

What Proven Methods can be Implemented to Increase Player Engagement?

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Certificate of Authenticity

This dissertation is a product of my own work and is not the result of anything done in collaboration.

I declare that the work in this dissertation has not been and is not being submitted for any other degree.

I agree that this dissertation may be available for reference or photocopy at the discretion of the University of Wales Trinity Saint David.

Signed  Michael Dawe

Date 29/04/2025

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Chapter 1: Introduction

1.1 Definition of Player Engagement

The following terms will be used from here on: ‘(Individual) Player Engagement’ will refer to the time each individual player spends in the game, and ‘Audience Engagement’ will refer the number of new players who interact with the game through purchases inspired by friends, online reviews, community created social media content, gameplay streams, et cetera.

1.2 Research Question

What Proven Methods can be Implemented to Increase Player Engagement? This research will focus on procedures that can be implemented during the design and development of a game which are proven to increase player engagement, audience engagement, or both.

1.3 Scope and Limitations

This research focuses only on actions that a developer can take during the design and development of a game, and will not include other important areas such as marketing or updates.

This research will focus on a selection of methods that complement each other and fit within the demographic and genre of the practical assignment, and within a financial system where the game is sold once and does not include in-game purchases or DLCs.

Chapter 2: Literature Review

This chapter will cover why people play video games, and what known methods can be used to increase individual player engagement and audience engagement specifically within a given demographic, genre, and financial system.

2.1 Why do people play video games?

To understand what impact game design decisions will have on the player's experience it is important to first have a basic understanding of why people play video games.

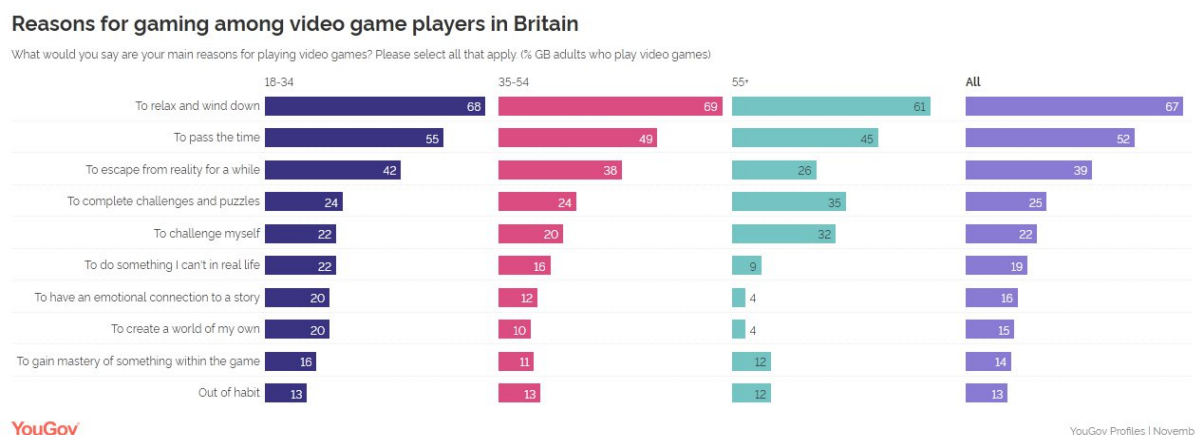


Figure 1: Data from the UK published in 2021 by YouGov [1]

Figure 1 is a survey on why people play games. Relaxation is the leading reason across age groups in this research. With escapism, challenge, creativity / self expression, and mastery / achievement being the other main reasons, excluding “to pass the time” as this is largely irrelevant in terms of game design, because when these people play games they will be choosing between games based on their other reasons (note that the survey allowed users to select multiple responses).

Although it is not represented by this survey, there is an important social aspect to gaming, with 28% of players in the study below (see Figures 2 and 3) playing multiplayer games either online or offline. Also, some number of solo players will be doing so in a social setting with someone watching or taking turns.

Preferred styles of gaming in Britain

What is your preferred way of playing video games? (% GB adults who play video games on PC/Console for at least 30 minutes per week)



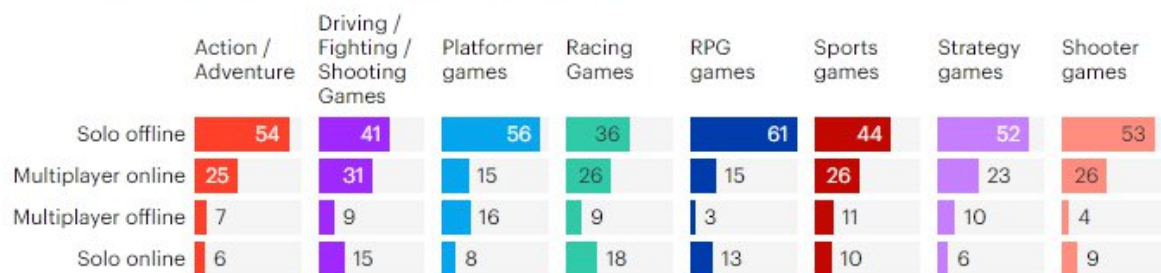
YouGov

YouGov Profiles | July 2022

Figure 2: Data from the UK in 2022 published by YouGov [2]

