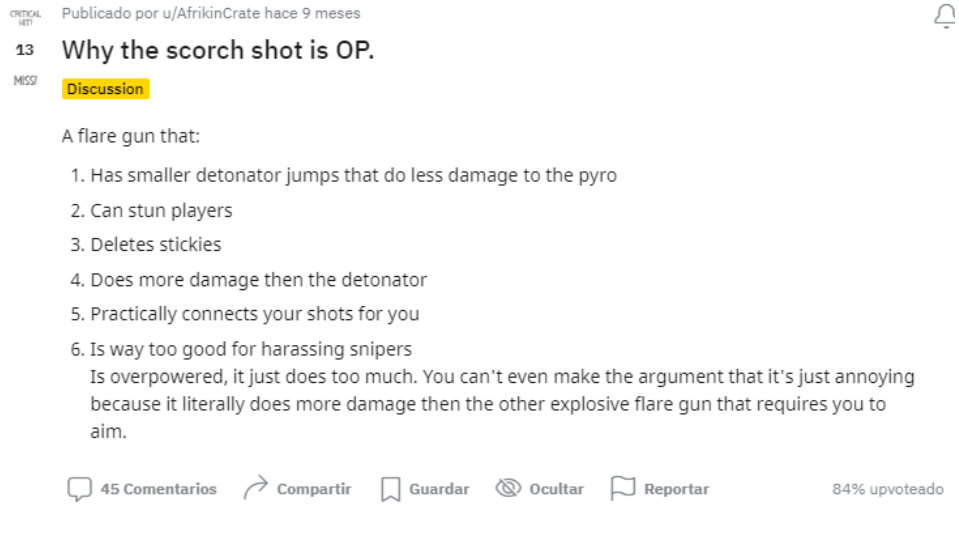
Figure 14: Comment of user about scorch shot. Source (Reddit - Why the scorch shot is OP. : tf2, 2022)

8. Battlefield V: ZH-29 is a two shot kill at all ranges.

The ZH-29 is a rifle in Battlefield V. Although it has a small magazine and is not considered a sniper, it is used in both long-range and medium-range. Its strength is that it can kill with two shots, regardless of distance. It has proven better than snipers in long distances and has the versatility of close-quarters encounters. (Reddit - Any of you used the ZH-29 for Recon yet? Thing is insane! : BattlefieldV, 2022) (Reddit - Am I the only person that realizes the ZH-29 is absolutely god tier? : BattlefieldV, 2022)

Tool – Gadget

1. Fortnite: Spider gloves give lots of mobility which is a key part of the game.

Spider gloves allow the players to move freely through the environment. This mobility gives an unfair advantage over the players that do not have them because they cannot escape nor chase the players using these gloves. Players have been criticising this tool on multiple occasions. (Reddit - When will they remove the spider man gloves? : FortNiteBR, 2022) (Reddit - Remove Spider-Man hands from fortnite arenas : FortniteCompetitive, 2022)

In a recent patch, the Fortnite team is nerfing the spider gloves from 80 shots to 20. ('Fortnite' Update V19.20 Patch Notes: Covert Cavern, Mythic Stinger and Haven Masks Added, 2022)

2. **Player's Unknown Battlegrounds: Vehicles increase mobility in a way that all matches end with lots of vehicles.**

In PUBG there are vehicles scattered around the map; players can use those vehicles to move faster throughout the environment. The problem arises when players must use vehicles because they provide a lot of mobility and cover from other players. This problem is more predominant in consoles because players have more difficulty hitting the vehicles and drivers while moving. ([XB1Now that everyone has figured out how OP vehicles are (b/c it's very hard to shoot out drivers using controller), every Solo match ends with a derby. : PUBATTLEGROUNDS, 2022) (Reddit - Drive-bys are ridiculous and need to change : PUBATTLEGROUNDS, 2022) (Reddit - Vehicles are pretty overpowered simply because the controls limit you so much : PUBGMobile, 2022)

In more recent updates, the developers have nerfed vehicles due to the previously mentioned complaints of the users. (Vehicles Nerfed in PUBG Update for Xbox One | AllGamers, 2022)

Time – Game start

1. **Fortnite: W key meta**

W key is a term that describes the act of pressing the W key. In most PC games this key is used to move forward. It implies that the strategy is set around moving onward without caring about strategy. In this meta, players tend to play more aggressive and there is no room for other strategies, like taking your time to prepare for the late game. This type of player forces early and rush encounters to catch off guard to other players. (Reddit - How to counter w-key? : FortniteCompetitive, 2022).

2. **Overwatch: An attack strategy is better than a defensive one.**

In Overwatch, there is a snowball effect that is difficult to counter. It is something that the community complains about in the forums (Reddit - How do i stop snowballing effect : OverwatchUniversity, 2022) (The ultimate snowball effect - Competitive Discussion - Overwatch Forums, 2022), but we can also detect this by analysing the differences in the picks for each of the four roles (Support, tank, offence, defence). As can be seen in the figure below. The defence role is one of the less played roles because it does not help to push the offence as roles like support with their healing abilities, or tank, with their barriers, can do.

ROLE STATS PC

PC   PSN   XBL   QUICK PLAY   COMPETITIVE

Overview   Primary   Eliminations   Medals

Role	Popularity	Picked	Win Rate	On Fire	E:D Ratio
Support	35.29%	4.24 /GAME	51.36%	9.54%	1.90
Tank	34.49%	4.14 /GAME	51.59%	9.08%	2.90
Offense	22.30%	2.68 /GAME	51.03%	10.16%	2.77
Defense	7.92%	0.95 /GAME	51.64%	9.28%	2.67

Figure 15: Roles and their stats. Source (Roles - Overbuff - Overwatch Statistics, 2022)

3. Overwatch: Dive Meta.

Overwatch players use the term dive to describe the action of "diving" into enemy territory to secure a quick and first kill. The composition of the team uses Winston, D.Va, Genji, and Tracer (It may also use Zenyatta or Lúcio). These heroes can move fast and deal a lot of damage, but they are not as defensive. The main goal of this strategy is to focus on a victim, thus creating an imbalance in the number of the enemy team and their strategy. This strategy was so strong that was dominant during 2017 and 2018. (Reddit - What is the dive meta? : Overwatch, 2022) (Reddit - Just A Reminder That Dive Has Been The Dominant Meta For The Past 4 Seasons. : Overwatch, 2022) (Looking back historically, what was the timeframe of the dive meta, and when did it begin to die off? : Competitiveoverwatch, 2022)

4. Rust: Riding (destroying the base) other players is easy and without penalties.

Rust is a game where players can create, defend, or attack other bases. The game never stops, and the elements exist whether players are in the game or not. To

destroy an enemy base, players need a fixed number of resources to build the explosives, weapons, and all the possible attack options. But this cost is much less expensive than rebuilding the broken stuff. On top of that, there are no effective tools to defend against this kind of attack and attackers are free to rush the base while the owners are not playing. This has discouraged players to continue with the game or constructing a base at all. (Reddit - Raiding is too easy, here's why. : playrust, 2022) (Reddit - [Opinion] Raiding is Too Easy, Causes Dead Servers. : playrust, 2022) (Reddit - Rust has gotten too easy and fast : playrust, 2022) (Reddit - Offline raiding is boring and too easy but it's the only way getting out with profit : playrust, 2022)

Space – Visibility

1. Battlefield 1: Advantageous places for camping.

Players complain that there exist a lot of safe places for camping in Battlefield 1. These spots are easy to protect and allow a great vision of the field without exposing the player.

Figure 16: Camping spot. Source (FragHero - 8 Unfair Camping Spots in Battlefield 1 Multiplayer - YouTube, 2022)

2. TitanFall 2: Camping problems in console.

TitanFall 2 is a fast-paced game that rewards constant movement and quick reactions, but in the console version, some players prefer to stay still because it is easier with the gamepad. They use a weapon that allows them to have better aim while standing still and choose a spot that gives visibility without exposition to enemy fire. (Reddit - Camping solution : titanfall, 2022).

3. Battlefield 3: Bush wookies, campers difficult to see.

Snipers fall from parachutes into specific places where they are difficult to be spotted and stay there for the rest of the match. From those spots, they try to shoot other players minimizing their exposure. These practices are considered annoying for other players (Battlefield 3: Top 10 Things People Hate About BF3s Multiplayer_all video game, 2022).

Figure 17: Bush wookies. Source (Reddit - The bush wookie nest. : battlefield3, 2022)

4. Apex Legends: Players can dive underwater and become invisible.

A user discovered in Apex Legends that by crouching in a deep enough pool of water, he could conceal himself from the rest of the players. This effect made him almost invisible due to the way textures work in the game while allowing him to see the enemies as if he was not underwater (Underwater glitch in Apex Legends makes for a great hiding spot, 2022).

Figure 18: Player underwater. Source (Casagaming, 2022)

5. Counter-Strike Global Offensive: Players can see enemies through walls.

Counter-Strike is a game where users tend to be precise with their shots. Headshots are prominent. Users have discovered that by replacing some files and changing the shaders setting from high to low, they can see other players through the walls. The game renders the players' bodies above the walls without being detected by the file verifier. In a game where players can land headshots that easily, letting them know from advance where are the enemies, it is dangerous. We can see an example of this problem in the image below.
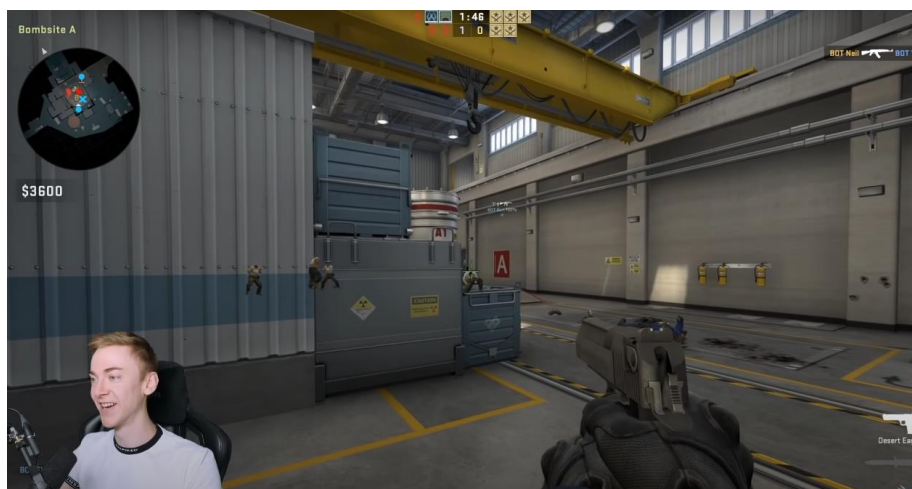
Figure 19: Enemies showed behind the walls. Source (Sparkles - WALLHACK Exploit that requires no hacks... (CS:GO) - YouTube, 2022)

6. Counter-Strike Global Offensive: Players can see enemies through smoke bombs.

This problem allows players to see the silhouette of other players through the smoke. Some players consider this a part of the game, while others think it is a bug which makes no sense. We can see an example of the visibility of the smoke grenade in the image below.