Britain: Popularity of gaming styles by genre

What is your preferred way of playing video games? (% who play each of the following genres of games on PC/Console and who play on PC/Console for at least 30 minutes each week)



YouGov

YouGov Profiles | July 2022

Figure 3: Data from the UK in 2022 published by YouGov [2]

Klug and Schell [3] give an industry perspective on why people play games, and offer a list of nine categories of player motivation: *The Competitor*, *The Explorer*, *The Collector*, *The Achiever*, *The Joker*, *The Director*, *The Storyteller*, *The Performer*, and *The Craftsman*. These are defined as follows:

“The Competitor plays to be better than other players.

The Explorer plays to experience the boundaries of the play world. He plays to discover first what others do not know yet.

The Collector plays to acquire the most stuff through the game.

The Achiever plays to not only be better now, but also be better in rankings over time. He plays to attain the most championships over time.

The Joker plays for the fun alone and enjoys the social aspects.

The Director plays for the thrill of being in charge. He wants to orchestrate the event.

The Storyteller plays to create or live in an alternate world and build narrative out of that world.

The Performer plays for the show he can put on.

The Craftsman plays to build, solve puzzles, and engineer constructs.”

They point out that most players are a combination of at least two of the above categories.

This is a clear and useful set of personas to tailor a game to, and to use when analysing the success of existing games, and will be referred to throughout this document. However, it is not conclusive, partly because it was published in 2006 and the gaming industry has continued to develop since then. With that in mind four more categories of player motivation are going to be added: Relaxation, Socialization, Escapism, and Self-expression which are going to be used as categories to cater to or assess in case studies.

2.2 The demographic, genre, and financial system targeted in this research

The target demographic, genre, and financial system are all important considerations to make up front. Different demographics will play a game for different reasons, leading to increased or decreased effectiveness of design decisions; different genres of game are more suited to particular design approaches, due to the way mechanics interact with each other; and different financial systems allow for different approaches to keeping a player engaged.

Games designed for entertainment (rather than education or training etc.) typically start with the formation of a concept for gameplay and story before anything else. Different design ideas are suitable for different demographics, for example if the concept includes graphical violence it will not be suitable for younger players. However, the targeted demographic can still impact the design process, so it is important to determine it early in the development process.

For the purpose of this module two game concepts were created, both unsuitable for players under the age of sixteen. Market research was carried out among other students at UWTSD to ascertain what mechanics, settings and story appealed to them most, and the second game concept was chosen to centre further research around. More information on primary research is in chapter 4.

Market statistics from the UK [4] indicate that the age range 16-24 contains the highest percentage of people playing computer games, and that there are more male than female players. Due to the story and setting of the game concept, the target age range was adjusted slightly, resulting in 18-25.

The genre of a game is largely determined by the mechanics of the game concept [5], however changes can be made based on market research, and the chosen genre can affect future design decisions. The chosen game concept is for a 3D first-person adventure game, with elements of existential horror, comedy, and strategy.

There are two main financial systems for video games, one-time purchase and free-to-play. Both can benefit from in-game purchases, advertising, or incrementally released DLCs. The best financial system for a game depends on both the intended demographic and genre, along with the game scope and whether or not providing incremental updates is an option. A one-time purchase model was chosen, because it is easier to manage and works well with a smaller game scope. In-game purchases and DLCs are not being considered, and in-app advertising is less effective in a game purchased upfront and can cause player dissatisfaction.

2.3 Common methods to improve player engagement

Methods for improving a game's shareability: [6]



Figure 4: Epic moment likely worth sharing online. [7]

Engagement, particularly audience engagement, can be boosted by directly or indirectly encouraging players to share the game or game content. This could be implemented through multiplayer, which will make players more likely to encourage their friends to buy the game; or through game mechanics centred around creating shareable moments or media, for example creating in-game photography options, or an in-game clip recording system. It could also be helped by making key moments of gameplay require player skill which would encourage players to share recordings of these moments, or by making cut-scenes memorable and relatable, making them more likely to be shared on social media.

Many of the same principles can be used to make gameplay more fun to watch, on stream or YouTube for example. This can be further improved by having attractive art styles and humorous plot lines.

Methods for improving a game's replayability: [6]

Methods for creating a gameplay loop that is consistently engaging vary across genres, however key tools available to most developers include implementing skill trees, power-ups, player choice (for example having a level with multiple routes, each with different difficulties and rewards, which would encourage a player to try different play styles or to get all the rewards), and implementing multiplayer, which inherently adds an element of chaos and competition even in a co-op game, where some players might not be satisfied with their performance and thus want to play the game or level again, or where they might have had a lot of fun in one portion of the game and want to experience it with another group of friends.

Methods for improving a player's sense of control: [8]

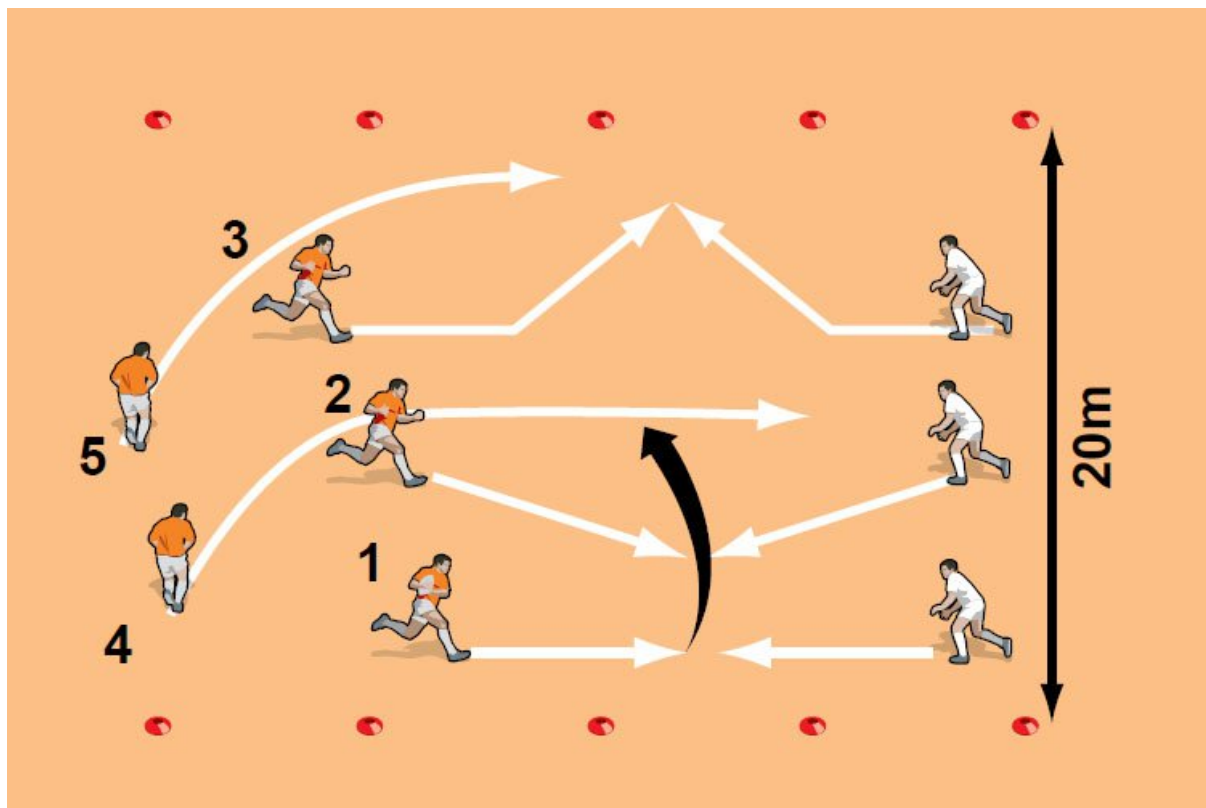


Figure 5: Meaningful choices. [9]

Players are more inclined to spend time playing a game that provides both meaningful choices and predictable outcomes. Having a predictable outcome in this sense does not exclude randomization of effect, e.g. a dice roll, but instead it refers to making sure the player knows what to expect and that the game fulfils the player's intentions. Randomness, when expected, can further increase playtime as players might keep trying until they get a good roll; however, having a mechanic, e.g. a weapon, fall short of the players' expectations is going to cause them to feel dissatisfied.

Meaningful choices largely involve two categories: Those entirely based on mechanics, for example allowing a player to assign skill points to areas of their character that complement their play style; and emotional outcomes, for example dialogue choices that affect the in-game environment of a non-playing character, or their feelings towards the player later in the game.