Figure 20: Enemy shown through the smoke bomb. Source (Reddit - Devs should really fix this : GlobalOffensive, 2022)

Space – Location

1. Counter-Strike Global Offensive: Olofboost.

This problem became popular when it was used in a tournament to come back from the match. (Olofboost: The Day CSGO Changed - Dot Esports, 2022). This tactic uses three people to form a tower. The tower can be performed thanks to a feature that allows players to jump one over the other. In this famous map, the player who was on top could reach a spot, from where he could control the rest of the map without exposing himself.
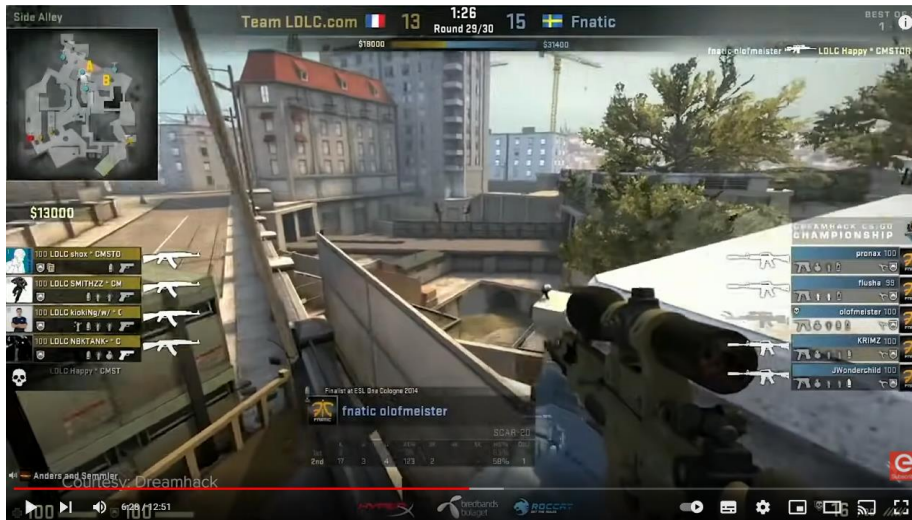
Figure 21: Olofboost in the tournament. Source (theScore esports - The Controversial Olofboost [Video], 2022)

2. Counter-Strike Global Offensive: Map boosts.

Map boosts are places on the map that provide good cover and hiding while giving a good spot from where they can shoot at the enemies with ease. There are various boosts on different maps.

Figure 22: Map Cobblestone boost. Source (CS:GO - Best boosts - Metabomb, 2022)

3. Battlefield 3: In the map Metro, players can get out of bounds and shoot players from a safe zone.

In Battlefield 3, players discovered that they could get out of bounds on the map Metro. This bug allowed players to navigate through the ceiling and shoot at the other players while the walls hid them. With this advantage, they usually would wait above a highly concurrent place on the map and get other players off guard. The other players were able to shoot back, but they could only see the flashes of the gun instead of the player. (TheNickyYo - BF3 Metro MAV, C4 Glitch / Exploit! with lots of kills - YouTube, 2022)

Figure 23: Players outside the bounds of the map. Source (Excarline - Battlefield 3 - Glitch Operacion metro - Encimita del mapa - YouTube, 2022)

4. Overwatch: Place turret under map.

The character Torbjorn has an ability that allows him to place a turret. This turret is autonomous and can shoot other players if they step within its vision range. Some players have discovered that they can plant the turret underneath the maps. While the turret is underneath the map, it continues to work as usual, but is invisible to other players. Other players can receive damage from the turret, but they do not know where it is. (Game-breaking Overwatch exploit makes Torbjorn's turret completely invincible - Dexerto, 2022)

Figure 24: Turret placed under the map. Source (Reddit - Found this Torb player abusing a turret bug on Gibraltar in competitive. Not sure if this has been found before?? : Overwatch, 2022)

Space – Time

1. Splitgate: Spawn Killing.

In Splitgate players can open portals to move and shoot through them. Spawns in this game do not work well, the player can spawn in the middle of the map. But some players have started to abuse this bad design to get free kills. Players can place portals to known locations of spawns to kill the players as soon as they appear. (Reddit - The spawn system is broken : Splitgate, 2022)
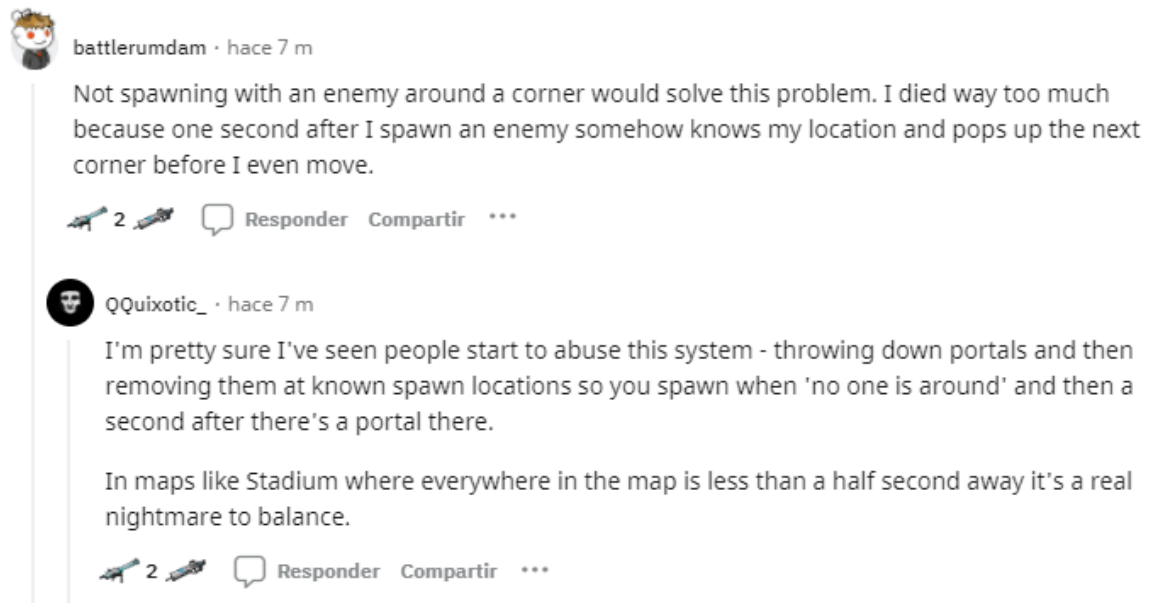
Figure 25: Players complaining about the spawn system. Source (Reddit - About spawn killing : Splitgate, 2022)

Win condition – Win condition

1. Rainbow six siege: Players do not play the mode, they win killing.

There are different play modes in the game: bomb, hostage, and secure area. Each of these modes has different ways of winning. For example, in the bomb mode, the defender team must stop the attackers from planting a bomb, while in hostage mode, there is a team that has to save a hostage and the other team has to keep that hostage. The two modes differ in their objectives, but it is possible for players to win by eliminating the other team. In the end, the prefered option is the latest, as we can see in the graphics below.
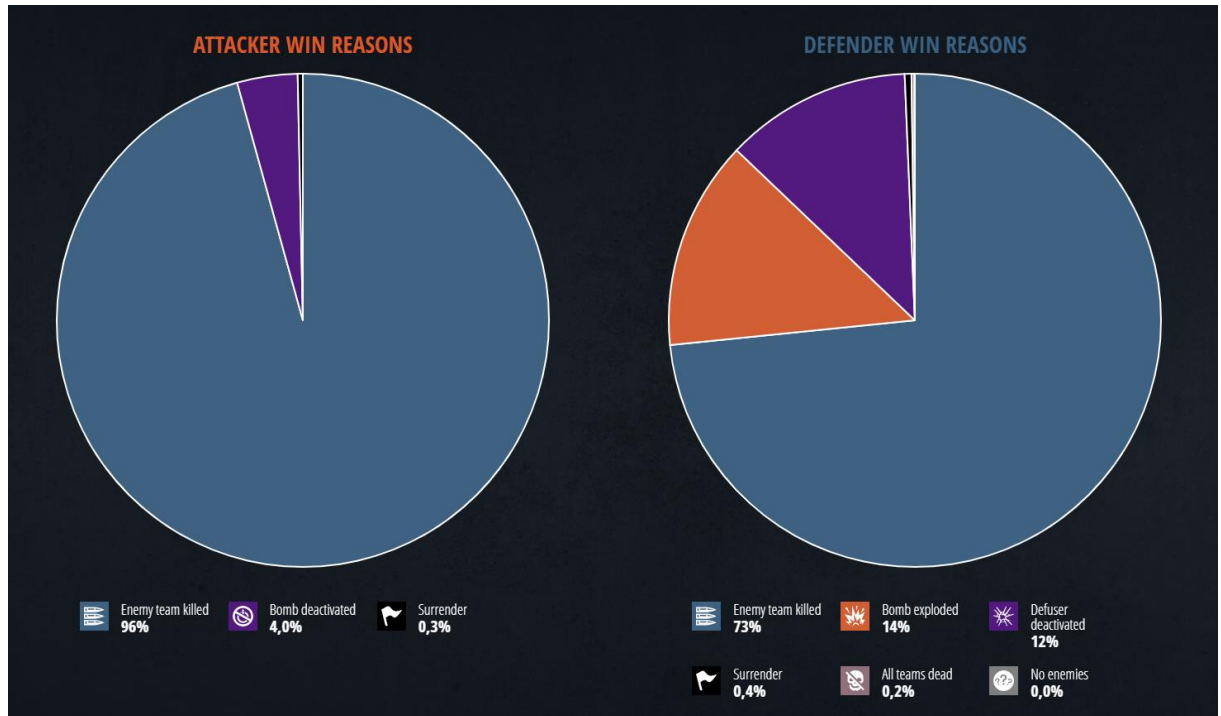
Figure 26: Bomb match win reasons. Source (R6Maps.com - Stats BETA, 2022)
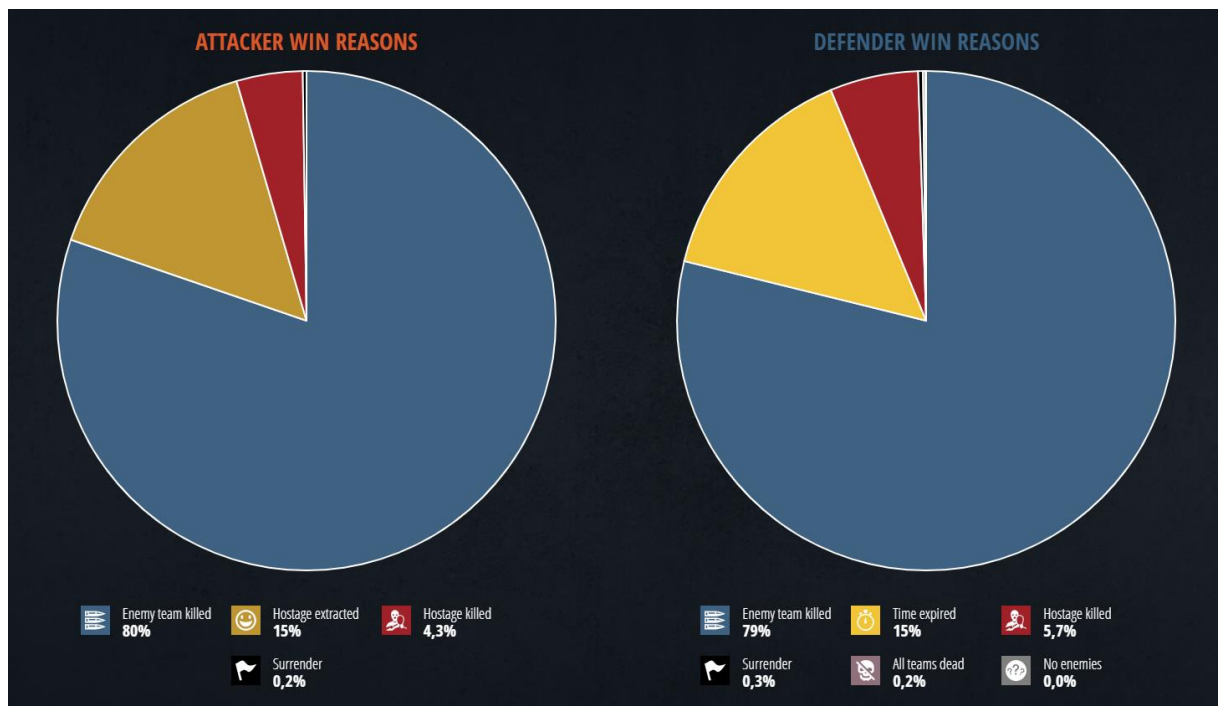
Figure 27: Hostage match win reasons. Source (R6Maps.com - Stats BETA, 2022)
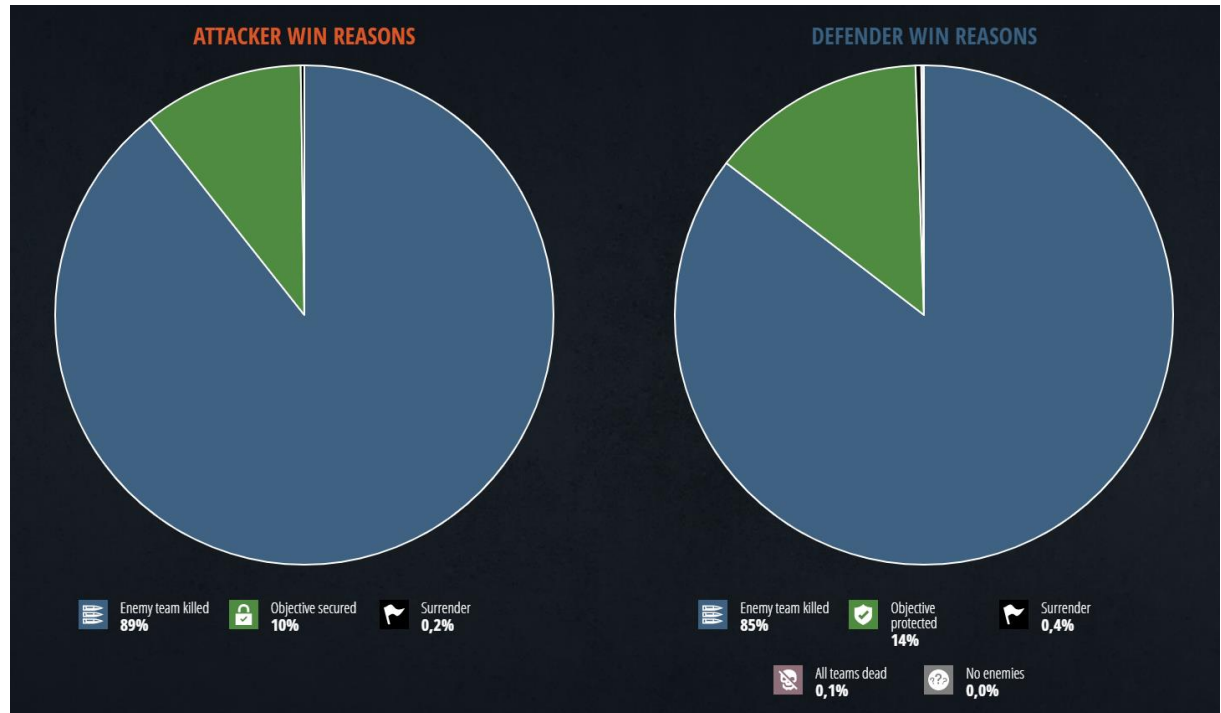
Figure 28: Secure Area match win reasons. Source (R6Maps.com - Stats BETA, 2022)