These both work because players feel more motivated if they are more confident in their skill and ability to achieve the outcome they want.

Methods for improving immersion and emotion through music and SFX: [10]

Music is one of the most powerful psychological tools in ambient and environmental immersion and in defining the player's expectations and emotional response to a level, character, or whole game.

Implementing 3D spatial sound will dramatically improve immersion, and can be used as a game-play mechanic especially if the player is using headphones or a surround sound setup as it allows the player to hear NPCs, enemies, or interactive elements such as a phone box, and walk in their direction or run away from them without having to directly see them.

Implementing adaptive music allows for both specializing the emotional atmosphere in different areas (for example a spooky track could play when the player enters a cave inhabited by ghosts); and providing feedback on the player's actions, creating a feedback loop which heightens their emotion (for example having the music change between stealth and action, where when the player becomes more aggressive, the music builds up).

Audio cues can also be used, for example if a specific track or measure is played just before the player enters a boss battle, they will learn this association and it will allow them to prepare themselves, leading to less stress or surprise.

These are just some of the ways music can be used, with a focus on heightening the player's immersion and emotion, and reducing unwanted stress or the chance of the player being caught off-guard and feeling out of control.

Methods for improving the social aspect of games: [11]



Figure 6: Dialogue options. [12]

While multiplayer is the ultimate form of in-game social interaction, implementing NPCs with personality driven behaviour patterns will allow players to feel connected and more immersed than if all NPCs act alike. This will also give the player reason to interact with multiple NPCs. In the case of enemies, having different personalities will give the player the opportunity to learn the attacks and patterns of each enemy, and which weapons or play styles are most effective against them. Together these will encourage a player to spend longer in the game, and also satisfy some of their social needs.

In multiplayer games, the inclusion of elements that encourage players to interact in a meaningful manner is one of the most important design considerations. For example, in a player-vs-player game, the inclusion of a score board or rewards only available to the winner will motivate both players to try their best. Similarly, in a co-op game, elements of competition (for example scores provided per player) are still a really useful tool.

Humour is also a very important aspect of modern multiplayer games. This can be difficult to design for as it is mostly based on emergent behaviours; however, some mechanics can be changed or added, such as player-player collisions or traps, although they can become a reason for a player to quit if overused to a point where the player becomes frustrated, or if the player is put in a situation where they are unable to interact with the game.

The inclusion of animated emotes is very popular in recent multiplayer games, and, when accompanied by an in-game camera, leads to great opportunities for sharing images among friends or on social media after the fact.

Character design also has a strong impact on the social aspect of gaming, as typically the appearance of the character is the first thing the player knows about them; and, it can define the approach a player will take towards them, for example whether they appear relatable or not will influence the player's interaction with them.

Game-play tweaks for existing mechanics: [13]

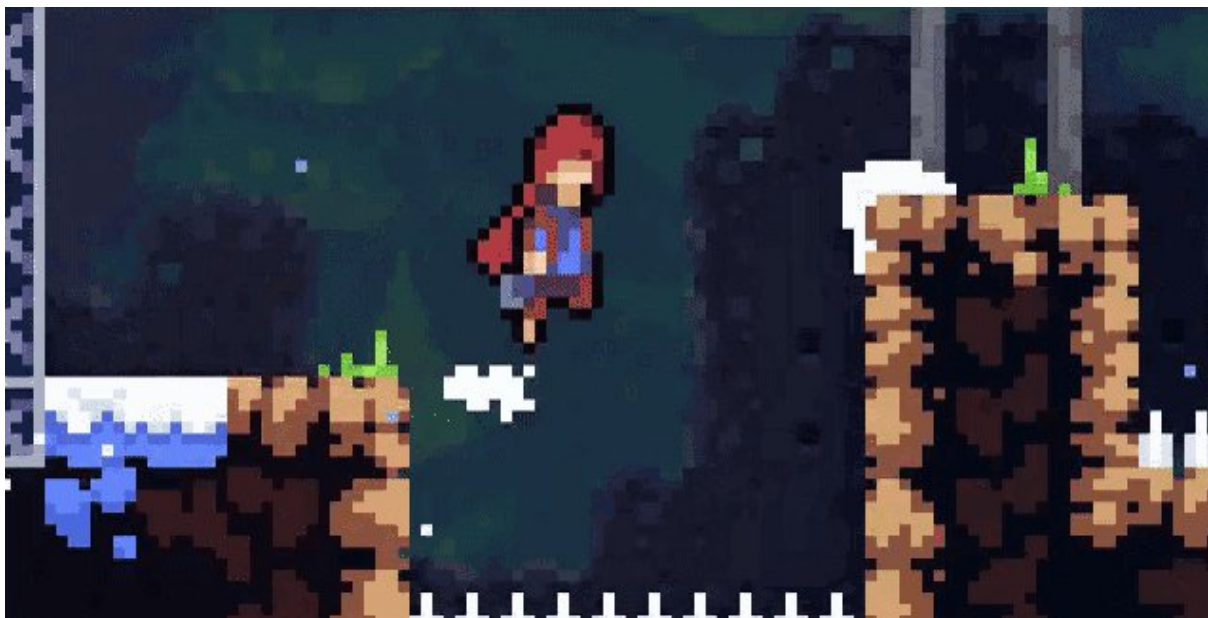


Figure 7: Coyote time. [13]

To limit player frustration and improve their sense of control and skill, mechanics can be altered on a very short timescale that should not affect the overall feel of the game, while making it easier for new players.

One popular example is coyote time, which refers largely to player movement, specifically allowing the player to continue actions after they technically should not be possible. For example, allowing the player to activate a jump, even if they press the jump key after walking off an edge, as long as it's within a short time window. This can be expanded to many interactions, such as allowing a player to get out of a trap after it is already slamming shut, or to interact with a moving target after it has left their cross-hair. These help make players feel more powerful, and improve the experience for players who are dealing with lag.

Emotional connection with environments: [14]



Figure 8: Peaceful view but showing potential danger ahead. [14]

Environment design affects immersion and emotion, allowing the player to understand the world and feel more a part of it.

The use of colour theory will directly affect a player's emotional response when first seeing a new scene. The player will start to form expectations which, if upheld, will make them feel more prepared and skilled.

Spaces, shapes, and lighting all draw the player to different areas, and simultaneously invoke emotional responses. For example a wide sunlit valley will be likely to make the player feel freer and more at peace, while drawing them down and along it; alternatively, a small dark room with old machinery and peeling paint will put the player on-edge waiting for an enemy or environmental hazard, while drawing the player towards the most brightly lit areas. For games set outdoors the weather will also have a significant effect on the player's emotions and motivation.

Giving the player a break from uncomfortable environments both reinforces the player's emotion when returning to a more high-pressure scene, and gives them a chance to catch a breath and relax. A 'safe space' is an important mechanic in high-stress games, allowing the player's heart rate to drop and letting them analyse their previous strategies and prepare for the next challenge. Combining this with a peaceful environment and music makes the effect much more powerful.

Chapter 3: Case Studies

This section will examine two of the most popular games in the world and two recent indie titles to determine what design choices may have led to their success.

3.1 Minecraft



Figure 9: Minecraft promotional image. [15]

Minecraft is undoubtedly one of the world's most popular games, with over 300 million copies sold since 2011. [16] It is a sandbox game with optional survival mode and multiplayer [17] which appeals to all nine of the player classes [3] (defined in section 2.1) with even greater appeal due to its support for community mods.

Minecraft at its core appeals to *The Explorer* with huge procedurally generated worlds and frequent free content updates, *The Craftsman* through its sandbox building mechanics and redstone (a set of in-game logical systems used to automate processes such as acquiring resources, or creating mini-games and even functional computers in-game). It appeals to *The Collector*, with almost 2,000 items and over 100 achievements. It has a huge speed-running community with 24,136 runs recorded on speedrun.com [18] at the time of writing; this aspect appeals directly to *The Competitor* and *The Achiever*. It appeals to *The Joker* through its comedic Easter-eggs and extensive multi-player support. It appeals to *The Director* and *The Performer* through its sandbox mechanics and the ability to control NPCs in-game. Finally, it appeals to *The Storyteller* through the ability for players to shape their own world and live a life

in that world, solo or with friends, with Minecraft worlds often being played regularly for years and progressing with each update and the players' skill.

Due to its casual and largely stress-free nature Minecraft appeals to players looking to relax, aided further by its sound design and atmospheric music. It may also offer a form of escapism and self-expression despite its abstract graphics.

With support for multi-player, Minecraft appeals to players looking to socialize with a small group of friends or join open servers to make new friends. Minecraft has no coded limit to the number of players active on a world, and although many servers impose a limit on concurrent players in one world due to hardware limitations, they can have many thousands of players active in a given week. [19]

3.2 GTA V



Figure 10: GTA V promotional screenshot. [20]

Grand Theft Auto 5 is also among the most popular games, surpassing 200 million copies sold last year (2024) since its release in 2013. [21]

GTA V is an action-adventure game, featuring a story mode and online multiplayer. [20] GTA V appeals to *The Competitor* through in-game combat, vehicular racing, economy, and more. It appeals to *The Explorer* through its vast, detailed, and interactive world and narrative. It appeals to *The Collector* and *The Achiever*, especially in online multi-player, through

collectibles, achievements, and competitive play. It appeals to *The Joker* through extensive humour and multi-player. To *The Director* and *The Performer* through impressive combat, heists, and self-expression through character customization.