2. Battlefield V: Snipers tend to stay away killing other players and do not help with the objective.

Each class in Battlefield V has a main role. In the case of the snipers, they are the ones that gather information for the team. Because of its long-range, some players prefer to stay away from the objective and try to kill other players from the distance. Apart from its range, the other thing that makes possible this strategy is that they can find places to hide that give them good visibility while minimizing their exposure. (Reddit - Are snipers ruining the game for anyone else? : BattlefieldV, 2022) (Reddit - Snipers ruin the game : BattlefieldV, 2022) (Reddit - Snipers are cancer : BattlefieldV, 2022)

Game – Assist

1. Splitgate: Console players have aim assist, pc players don't.

Developers created aim assist to help players that use a gamepad to aim better. It slightly moves the crosshair of the weapon to the target, it is a subtle movement like a magnet, but it can help.

In Splitgate, aim assist is very noticeable. The problem appears when PC players, who do not have this assist, and console players play on the same servers. Even if playing with a keyboard and a mouse is easier, PC players complain that they are at disadvantage because of this feature. (Shacknews - How does aim assist work in Splitgate?, 2022) (Reddit - The strength of aim assist : Splitgate, 2022). PC players are complaining about this assist because is helping a lot to console players (Steam - Aim assist is just dumb :: Splitgate , 2022) (Reddit - Is aim assist op? : Splitgate, 2022)

2. **Fortnite: Visual audio setting allows to see from where a sound comes.**

There is a feature on Fortnite that allow players to represent visually from where the sounds are coming. In the beginning, this feature disallowed the stereo sound, but now players can decide to active the visual indications while maintaining the stereo sound. While it was originally intended as an aid for those with hearing disabilities, players use this feature to help locate other players. (Codelife - Why Everyone's Using Visual Audio In Fortnite! (After Sound Update) - YouTube, 2022)

Figure 29: Visual audio activated. Source (Fortnite: Cómo activar efectos de sonido visuales, 2022)

3. **Call of Duty Vanguard: Aim assist is used among PC players to improve their accuracy.**

When using a gamepad controller, players can activate the aim assist in the game, making their aim more accurate. Some players have complained that the aim assist helps a lot and it is not fair.
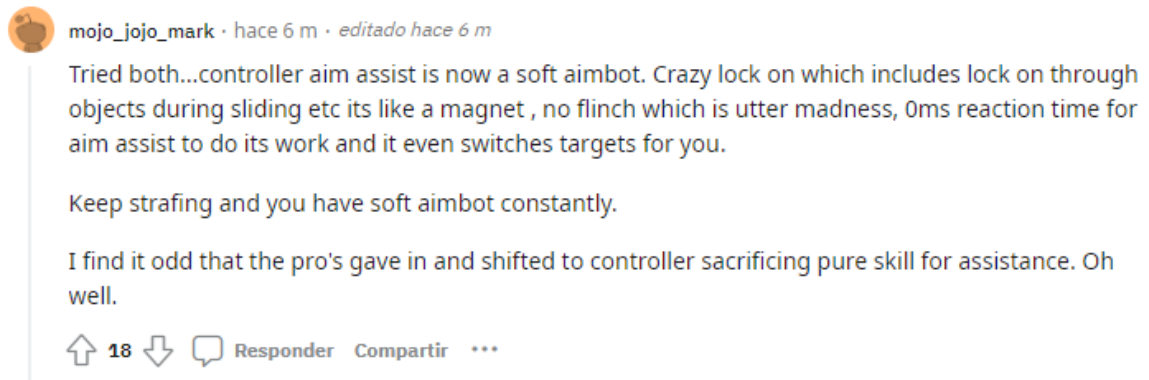
Figure 30: User talking about aim assist. Source (Reddit - Aim assist on vanguard seems too strong : CODWarzone, 2022).

6.2 Develop categories that group problems

Once we had the initial set of problems, we arranged them into different categories: character, tool, time, space, win condition, and game.

This first categorization led to a smaller categorization inside the general ones, where we can find subcategories like damage avoidance, unique characteristics, weapon, visibility, and strategic places.

Category	Subcategory	Description
Character		This type of game balance problem is related to the character, their physical representations, and characteristics.
	Movements	Problem related to the ability of a character to move around the map.
	Unique characteristics	The specific characteristics of a character can be its skills or stats.
	Defence	Balance issues linked to the available defence methods of the players.
Tool		Problems that emerge from the tools used by the players.
	Weapon	Balance issue due to the weapons chosen by the players
	Gadget	These can be the perks, objects, vehicles, etc. That a player chooses
Time		Balance problems that arise from the different times that the players deal with.
	Game start	Problems from early starts and engages.
Space		Problems caused by the game space where the players appear.
	Visibility	This is related to the vision that a player has from a specific point.
	Location	Related to the advantages and disadvantages that a player has from a specific point in the space.
	Time	Describes the time of reaction that players have due to their position.

Win Condition		This type of problem comes from the way that the players have of winning a match.
	Win Condition	When the win condition has a flaw in its design.
Game		Problems that arouse due to bad designers' decisions in the game.
	Assist	In-game assists that designers develop to make the game easier.

Table 1: Categories of the problems. Source (own creation)

After defining the categories, the problems were grouped in a fitting subcategory:

Category	Subcategory	Game	Problem
Character	Movements	Player's Unknown Battlegrounds	Players can avoid shots by spamming the crouch button, forcing players to aim at the lower section of the body.
		Rainbow six siege	Players abuse crouch to avoid getting hit.
		Rainbow six siege	Drop shotting.
		Escape from Tarkov	Jiggle peeking, players look from the corners fast and return to cover.
		Escape from Tarkov	Moving in an erratically way.
		Battlefield V	Prone meta.
		Planetside	Players spam crouch to make them more difficult to be hit
		Quake	Circle strafing
	Unique characteristics	Valorant	Astra is one of the most used characters and changes the meta.
		Valorant	Jett is used in almost every competitive match due to its high mobility and abilities.
		Valorant	Sova is picked up almost in every competitive game, due to its gathering information abilities.
		Evolve	The monster wraith is the most powerful monster of the roaster.
		Apex Legends	Octane can reload without waiting full reloading time.
	Defence	Escape from Tarkov	Leg meta, shooting to the legs is effective and easy.
		Halo Reach	Bleedthrough, insta-kill with melee attack.
Tool	Weapon	Fortnite	SMG can shatter structures and dominates the game.
		Fortnite	MK7 AR rifle does not have recoil and works as a hit scan weapon.
		Valorant	Ares is being used by everyone.
		Valorant	Vandal is picked up in 37% of the matches followed by a 13% pick of the next weapon.
		Halo	The pistol is a very powerful weapon.
		TitanFall 2	Spitfire has higher damage and range than all the other weapons.

		Team Fortress 2	Scorch shot has a great splash damage and after effect.
		Battlefield V	ZH-29 is a two shot kill at all ranges.
	Gadget	Fortnite	Spider gloves give lots of mobility which is a key part of the game.
		Player's Unknown Battlegrounds	Vehicles increase mobility in a way that all matches end with lots of vehicles.
Time	Game start	Fortnite	W key meta.
		Overwatch	An attack strategy is better than a defensive one.
		Rust	Riding (destroying the base) other players is easy and without penalties.
		Overwatch	Dive Meta
Space	Visibility	Battlefield 1	Advantageous places for camping.
		TitanFall 2	Camping problems in console.
		Battlefield 3	Bush wookies, campers difficult to see.
		Apex Legends	Players can dive underwater and become invisible.
		Counter-Strike Global Offensive	Players can see enemies through walls.
		Counter-Strike Global Offensive	Players can see enemies through smoke bombs.
	Location	Counter-Strike Global Offensive	Olofboost.
		Counter-Strike Global Offensive	Map boosts.
		Battlefield 3	In the map Metro, players can get out of bounds and shoot players from a safe zone.
		Overwatch	Place turret under map.
	Time	Splitgate	Spawn Killing.
Win Condition	Win condition	Rainbow six siege	Players do not play the mode, they win killing.
		Battlefield V	Snipers tend to stay away killing other players and do not help with the objective.
Game	Assists	Fortnite	Visual audio setting allows to see from where a sound comes.
		Splitgate	Console players have aim assist, pc players don't.