The appeal of GTA V to *The Storyteller* is more limited in story mode as in this mode the game is relatively linear; however, in online mode it is quite extensive, acting as a sandbox. Appeal to *The Craftsman* is perhaps most lacking, although the game features customization of vehicles.

GTA V also offers a relatively unique opportunity for escapism (unique, at least, at the time of its launch) and the ability to express oneself in ways that are not possible without consequences in real life, as it features a story based around crime set in an impressively realistic world.

With both invite only and public lobbies, it caters to socialization and interaction, with added depth due to the detailed and customizable characters.

3.3 Lethal Company



Figure 11: *Lethal Company* promotional screenshot. [22]

Lethal Company is a co-op horror game which was released on Steam near the end of 2023. [22] It has sold almost 20 million copies since its release [23] making it a recent example of a successful indie game.

The developer, Zeekerss, has been publishing on Steam since 2021; however, it is fair to imagine the marketing budget for Lethal Company was significantly lower than the previous games on this list. It is a good example of audience engagement, having achieved widespread and rapid popularity across social media and streaming.

This is probably largely due to a combination of simple yet addictive progression and a variety of mechanics that allow humour and expression between players (from items to traps and enemies). It features a relatively short gameplay loop, with a safe space between each round where players can discuss their last adventure and prepare themselves for the next. The art style is also somewhat unique, although this may be driven in part by necessity, based on an analysis of the rendering sequence by Acerola. [24]

Lethal Company appeals to *The Joker* through its goofy characters and enemies, multiplayer mechanics, and satirical humour. It appeals to *The Collector* in a literal sense through its main mechanic and through achievements. With the addition of the CompetitiveCompany mod [25] it gains even greater appeal to *The Competitor* than it already has in its base form. With procedurally generated levels and 24 monsters it provides plenty of content for *The Explorer*.

Lethal Company is weaker in the other categories, *The Achiever*, *The Director*, *The Storyteller*, *The Performer*, and *The Craftsman*. This is largely due to having limited scope for creative play outside of interaction between players, which does increase the appeal particularly for *The Director* assuming they get a leadership role among the players.

3.4 Bloodtheif

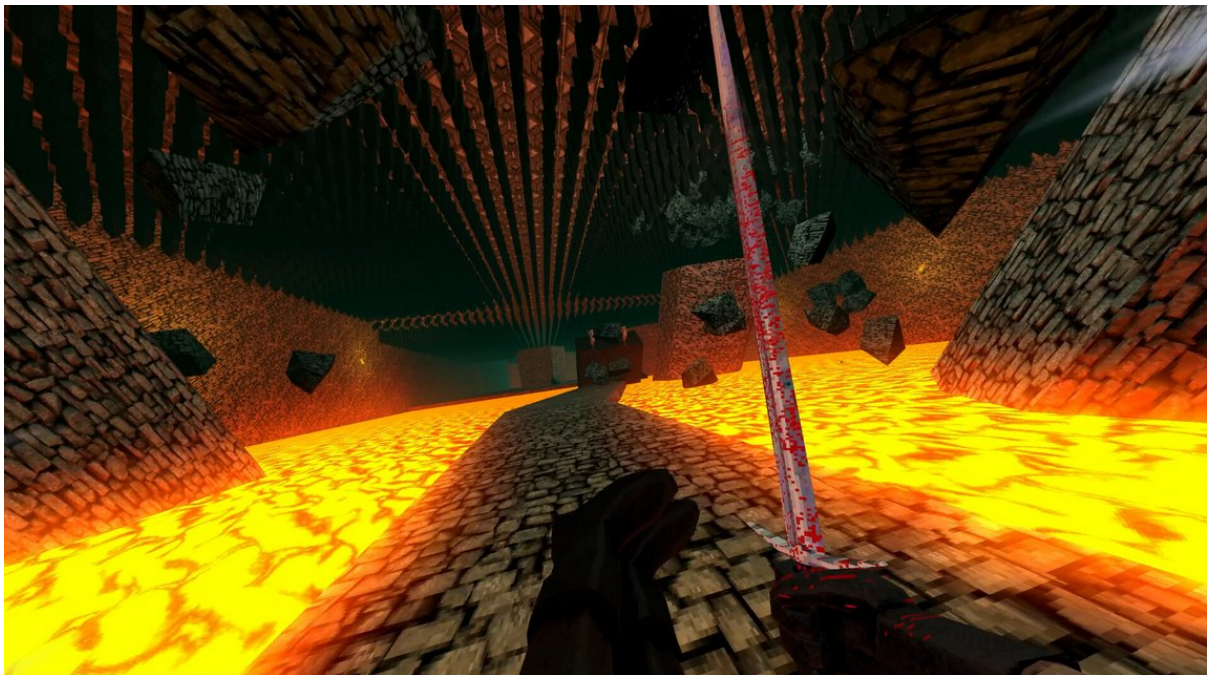


Figure 12: *Bloodtheif* promotional screenshot. [26]