		Call of Duty Warzone	Aim assist is used among PC players to improve their accuracy.

Table 2: Categorization of the problems. Source (own creation)

As it can be seen in the table, most of the games have balance problems found in this list are still being a problem because designers do not fix them, or they do not take them into account.

6.3 Develop game heuristics

Once all the problems were categorized, we have tried to make an abstraction of the problem and define it as a heuristic. From this abstraction we have subtracted eight heuristics:

1. **Character – Movements:**
   No repeated movements in combination with the scenario characteristics should allow the player to have minimal exposure.

Players must understand their surroundings and act according to that knowledge. They cannot repeat the same movements to gain an advantage without taking a risk in different situations.

We have found that in some games, players tend to spam crouch when they are exposed to enemy fire. Another action that players tend to abuse is to jiggle peek in the corners. These fast and short movements on the edge of a corner allow them to quickly scan the arena and take advantage of exposed enemies without revealing themselves.

2. **Character – Unique Characteristics:**
   No unique skillset should allow a character to be able to dominate the game without displaying a unique weakness or assuming an equivalent cost or risk when using these skills.

In many games, there are characters that, due to their unique skills, become a must-pick to be competitive in the game. This set of characteristics gives them an advantage over the rest of the characters. In most shooters, the advantage is over a group of characters that share the same role, like Jett in Valorant.

This problem is also common in other types of games because it is difficult to balance qualitative attributes, but an indicator of poor balance can be the different pick rates of each one. It is common to have different pick rates from the characters, but we must avoid massive differences between them. If those big differences exist, maybe there is a balance issue and that character is outperforming the others

3. **Character – Defence:**
   No weakness in the enemy's defence should be exploitable without requiring an equivalent degree of skill.

All the weak points that a player can find in an enemy's defence, can and should be exploited, if possible, but if the weakness comes from the design, it must ensure that the ability to exploit that weakness is equivalent to the reward.

In Escape from Tarkov, there is armour that protects from the bullets, but this protection does not reach the feet. This makes the feet vulnerable, and even if hitting the head makes more damage, it is easier to always target the feet than the head.

If shooting to the head has a difficulty of 10 and a damage of 100, shooting to the torso cannot have a difficulty of 5 and a damage of 75. The damage to the torso is only 25 points less, while is half as difficult to hit.

4. **Tool – Weapon:**
   No weapon should be designed to excel in more than one or a few different types of encounters or scenarios.

This heuristic is like the second but applied to weapons. The difference with the second heuristic is that in this case the advantage usually comes from a more quantitative approach; the weapon normally does not have a unique skill but has higher stats than the rest. These higher stats make them more versatile and better in situations where they should not shine.

An example of this can be the ZH-29 from Battlefield V. This weapon is a rifle that due to its high range, high damage and good cadence can outperform a sniper and a more medium-range weapon.

5. **Tool – Gadget:**

   No special advantages or skills a player obtains during the game can be used without being countered by other players or having a duration inverse to their power.

It is common in shooters with big maps to place objects that can benefit the player that gets them, for example, tanks, helicopters... Usually, these devices give an advantage to the person that uses them, but they can be countered by a player that does not have that device. The problem is when those devices do not have a counter or weak point, and the rest of the players cannot do much to avoid them.

For example, in Fortnite there are some gloves that allow the user to navigate through the map way faster than the rest of the players, this allows the user to chase other players and escape from them with ease.

6. **Time – Game start:**

   No successful attack at the start of the game can bring victory to the attacker's side.

First-person shooters tend to have a fast-paced style where the most aggressive players usually are the winners. The initial attacks define the terms of later encounters due to a snowball effect, but this eliminates the uncertainty of the game.

We can see an example of this aggressive style in Overwatch, where all the competitive players in season 4 followed the same strategy, taking down a character to get a number and strategic advantage, which put the enemy team in a defence mode until the end of the game.

7. **Space – Visibility:**

   No place on the map should provide good visibility of the environment while completely protecting the player from the other players.

There are places in some maps that provide a good vision of the field and protect the player from external threats. This is the case of the famous Olofboost. This spot provides a good vision of the map while it hides the player that is in that spot.

Each spot on a map needs to have its costs and benefits. If it provides good visibility to the players, it has to make them visible; and if it hides them, it has to limit their visibility.

8. **Space – Time:**
   No player should respawn in a predictable area where the enemy may expect her, or this area must be protected.

When players die in a match, usually they respawn until the end of the match. The respawn location varies from game to game, some games make this location fix, and others have different locations that vary depending on the movements of the players. The problem appears when players can predict and exploit the respawn location of the enemy. This makes the player that is about to respawn vulnerable to an attack that is impossible to predict.

9. **Win condition – Win condition:**
   No game mode can be won by applying the same strategy as a different one, or at least, not in the same proportion.

It can be found that games implement alternative gameplay modes, where in the end, the new rules are not followed because is easier to win as always. This can be a waste of resources and time.

An example of this is Rainbow Six Siege. This game implements different game modes, like rescue the hostage or disarm the bomb. But in the end, most of the matches end by killing the rest of the team. And if they win by doing the same in each of the different types of matches, it is only necessary for one type of match.

10. **Game – Assist:**
    No game assists can only benefit a group of players; all the players must have the same conditions.

If the game implements an assist that can help to win the match, players will have to activate that option eventually if they want to win. Players always will take the shortest path to victory, so if the designers give them assists, they will activate them. The problem comes when these assists break the flow of the game.

In Fortnite there is an assist for people with hearing problems, what this assist does is to represent visually from where the sounds are coming. It is a good idea, but players that do not have any disability also use this help to locate the enemies more easily.

6.4 Validation of the heuristics

To try to validate the heuristics we have created a questionary that consists of twenty questions, two for each heuristic. On the presentation page of the questionary, we have explained the project, the purpose of the questions, and the heuristics.

The questionary is divided into 10 sections. In each section, the users can find the heuristic and the two questions. The first question asks the users what they think is the value of applying this heuristic. They must respond on a Likert scale that goes from "Not at all important" (1) to "Very important" (5). The second question, on the other hand, is an open question where users can give feedback about the heuristic, unlike the first, this question is not mandatory.

In the end, they have participated in the questionary ten people and there are only twelve suggestions in total. We believe that this low participation is due to the time required to read, understand, and give feedback for each of the heuristics.

We think that the results are positive despite the low participation and suggestions:

1. No repeated movements in combination with the scenario characteristics should allow the player to have minimal exposure. (36 points)

1. No repeated movements in combination with the scenario characteristics should allow the player to have minimal exposure.

Value of applying it   Copiar

10 respuestas

Suggestions

2 respuestas

Me parece feo que se utilicen ciertos movimientos, como agacharse continuamente en un enfrentamiento directo en un pasillo, por ejemplo.
Pero me parece lógico que si tienes una cobertura, te asomes, dispares, y te vuelvas a cubrir.

Entiendo que en los juegos donde las balas llegan instantáneas como en el Counter es algo que tienes que tener en cuenta, en cambio en juegos como Battlefield donde hay caída de bala y el movimiento es mas lento, el jiggle peek no creo que sea una estrategia tan fuerte.

Figure 31: Results for the first heuristic. Source (own creation)

As it can be seen, designers tend to believe that the value of applying this heuristic is generally very important, and the two suggestions confirm that. The first suggestion argues that even though it can be a bad practice, it is logical that users use them because the game allows this strategy. The other suggestion, on the other hand, says that he believes that the strategy of jiggle peaking is more useful in games with hitscan weapons and that it is not useful in games where bullets have to traverse through the map.

2. No unique skillset should allow a character to be able to dominate the game without displaying a unique weakness or assuming an equivalent cost or risk when using these skills. (47 points)
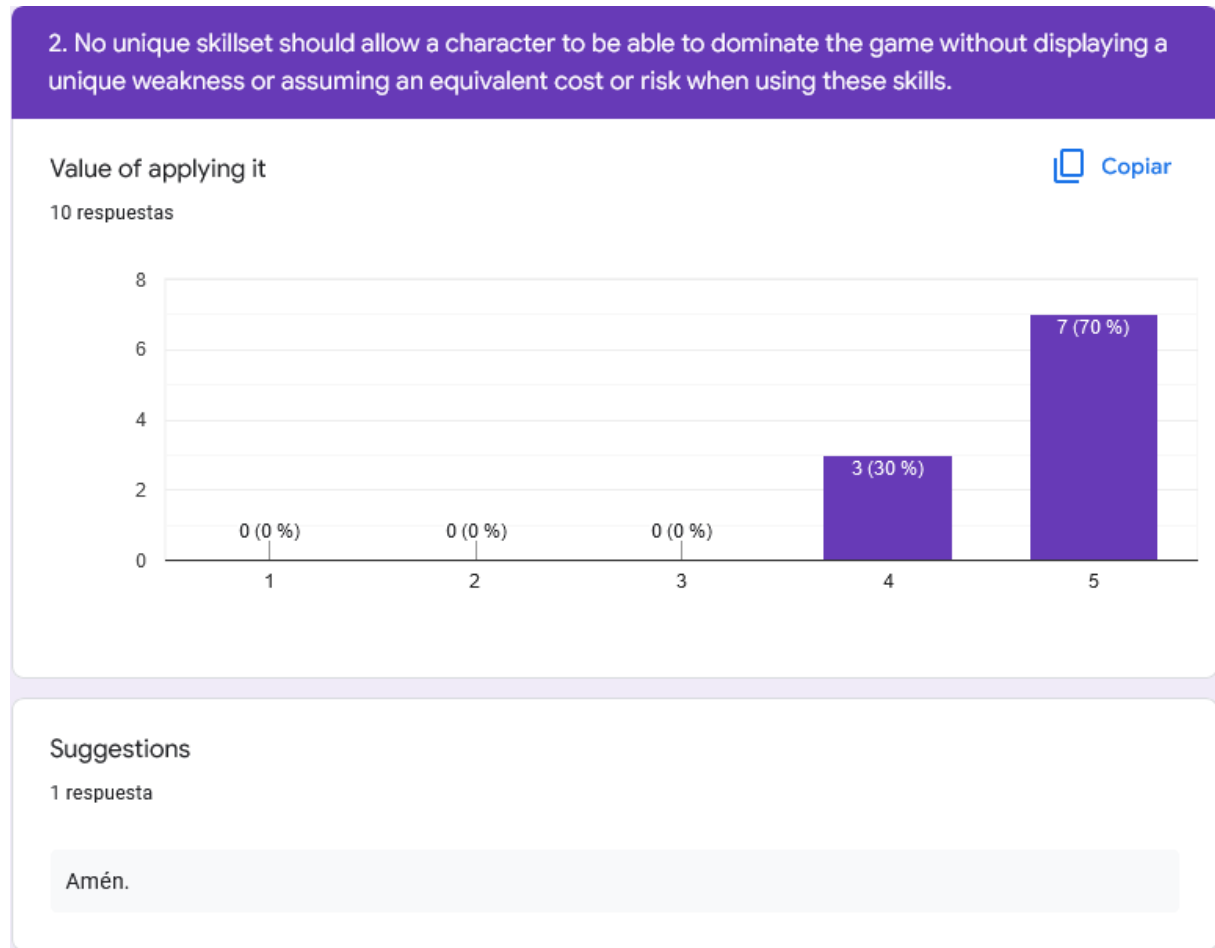
Figure 32: Results for the second heuristic. Source (own creation)

With this heuristic, they all agree that has an important to very important value.

3. No weakness in the enemy's defence should be exploitable without requiring an equivalent degree of skill. (47 points)

3. No weakness in the enemy's defence should be exploitable without requiring an equivalent degree of skill.

Value of applying it   Copiar

10 respuestas

Suggestions

0 respuestas

Aún no hay respuestas para esta pregunta.
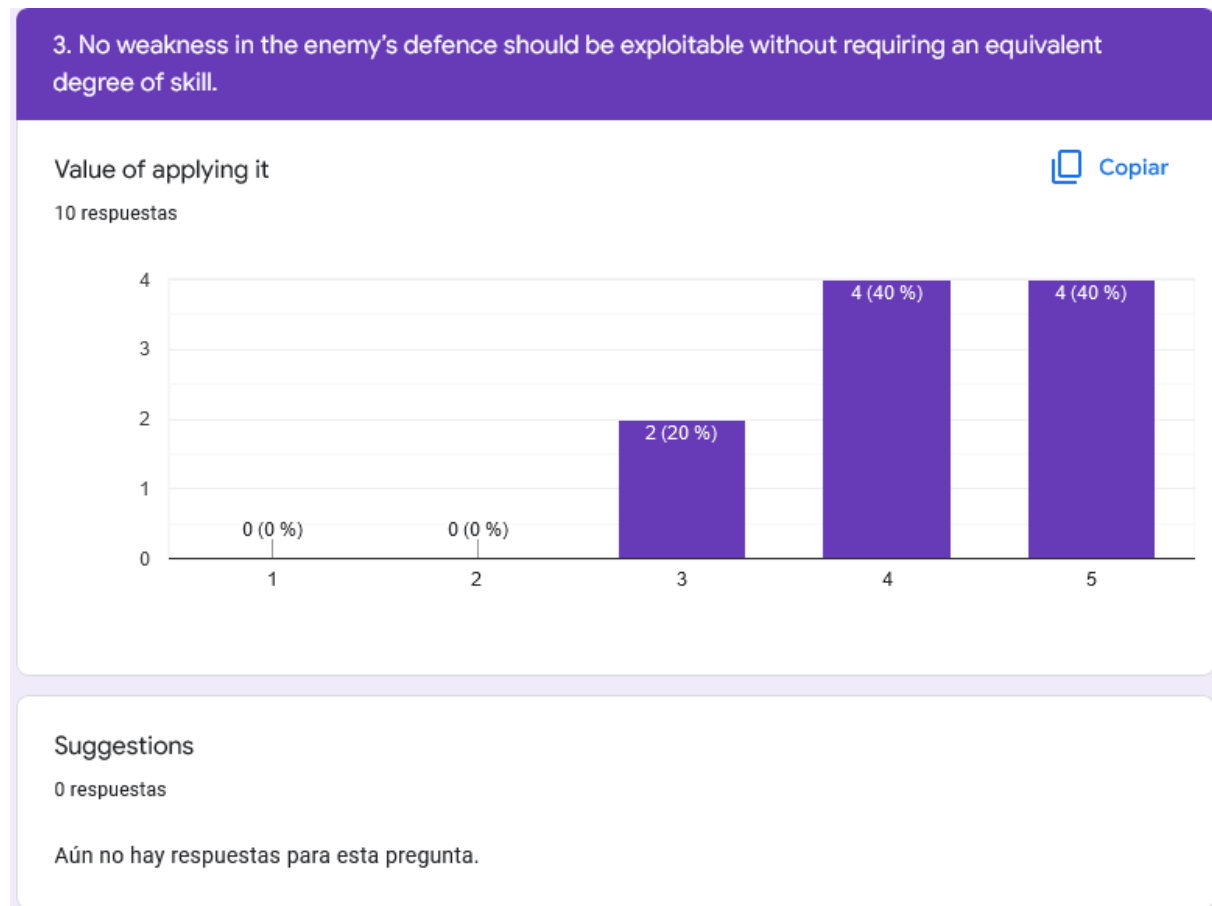
Figure 33: Results for the third heuristic. Source (own creation)

Here we have a similar case as the second heuristic. Only two of the designers see the heuristic with a neutral value.

4. No weapon should be designed to excel in more than one or a few different types of encounters or scenarios. (39 points)
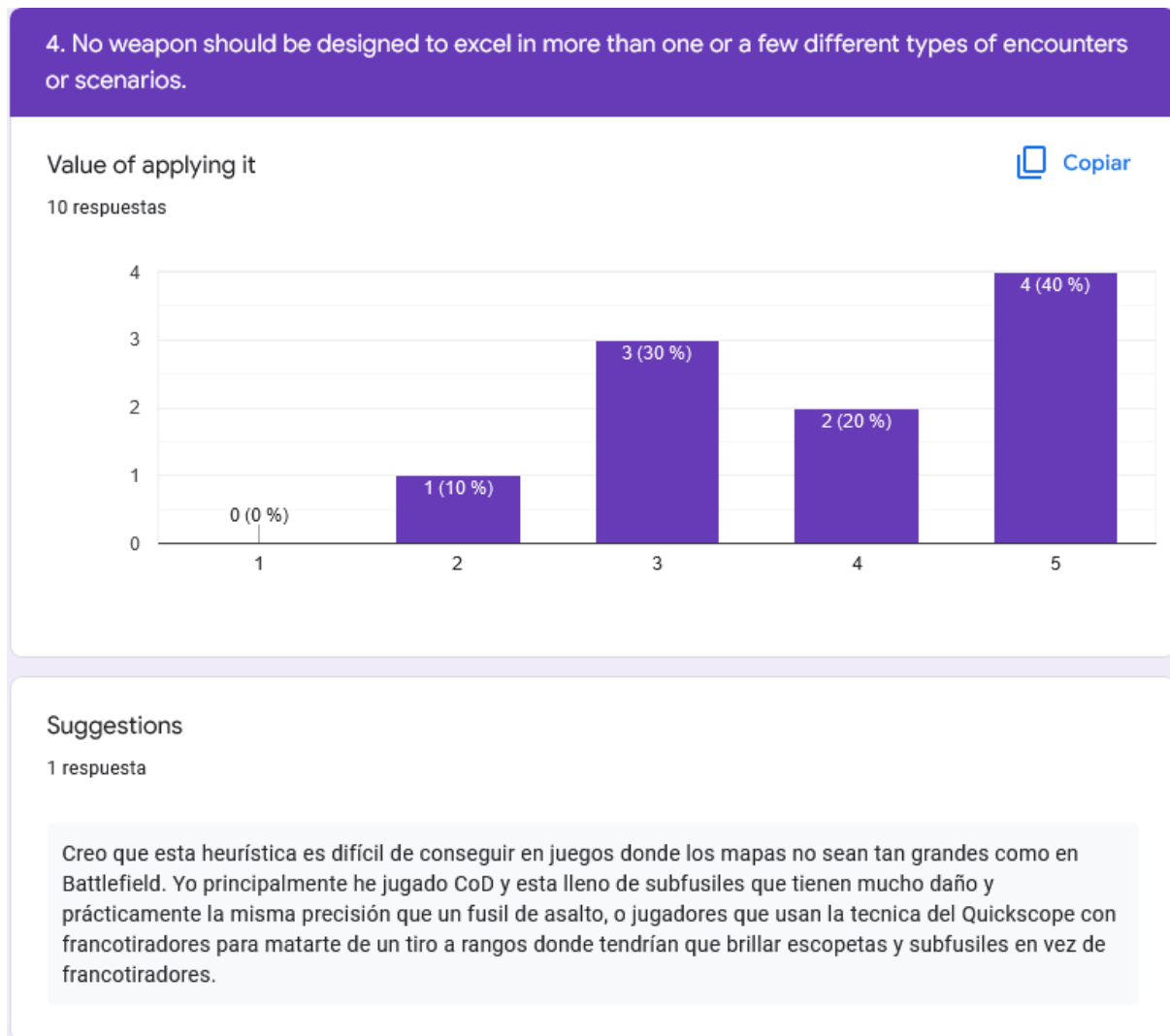
Figure 34: Results for the fourth heuristic. Source (own creation)

Four designers see this heuristic as neutral or low value. In the suggestions, a designer explains that he finds it difficult to apply it in games with small maps because in larger maps it is easier to have different tactical needs, but in smaller maps, players search for the highest damage possible regardless of the accuracy. He explains the case of quick scopes, where players use long-range weapons in very close combat situations.

5. No special advantages or skills a player obtains during the game can be used without being countered by other players or having a duration inverse to their power. (37 points)

5. No special advantages or skills a player obtains during the game can be used without being countered by other players or having a duration inverse to their power.

Value of applying it   Copiar
10 respuestas

Suggestions
3 respuestas

It's not bad if you had to make sacrifice to get that adventage.

Creo que un juego competitivo no debería tener elementos aleatorios que unos jugadores puedan obtener y otros no. Aunque esto pueda hacer algunas partidas mas entretenidas/divertidas, también puede causar bastante frustración el hecho de que por haber caído 30 metros mas a la derecha que mi rival, el tenga un tanque y yo un subfusil.

Entiendo que si el resto de jugadores tienen las mismas oportunidades de conseguir esa ventaja, no debería ser un problema. Aunque si es cierto que puede convertir el metajuego en una carrera para conseguir esa ventaja lo mas rápido posible.

Figure 35: Results for the fifth heuristic. Source (own creation)

In the suggestions, we can appreciate that designers believe that the triangularity that occurs with these types of objects is a good thing, but they don't like the possible random factors that can transform the triangularity into just luck.

6. No successful attack at the start of the game can bring victory to the attacker's side. (26 points)

6. No successful attack at the start of the game can bring victory to the attacker's side.

Value of applying it   📋 Copiar

10 respuestas

[Bar chart showing:
1: 3 (30 %)
2: 2 (20 %)
3: 2 (20 %)
4: 2 (20 %)
5: 1 (10 %)]

Suggestions

2 respuestas

Este aspecto es un poco complejo a mi parecer. Porque, si bien es cierto que el efecto snowball es bastante "duro" recibirlo en contra, también es bastante "duro" dominar la fase inicial de una partida y que por mecánicas de "comeback" acabes perdiendo el partido, pese a haber jugado mejor.

Yo creo que en el juego debería haber estrategias o campeones que se contrarresten, para que en medio de la partida los jugadores se vayan adaptando al rival y acabe venciendo el que mejor entiende el juego. O bien, que si tu estrategia de hacer un "all-in" no te funcione , el juego te penalice de la misma forma, y te haga plantearte 2 veces si quieres jugártela, o ir con un planteamiento más equilibrado.

Si una estrategia tiene counter no veo por lo que tendría que ser un problema. Aunque estas estrategias deberían ser parecidas a jugadas agresivas en ajedrez como el mate del pastor, donde hay una alta recompensa pero también un alto riesgo.

Figure 36: Results for the sixth heuristic. Source (own creation)

This is the least valuable heuristic from the designers' perspective. In the first comment, the designer explains that sometimes the comeback mechanics to counter these strong starts can feel unfair. The second suggestion exposes that maybe these strategies do not share an equivalent risk and reward. And the last comment, like the second, does not see this as a balance problem if the risk and reward are aligned.

7. No place on the map should provide good visibility of the environment while completely protecting the player from the other players. (37 points)

7. No place on the map should provide good visibility of the environment while completely protecting the player from the other players.

Value of applying it   Copiar
10 respuestas

Suggestions
2 respuestas

In fortnite for example, bushes gives player an easy spot to shot, due that when you aim, the bush amost disapears from your vision also making you invisible from outside. I don't think its something that important, if it makes that spot kinda obvious.

Yo es que sinceramente soy un campero así que le pongo un 4 en vez de un 5.

Figure 37: Results for the seventh heuristic. Source (own creation)

One of the designers explains that he does not think it is as important while players can see that this is an obvious spot where enemies can hide.