Bloodtheif is an upcoming fast-paced melee dungeon-runner made using the Godot game engine by indie developer, and devlog (a video diary of the development process) YouTuber, Blargis [27] which has provided technical inspiration for my development process hence its inclusion on this list. The public playtest version has already gained lots of interest from the speed-running community [27] and the game has over 3,000 followers on Steam, and ranks number 546 most wishlisted at the time of writing. [28]

This early success is in part due to Blargis's presence on YouTube with 86k subscribers, however the game features excellent replayability, satisfying mechanics, and an attractive retro-inspired style. Blargis has put a lot of thought into every detail of the game, which he explains in his devlogs and tutorials.

Bloodthief appeals to *The Competitor*, *The Achiever*, and *The Performer*, and *The Collector* through its learning curve (which is quite complex due to the use of many simple mechanics that interact with each other), its global leaderboards, and its tiered medals for each level. It appeals to *The Explorer* through hidden items; and to *The Joker* through its un-serious nature and enemies. It provides a perfect setting for escapism due to its fast action and compelling visuals, making it excellently immersive and engaging. It, however, has less appeal for relaxation due to its high stress gameplay; and to *The Director*, *The Storyteller*, and *The*

Craftsman due to having mostly linear levels, and a lack of long-term consequences or meaningful decisions.

3.5 Summary of Case Studies

In the four examples given above, these popular games are likely to appeal to a wide range of players, particularly those developed by large studios. While with indie games it may be necessary to focus on the most important mechanics rather than trying to cater to everyone, it is still possible to implement smaller things such as achievements, leaderboards, and customization options that will work together to appeal to a wider range of players.

Chapter 4: Methodology

This chapter will cover the tools and procedures used to create and test the practical assignment.

4.1 Software Used

Godot Engine [29] was chosen as the game engine for the project, due to its low performance overhead, small size on disk, multi-platform support, extensive documentation, and free and open-source model.

Blender 3D [30] was used for all 3D assets, due to its extensive features, free and open source model, and my personal experience with it.

Adobe Substance Painter [31] and Adobe Photoshop [32] were used for most of the textures, due to their unique abilities and ease of use.

InvokeAI [33] with various stable diffusion [34] models were used to generate a few textures to save time and avoid copyright issues, all textures made using AI are listed in appendix B.

Procreate [35] was used for hand-drawn textures, due to its smooth operation and extensive library of realistic brushes.

The Jolt physics engine [36] was used (initially as an addon before its integration into Godot in version 4.4) due to its superior performance and stability when compared to the Godot default physics engine.

Visual Studio Code [37] and the SCons build system [38] were used to modify and build a custom version of the Godot engine from source, integrating bug-fixes from the Godot developers which were essential to my game and are yet to be merged with the latest Godot release, along with modifying the built-in shaders to provide more fitting tone mapping and post-processing.

The GitHub website [39] and GitHub Desktop application [40] were used throughout development to store version history and back-ups of the project.

Google Forms [41] was used to create all surveys and gather most of the playtest feedback.

4.2 Project Planning

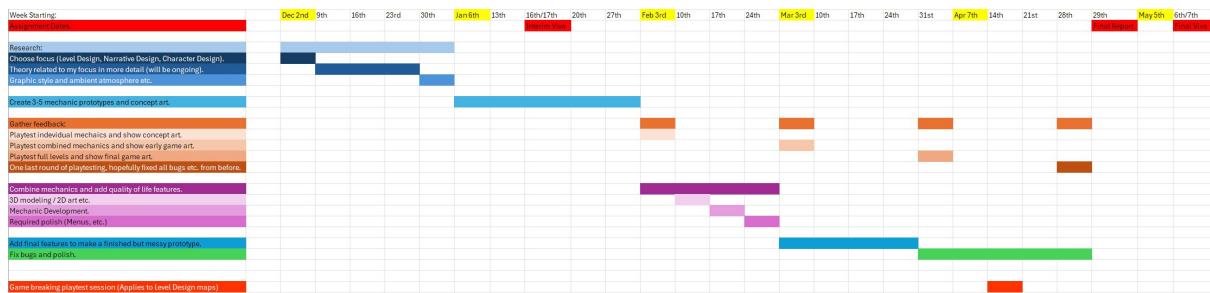


Figure 13: Gantt chart from start of project.