8. No player should respawn in a predictable area where the enemy may expect her, or this area must be protected. (40 points)

Figure 38: Results for the eight heuristic. Source (own creation)

Seven of the designers believe that this heuristic is important or really important, but there are no comments.

9. No game mode can be won applying the same strategy than a different one, or at least, not in the same proportion. (37 points)
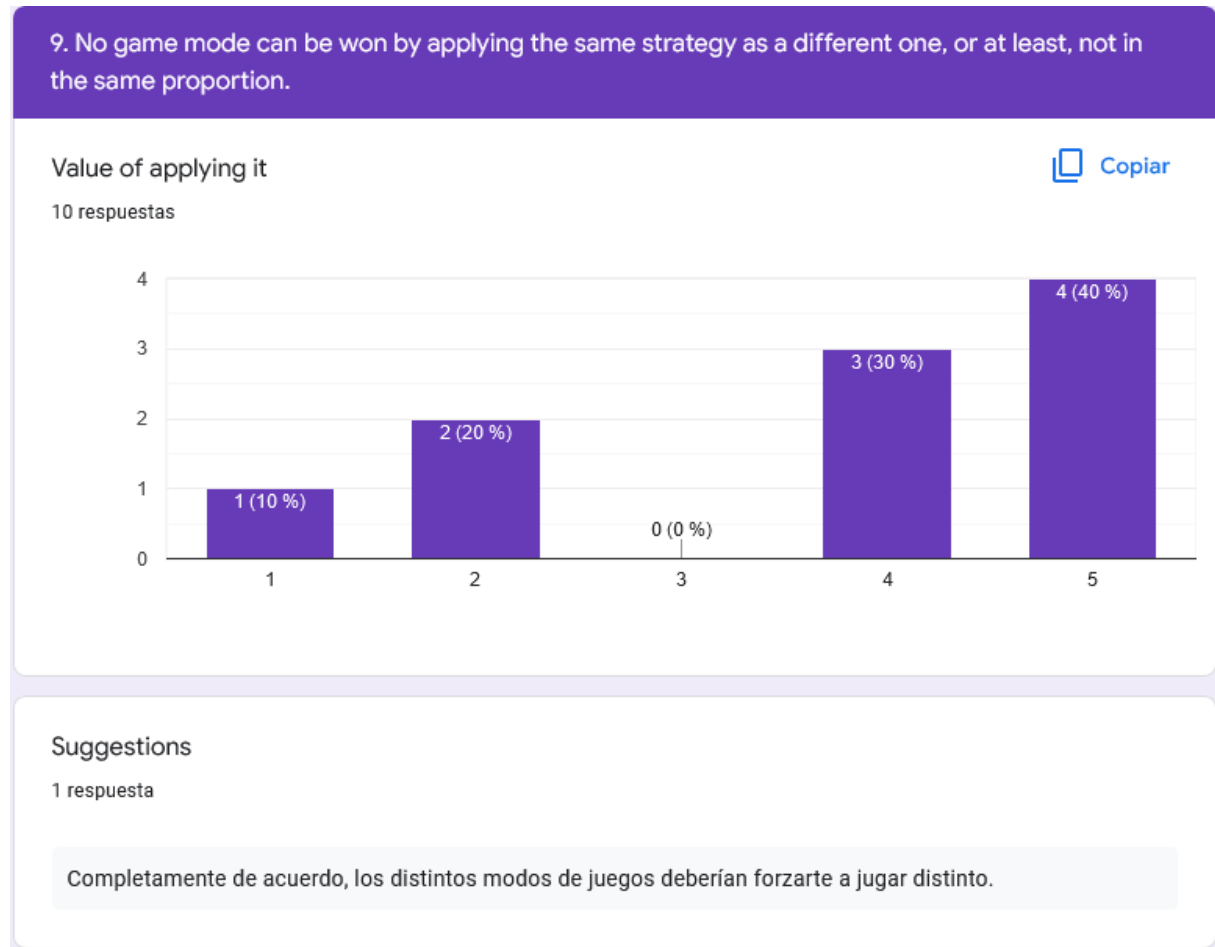

Figure 39: Results for the ninth heuristic. Source (own creation)

Only three believe that this heuristic is not important or not really important. The suggestion of a designer agrees with the objective of the heuristic.

10. No game assists can only benefit a group of players; all the players must have the same conditions. (31 points)

Figure 40: Results for the tenth heuristic. Source (own creation)

There is no consensus about this heuristic, and there are no suggestions.

6.5 Refinement of the heuristics

After analysing the results of the questionary, it is difficult to extract solid conclusions due to the lack of participation and a low number of suggestions. Where it has been more disparity of opinions, it has been in the heuristics that designers feel could break the triangularity of the options. We think that the heuristics do not go against the triangularity, they just warn that these situations can happen, but it is true that the sixth heuristic (No successful attack at the start of the game can bring victory to the attacker's side) in the way that it is written, does not leave room for triangularity.

We have decided to change the sixth heuristic to:

6. No successful attack at the start of the game can bring victory to the attacker's side without having an equivalent drawback if countered.

The final heuristics ordered by punctuation are:

1. **Character – Unique Characteristics:** No unique skillset should allow a character to be able to dominate the game without displaying a unique weakness or assuming an equivalent cost or risk when using these skills.

2. **Character – Defence:** No weakness in the enemy's defence should be exploitable without requiring an equivalent degree of skill.

3. **Space – Time:** No player should respawn in a predictable area where the enemy may expect her, or this area must be protected.

4. **Tool – Weapon:** No weapon should be designed to excel in more than one or a few different types of encounters or scenarios.

5. **Tool – Gadget:** No special advantages or skills a player obtains during the game can be used without being countered by other players or having a duration inverse to their power.

6. **Space – Visibility:** No place on the map should provide good visibility of the environment while completely protecting the player from the other players.

7. **Win condition – Win condition:**
No game mode can be won applying the same strategy than a different one, or at least, not in the same proportion.

8. **Character – Movements:** No repeated movements in combination with the scenario characteristics should allow the player to have minimal exposure.

9. **Game – Assist:** No game assists can only benefit a group of players; all the players must have the same conditions.

10. **Time – Game start:** No successful attack at the start of the game can bring victory to the attacker's side without having an equivalent drawback if countered.

7. Conclusions and future investigations

In this final degree project, we have developed a set of heuristics to help developers avoid dominant strategies in multiplayer shooter games. This objective has been reached by investigating the most common problems, categorizing the issues and evaluating the resultant heuristics with other video game students.

7.1 Difficulties

During the development of this project, one of the most important challenges to overcome has been the search for problems. We have known from the start that there was no time to play and understand all the multiplayer shooter games to find the balancing problems, so the information on the issues had to come from community forums, patch notes, and or user comments, but we did not know where to start. Without a lead or a hint of a possible balance problem, it was hard to find one. So, before studying the possible balance problems, we have had to search for those leads. A way that has helped to find leads, has been searching on Reddit. On this webpage, the user can find different subreddits devoted to distinct topics. By entering the subreddit of specific games and searching for keywords like "meta", "problem", or "overpowered", we have been able to find hints of different balance problems and investigate further in each of them. Then, by searching on the Internet, we have found different articles, user videos, and comments that have confirmed that they are problems.

The second most challenging issue has been the creation of the heuristics. It has been difficult to synthesize in a short sentence a lot of different problems, that even if they share a core issue, they all have something that makes them unique. All the games share the multiplayer shooter genre, but then we have had to compare battle royales with hero shooters or first-person shooters with third-person shooters.

And the last difficulty of this project has been the language and the writer's personal ability to transmit knowledge. We chose to write the document in English because we thought it could be an opportunity to learn and practice it. But it has slowed down the process of writing. At the start of the project, the writing was very unclear and difficult to understand, but thanks to tools like Grammarly and WordReference, we think that

the result, although it could be better, satisfies the standard of clarity and understanding for a document of this characteristics.

7.2 Fulfilment of the goals

At the beginning of the document (Chapter 2), we have described that the main goal was to generate a set of heuristics to avoid dominant strategies for multiplayer shooter games. We believe that we have completed this goal. In the end, we have been able to generate ten heuristics that address ten types of problems present in the shooter genre. We also have asked a group of game designers about the heuristics, and the consensus is that they have a moderate to important value of being applied.

Of the three secondary goals, the first one was to contrast the information about the problems. We believe that with all the different comments of the users, developers addressing the issue, and statistics found, we can say that we have accomplished this goal.

The second was to generate a library of game balance problems and classify them. In the end, we have created a list of 45 problems, that describe the game and the problem. We think that they are well documented, and that is easy to understand the problem.

For the third and last secondary goal of defining a wide number of heuristics to cover a comprehensive list of areas, we believe that these ten heuristics can fulfil this goal. They describe the problem, from the character movement to game assists.

But even if we believe that the project has fulfilled the goal and secondary goals, there is room to improve this work. In the next section, we describe the future investigations and improvements that can follow from this project.

7.3 Future Investigations

This investigation has focused on the investigation of problems and the development of heuristics to try to avoid dominant strategies. We have asked designers to evaluate which would be the value of applying these heuristics in the making of a game, and generally, they see them as valuable, but the only way to see if they are useful is to test them.

One of the things that could improve this project, would be to use these ten heuristics to create a multiplayer shooter game from scratch. With the development of this new game with the help of these heuristics, we could see if players can repeat the same dominant strategies seen in this document. After that test, we could be surer about the value of applying them, and we would have more information to change or improve the heuristics.

Another direction that could take this project, would be to focus more on the gathered problems. We have not been able to, and it was not within the scope of this project to evaluate the problems found, but it would be interesting to see the opinions of other designers about the problems.

To end with the problems, we think it could be interesting to expand the list and put them as a public resource. Game studies are a relatively young field that we think could benefit from these types of contributions. In the end, it makes it easier for everyone to have repositories of information to share and learn together.

8. Bibliography / References

[XB1Now that everyone has figured out how OP vehicles are (b/c it's very hard to shoot out drivers using controller), every Solo match ends with a derby. : PUBATTLEGROUNDS. (2022, April 22). Retrieved from https://www.reddit.com/r/PUBATTLEGROUNDS/comments/7l5uzn/xb1_now_t hat_everyone_has_figured_out_how_op/

Adams, E. (2013). *Fundamentals of game design.* Addison Wesley.

Adams, E. (2014). *Fundamentals of Shooter Game Design.*

Adams, E., & Dormans, J. (2012). *Game Mechanics: Advanced Game Design.* Addison Wesley.

Afiq Chii - PUBG Crouch Spam, hack or glitch? - YouTube. (2022, April 22). Retrieved from https://www.youtube.com/watch?v=urDX-9iZk4M

Astra Is Just OP | Valorant | Shroud - YouTube. (2022, May 18). Retrieved from https://www.youtube.com/watch?v=ZoJP1HSib0M

Battlefield 3: Top 10 Things People Hate About BF3s Multiplayer_all video game. (2022, April 22). Retrieved from http://game.lhg100.com/Article/tvgame/allvideogametwo/201512/4261.html

Bungie co-founder says he's to blame for Halo's overpowered pistol - Polygon. (2022, April 22). Retrieved from https://www.polygon.com/2013/7/8/4503242/bungie-co-founder-says-hes-to-blame-for-halos-overpowered-pistol

Casagaming. (2022, April 21). *Secret Underwater Hiding Spot in Apex Legends Season 11 [Video].* Retrieved from https://www.youtube.com/watch?v=8-SmIyWmh0g

Codelife - Why Everyone's Using Visual Audio In Fortnite! (After Sound Update) - YouTube. (2022, April 22). Retrieved from https://www.youtube.com/watch?v=0m8lDy4ag7o

Costikyan, G. (2013). *Uncertainty in Games.* Mit Press.

crouch   spam   -   Twitch.   (2022,   April   22).   Retrieved   from
https://clips.twitch.tv/MagnificentNurturingTurnipDoritosChip

CS:GO - Best boosts - Metabomb. (2022, April 22). Retrieved from
https://www.metabomb.net/csgo/gameplay-guides/csgo-best-boosts

Desurvire, H., & Wiberg, C. (2009). *Game Usability (PLAY) For Evaluating and
Designing Better Games: The Next Iteration.*

Desurvire, H., Caplan, M., & Toth, J. (2004). Using Heuristics to Evaluate the
Playability of Games. *Conference on Human Factors and Computing Systems*,
(pp. 1509-1512). Vienna.

Excarline - Battlefield 3 - Glitch Operacion metro - Encimita del mapa - YouTube.
(2022,   April   22).   Retrieved   from
https://www.youtube.com/watch?v=vNZ7selwKRg

*'Fortnite' Update V19.20 Patch Notes: Covert Cavern, Mythic Stinger and Haven
Masks   Added.*   (2022,   April   22).   Retrieved   from
https://www.newsweek.com/fortnite-update-v19-20-patch-notes-covert-vavern-
mythic-stinger-bug-fixes-haven-masks-1674906

Fortnite: Cómo activar efectos de sonido visuales. (2022, April 22). Retrieved from
https://xboxplay.games/es/news/fortnite-como-activar-efectos-de-sonido-
visuales-24666

FragHero - 8 Unfair Camping Spots in Battlefield 1 Multiplayer - YouTube. (2022, April
22). Retrieved from https://www.youtube.com/watch?v=tCSB3LVlifI

Fullerton, T. (2004). *Game design workshop: a playcentric approach to creating
innovative games.* CRC press.

Game   Balance   Concepts.   (2022,   April   25).   Retrieved   from
https://gamebalanceconcepts.wordpress.com/2010/07/07/level-1-intro-to-
game-balance/

Game Maker's Toolkit - YouTube. (2022, May 05). Retrieved from https://www.youtube.com/c/MarkBrownGMT

Game-breaking Overwatch exploit makes Torbjorn's turret completely invincible - Dexerto. (2022, April 22). Retrieved from https://www.dexerto.com/overwatch/game-breaking-overwatch-exploit-makes-torbjorns-turret-completely-invincible-1762848/

GameLeap Valorant Pro Guides - Valorant PRO's: "ASTRA Meta is KILLING VALORANT" - Why It's SO Bad - Update Guide - YouTube. (2022, April 22). Retrieved from https://www.youtube.com/watch?v=AApY_-8lf_o

GDC - YouTube. (2022, May 05). Retrieved from https://www.youtube.com/c/Gdconf

Groner, R., Groner, M., & Bischof, W. (1983). *Methods of Heuristics.* Lawrence Erlbaum Associates, Publishers.

i.imgur.com. (2022, April 22). Retrieved from https://i.imgur.com/xCWjToT.gif

JesseKazam - The End Of Tarkov Jiggle Peeking? - Inertia Before & After Breakdown - YouTube. (2022, April 22). Retrieved from https://www.youtube.com/watch?v=GSboRlsVAeE

Jett Op Mains are the Worst : VALORANT. (2022, April 22). Retrieved from https://www.reddit.com/r/VALORANT/comments/ibtxn4/jett_op_mains_are_the__worst/

Kramarzewski, A., & De Nucci, E. (2018). *Practical Game Design.* Birmingham: Packt Publishing Ltd.

Looking back historically, what was the timeframe of the dive meta, and when did it begin to die off? : Competitiveoverwatch. (2022, May 17). Retrieved from https://www.reddit.com/r/Competitiveoverwatch/comments/dspbo8/looking_back_historically_what_was_the_timeframe/

Nate | TSM FTX en Twitter: "this ares shit is the most dumb thing i've seen in valorant https://t.co/LKoK1C9t2H" / Twitter. (2022, April 22). Retrieved from https://twitter.com/pay3n/status/1481067006946422796?ref_src=twsrc%5Etfw

%7Ctwcamp%5Etweetembed%7Ctwterm%5E1481067006946422796%7Ctwg
r%5E%7Ctwcon%5Es1_&ref_url=https%3A%2F%2Fscreenrant.com%2Fvalor
ant-ares-gun-buff-overpowered-sound%2F

Nielsen, J. (2006). *Ten Usability Heuristics.*

*Nobody seems to care that we're about to play FNCS w/ one of the worst competitive
metas of all-time : FortniteCompetitive.* (2022, April 22). Retrieved from
https://www.reddit.com/r/FortniteCompetitive/comments/snbhue/nobody_seem
s_to_care_that_were_about_to_play_fncs/

Olofboost: The Day CSGO Changed - Dot Esports. (2022, April 21). Retrieved from
https://dotesports.com/counter-strike/news/olofboost-the-day-csgo-changed-
7148

Oxland, K. (2004). *Gameplay and design.* Addison-Wesley Educational Publishers Inc.

Pinelle, D., Wong, N., & Stach, T. (2008). *Heuristic Evaluation for Games: Usability
Principles for Video Game Design.*

Quiñones, D., & Rusu, C. (2017). *How to develop usability heuristcs: A systematic
literature review.*

R6Maps.com - Stats BETA. (2022, April 21). Retrieved from
http://www.r6maps.com/stats.html?season=5&mode=SECURE%20AREA

Reddit - "That's why you always jiggle peek" : EscapefromTarkov. (2022, April 22).
Retrieved   from
https://www.reddit.com/r/EscapefromTarkov/comments/jgzoa9/thats_why_you
_always_jiggle_peek/

Reddit - [Opinion] Raiding is Too Easy, Causes Dead Servers. : playrust. (2022, April
22).   Retrieved   from
https://www.reddit.com/r/playrust/comments/87ijsx/opinion_raiding_is_too_eas
y_causes_dead_servers/

*Reddit - A short video that (I hope) will help less experienced players with close
quarters engagements : EscapefromTarkov.* (2022, April 22). Retrieved from

https://www.reddit.com/r/EscapefromTarkov/comments/f8rbh2/a_short_video_ that_i_hope_will_help_less/

Reddit - About spawn killing : Splitgate. (2022, April 22). Retrieved from https://www.reddit.com/r/Splitgate/comments/pr5jzg/about_spawn_killing/

Reddit - Aim Assist feels overtuned. : Splitgate. (2022, April 22). Retrieved from https://www.reddit.com/r/Splitgate/comments/omjo2p/aim_assist_feels_overtu ned/

Reddit - Aim assist on vanguard seems too strong : CODWarzone. (2022, April 22). Retrieved from https://www.reddit.com/r/CODWarzone/comments/qx3ub0/aim_assist_on_van guard_seems_too_strong/

Reddit - Am I the only person that realizes the ZH-29 is absolutely god tier? : BattlefieldV. (2022, April 22). Retrieved from https://www.reddit.com/r/BattlefieldV/comments/glom4r/am_i_the_only_person _that_realizes_the_zh29_is/

Reddit - Any of you used the ZH-29 for Recon yet? Thing is insane! : BattlefieldV. (2022, April 22). Retrieved from https://www.reddit.com/r/BattlefieldV/comments/9wp5fk/any_of_you_used_the _zh29_for_recon_yet_thing_is/

Reddit - Anyone else loves to play Tarkov but hates the meta FPS mechanics required to be competitive? : EscapefromTarkov. (2022, April 22). Retrieved from https://www.reddit.com/r/EscapefromTarkov/comments/qn0dm9/anyone_else_ loves_to_play_tarkov_but_hates_the/

Reddit - Are snipers ruining the game for anyone else? : BattlefieldV. (2022, April 22). Retrieved from https://www.reddit.com/r/BattlefieldV/comments/9zw72u/are_snipers_ruining_t he_game_for_anyone_else/

Reddit - Are you guys happy now with the Wraith Nerf? : EvolveGame. (2022, April 22). Retrieved from

https://www.reddit.com/r/EvolveGame/comments/2xel0x/are_you_guys_happy
_now_with_the_wraith_nerf/

Reddit - Ares Thoughts for 4.0 : ValorantCompetitive. (2022, April 22). Retrieved from
https://www.reddit.com/r/ValorantCompetitive/comments/s1pels/ares_thoughts
_for_40/

Reddit - Camping solution : titanfall. (2022, April 22). Retrieved from
https://www.reddit.com/r/titanfall/comments/7v7bnb/camping_solution/

Reddit - Crouch and Lean Spamming : Rainbow6. (2022, April 22). Retrieved from
https://www.reddit.com/r/Rainbow6/comments/ajusqs/crouch_and_lean_spam
ming/

Reddit - Crouch spamming: What are the mechanics? : Planetside. (2022, April 22).
Retrieved   from
https://www.reddit.com/r/Planetside/comments/hqhtu0/crouch_spamming_wha
t_are_the_mechanics/

Reddit - Devs should really fix this : GlobalOffensive. (2022, April 22). Retrieved from
https://www.reddit.com/r/GlobalOffensive/comments/panhaf/devs_should_reall
y_fix_this/?ref=share&ref_source=embed&utm_content=title&utm_medium=po
st_embed&utm_name=6d714843f03949bfacd74f626e23920e&utm_source=e
mbedly&utm_term=panhaf

Reddit - Does crouch-shooting really work? : PUBGMobile. (2022, April 22). Retrieved
from
https://www.reddit.com/r/PUBGMobile/comments/j1vh05/does_crouchshooting
_really_work/

Reddit - Drive-bys are ridiculous and need to change : PUBATTLEGROUNDS. (2022,
April   22).   Retrieved   from
https://www.reddit.com/r/PUBATTLEGROUNDS/comments/l4sb0s/drivebys_ar
e_ridiculous_and_need_to_change/

*Reddit - Found this Torb player abusing a turret bug on Gibraltar in competitive. Not
sure if this has been found before?? : Overwatch.* (2022, April 22). Retrieved

from
https://www.reddit.com/r/Overwatch/comments/t3upw8/found_this_torb_player
_abusing_a_turret_bug_on/

Reddit - Guys using macro program spamming crouch. : PUBATTLEGROUNDS. (2022, April 22). Retrieved from https://www.reddit.com/r/PUBATTLEGROUNDS/comments/6jqbal/guys_using _macro_program_spamming_crouch/

Reddit - Halo 1 Pistol - A Discussion on Balance : halo. (2022, April 22). Retrieved from https://www.reddit.com/r/halo/comments/2e5401/halo_1_pistol_a_discussion_ on_balance/

Reddit - How do i stop snowballing effect : OverwatchUniversity. (2022, April 22). Retrieved from https://www.reddit.com/r/OverwatchUniversity/comments/l23l90/how_do_i_sto p_snowballing_effect/

Reddit - How to counter w-key? : FortniteCompetitive. (2022, April 22). Retrieved from https://www.reddit.com/r/FortniteCompetitive/comments/brv9t2/how_to_counte r_wkey/

Reddit - I really hate the MK7 meta. : FortniteCompetitive. (2022, April 22). Retrieved from https://www.reddit.com/r/FortniteCompetitive/comments/rb385x/i_really_hate_t he_mk7_meta/

Reddit - Is aim assist op? : Splitgate. (2022, April 22). Retrieved from https://www.reddit.com/r/Splitgate/comments/okynul/is_aim_assist_op/

Reddit - Jett is ruining the game of Valorant : VALORANT. (2022, April 22). Retrieved from https://www.reddit.com/r/VALORANT/comments/pxalvn/jett_is_ruining_the_ga me_of_valorant/

Reddit - Jiggle peaking? : EscapefromTarkov. (2022, April 22). Retrieved from https://www.reddit.com/r/EscapefromTarkov/comments/fbutxj/jiggle_peaking/

Reddit - Just A Reminder That Dive Has Been The Dominant Meta For The Past 4 Seasons. : Overwatch. (2022, April 22). Retrieved from https://www.reddit.com/r/Overwatch/comments/8221pn/just_a_reminder_that_dive_has_been_the_dominant/

Reddit - Meta Discussion: Sova : ValorantCompetitive. (20222, April 22). Retrieved from https://www.reddit.com/r/ValorantCompetitive/comments/sorhav/meta_discussion_sova/

Reddit - Offline raiding is boring and too easy but it's the only way getting out with profit : playrust. (2022, April 22). Retrieved from https://www.reddit.com/r/playrust/comments/8k3l6i/offline_raiding_is_boring_and_too_easy_but_its/

Reddit - Prone meta has ruined bf5. (2022, April 22). Retrieved from https://www.reddit.com/r/BattlefieldV/comments/b3blrd/prone_meta_has_ruined_bf5_going_prone_along_side/

Reddit - Raiding is too easy, here's why. : playrust. (2022, April 22). Retrieved from https://www.reddit.com/r/playrust/comments/g4rx7u/raiding_is_too_easy_heres_why/

Reddit - Remove Spider-Man hands from fortnite arenas : FortniteCompetitive. (2022, April 22). Retrieved from https://www.reddit.com/r/FortniteCompetitive/comments/rnumxu/remove_spiderman_hands_from_fortnite_arenas/

Reddit - Rust has gotten too easy and fast : playrust. (2022, April 22). Retrieved from https://www.reddit.com/r/playrust/comments/njxm5j/rust_has_gotten_too_easy_and_fast/

Reddit - Scorch shot is beyond overhated : tf2. (2022, April 22). Retrieved from https://www.reddit.com/r/tf2/comments/pbfz64/scorch_shot_is_beyond_overhated/

Reddit - ScorchShotHateClub. (2022, April 22). Retrieved from https://www.reddit.com/r/ScorchShotHateClub/

Reddit - Snipers are cancer : BattlefieldV. (2022, April 22). Retrieved from https://www.reddit.com/r/BattlefieldV/comments/dvwmur/snipers_are_cancer/

Reddit - Snipers ruin the game : BattlefieldV. (2022, April 22). Retrieved from https://www.reddit.com/r/BattlefieldV/comments/a51fry/snipers_ruin_the_game/

Reddit - Spitfire needs a nerf : titanfall. (2022, April 22). Retrieved from https://www.reddit.com/r/titanfall/comments/b65301/spitfire_needs_a_nerf/

Reddit - The bush wookie nest. : battlefield3. (2022, April 22). Retrieved from https://www.reddit.com/r/battlefield3/comments/wy4lx/the_bush_wookie_nest/

Reddit - The duck-lean-spam needs to fucking die : Rainbow6. (2022, April 22). Retrieved from https://www.reddit.com/r/Rainbow6/comments/afy32x/the_duckleanspam_needs_to_fucking_die/

Reddit - The Prone Camping Problem In BFV! : BattlefieldV. (2022, April 22). Retrieved from https://www.reddit.com/r/BattlefieldV/comments/apwa3f/the_prone_camping_problem_in_bfv/

Reddit - The spawn system is broken : Splitgate. (2022, April 22). Retrieved from https://www.reddit.com/r/Splitgate/comments/qamnh4/the_spawn_system_is_broken/

Reddit - The strength of aim assist : Splitgate. (2022, April 22). Retrieved from https://www.reddit.com/r/Splitgate/comments/p8t1b8/the_strength_of_aim_assist/

Reddit - The Topic of Dropshotting in R6 : Rainbow6. (2022, April 22). Retrieved from https://www.reddit.com/r/Rainbow6/comments/6bmxyx/the_topic_of_dropshotting_in_r6/

Reddit - Vehicles are pretty overpowered simply because the controls limit you so much : PUBGMobile. (2022, April 22). Retrieved from https://www.reddit.com/r/PUBGMobile/comments/86b7to/vehicles_are_pretty_overpowered_simply_because/

Reddit - What is dropshotting? : Rainbow6. (2022, April 22). Retrieved from https://www.reddit.com/r/Rainbow6/comments/7tjs71/what_is_dropshotting/

Reddit - What is it with the spitfire? (Titanfall 2) : titanfall. (2022, April 22). Retrieved from
https://www.reddit.com/r/titanfall/comments/l7xfkp/what_is_it_with_the_spitfire_titanfall_2/

Reddit - What is the dive meta? : Overwatch. (2022, April 22). Retrieved from https://www.reddit.com/r/Overwatch/comments/6rmb3y/what_is_the_dive_meta/

Reddit - What's Bleedthrough? : halo. (2022, April 22). Retrieved from https://www.reddit.com/r/halo/comments/e989vx/whats_bleedthrough/

Reddit - When will they remove the spider man gloves? : FortNiteBR. (2022, April 22). Retrieved from https://www.reddit.com/r/FortNiteBR/comments/s4el0u/when_will_they_remove_the_spider_man_gloves/

Reddit - Why is the spitfire so OP : titanfall. (2022, April 22). Retrieved from https://www.reddit.com/r/titanfall/comments/804klr/why_is_the_spitfire_so_op/

Reddit - Why the scorch shot is OP. : tf2. (2022, April 22). Retrieved from https://www.reddit.com/r/tf2/comments/oigbkh/why_the_scorch_shot_is_op/

Reddit - Wraith is way too overpowered : EvolveGame. (2022, April 22). Retrieved from https://www.reddit.com/r/EvolveGame/comments/2vilrn/wraith_is_way_too_overpowered/

Reddit- Apex Legends Octane . (2022, April 22). Retrieved from https://www.reddit.com/r/apexlegends/comments/qwkjb5/idk_if_this_is_new_or_not_but_i_found_a_way_to/

Roles - Overbuff - Overwatch Statistics. (2022, April 22). Retrieved from
https://www.overbuff.com/roles?mode=competitive

Roles - Overbuff - Overwatch Statistics. (2022, June 15). Retrieved from
https://www.overbuff.com/roles?mode=competitive

Rollings, A., & Morris, D. (2003). *Game Architecture and Design: A New Edition.* New
Riders Publishing.

Rusu, C., Roncagliolo, S., Rusu, V., & Collazos, C. (2011). A Methodology to Establish
Usability Heuristics. *The Fourth Internatinal Conference on Advances in
Computer-Human Interactions.*

Schell, J. (2008). *The Art of Game Design: A book of lenses.* CRC Press.

Schreiber, I., & Romero, B. (2021). *Game Balance.*

Se acabó el dropshot en Rainbow Six Siege. ¿El cambio más importante hasta ahora?
(2022, April 22). Retrieved from https://www.somosxbox.com/se-acabo-el-
dropshot-en-rainbow-six-siege-el-cambio-mas-importante-hasta-ahora/776264

Sellers, M. (2017). *Advanced game design: a systems approach.*

Shacknews - How does aim assist work in Splitgate? (2022, April 22). Retrieved from
https://www.shacknews.com/article/126314/how-does-aim-assist-work-in-
splitgate

Shield bleed through. Shouldn't this be a bad thing? : halo. (2022, May 16). Retrieved
from
https://www.reddit.com/r/halo/comments/dcy1ob/shield_bleed_through_should
nt_this_be_a_bad_thing/

Spammable crouching has to go! | PlanetSide 2 Forums. (2022, April 22). Retrieved
from https://forums.daybreakgames.com/ps2/index.php?threads/spammable-
crouching-has-to-go.248244/

Sparkles - WALLHACK Exploit that requires no hacks... (CS:GO) - YouTube. (2022,
April 22). Retrieved from https://www.youtube.com/watch?v=6E8yQI76QnI

Steam - Aim assist is just dumb :: Splitgate . (2022, April 22). Retrieved from https://steamcommunity.com/app/677620/discussions/0/30393547350220534 88/

Sylvester, T. (2013). *Designing Games: A Guide to Engineering Experiences.* O'Reilly Media.

The ultimate snowball effect - Competitive Discussion - Overwatch Forums. (2022, April 22). Retrieved from https://us.forums.blizzard.com/en/overwatch/t/the-ultimate-snowball-effect/404969

TheNickyYo - BF3 Metro MAV, C4 Glitch / Exploit! with lots of kills - YouTube. (2022, April 22). Retrieved from https://www.youtube.com/watch?v=W9nA7VMAdXM

theScore esports - The Controversial Olofboost [Video]. (2022, April 21). Retrieved from https://www.youtube.com/watch?v=oYqh_jfJU3I

Transitive relation. (2022, June 02). Retrieved from https://www.wikiwand.com/en/Transitive_relation

TwitchTracker. (2022, June 02). Retrieved from https://twitchtracker.com/statistics/games

TwitLonger — When you talk too much for Twitter. (2022, April 22). Retrieved from https://www.twitlonger.com/show/n_1sru6q7

Twitter - Ominous. (2022, April 22). Retrieved from https://twitter.com/_sushantjha/status/1491456277259898881?s=21

Underwater glitch in Apex Legends makes for a great hiding spot. (2022, April 21). Retrieved from https://ftw.usatoday.com/2021/12/apex-legends-underwater-sniping-spot

Valorant Champions 2021: Agent Pick Rates and Compositions | Valorant Event | VLR.gg. (2022, April 22). Retrieved from https://www.vlr.gg/event/agents/449/valorant-champions?exclude=

Valorant patch 4.01: The Ares is finally nerfed | ONE Esports. (2022, April 22). Retrieved from https://www.oneesports.gg/valorant/valorant-patch-4-01-ares-nerfed/

Valorant Players Are Upset About Overpowered Ares Gun Buff. (2022, April 22). Retrieved from https://screenrant.com/valorant-ares-gun-buff-overpowered-sound/

Valorant Weapon Stats Patch 4.07 - METAsrc. (2022, April 22). Retrieved from https://www.metasrc.com/valorant/stats/weapons

Valorbuff - VALORANT Estadísticas de Armas. (2022, June 15). Retrieved from https://www.valorbuff.com/weapons

Vehicles Nerfed in PUBG Update for Xbox One | AllGamers. (2022, April 22). Retrieved from https://ag.hyperxgaming.com/article/3785/vehicles-nerfed-in-pubg-update-for-xbox-one

VoX_E. (2022, April 21). *Tarkov's Highest Damage Rounds! Leg Meta Breakdown - Escape From Tarkov [Video]*. Retrieved from https://www.youtube.com/watch?v=eV_ZYCxqZSA

What Is Bleed Through in Halo: Reach - DoubleXP. (2022, April 22). Retrieved from https://doublexp.com/guides/what-is-bleedthrough-in-halo-reach

What is Damage Bleed Through. (2022, May 16). Retrieved from https://www.youtube.com/watch?v=P0Pj9cWs4_o

Wiki, E. F. (2022, April 21). *Leg meta - The Official Escape from Tarkov Wiki*. Retrieved from https://escapefromtarkov.fandom.com/wiki/Leg_meta

Wraith Op :: Evolve Stage 2. (2022, April 22). Retrieved from https://steamcommunity.com/app/273350/discussions/0/358417008729031040/

9. Appendix

The questionary used for this project can be found in the "Set of Game Balance Heuristics for the Genre of Multiplayer Shooter Video Games (questionary).pdf" file, and the responses in the "Set of Game Balance Heuristics for the Genre of Multiplayer Shooter Video Games (response).xlsx" file.