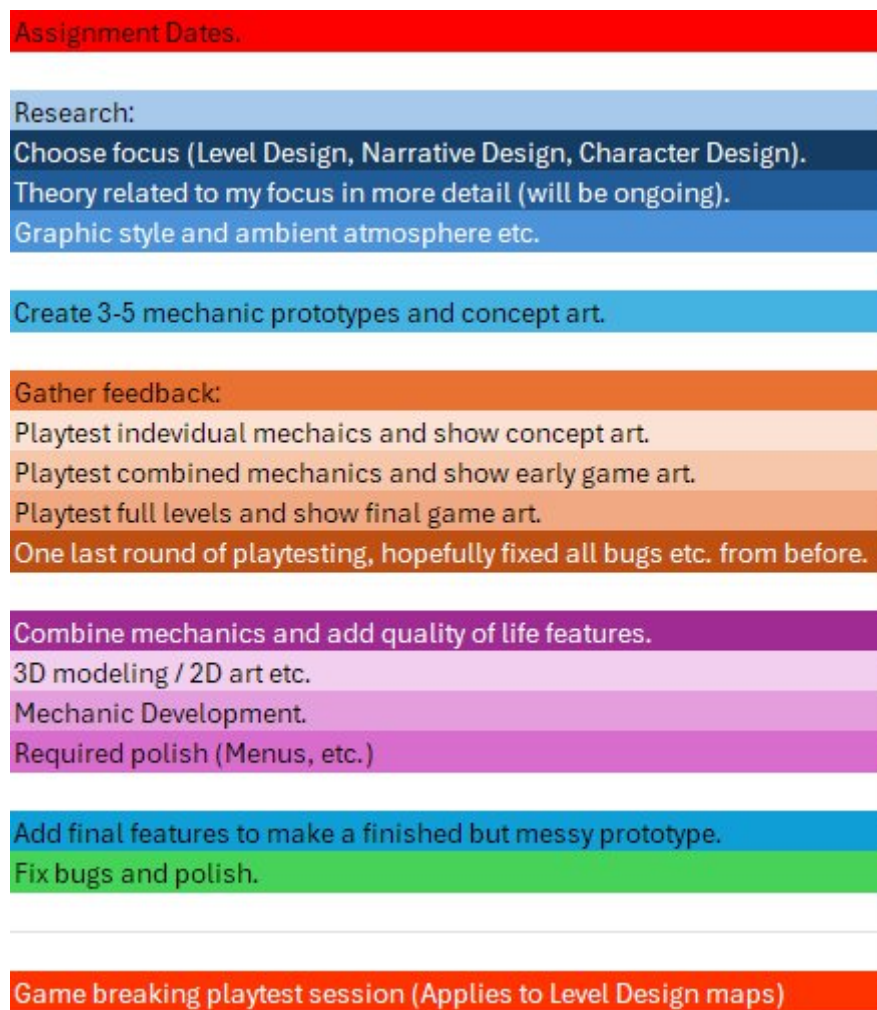


Figure 14: Close-up of Gantt chart components.

This was my original Gantt chart, created close to the start of the project. It has been largely followed; however, 3D modelling and 2D art started a little earlier and continued throughout, and the second playtesting session was missed due to a lack of meaningful changes implemented.

4.3 Planned Objectives

The goal of the practical work was to implement and test strategies outlined in my research. This has been carried out to a satisfactory degree, despite not being able to personally test all elements of my research.

Primary research was to be carried out via surveys and playtesting. The aim of the playtesting was to compare the feedback from parallel testing of two version of the game, with specific strategies applied to only one version. The results of playtesting have been limited, but useful and consistent with my research.

Chapter 5: Project Development

This chapter will roughly outline the development path followed so far, with a focus on elements affected by research and user feedback.

The project is currently in a playable state, with the core mechanics completed. The core mechanics for my game include player movement systems, LAN multiplayer, synchronized level loading, player character selection, a dynamic interaction system (providing context-dependent interactive features for environmental elements, NPCs, enemies, and items), a HUD, and an inventory system. Other planned mechanics that have not been completed include the NPC and enemy systems, the dialogue system, and a crafting system. The artistic content and level design also remains unfinished, however the first two levels are completed to a degree suitable for testing and for understanding the basics of the game.

5.1 How I chose a project concept

Two game concepts were created at the start of the project, along with one-page GDDs and elevator pitches.

For concept 1, code-named *Children, Please*, the elevator pitch is:

“A single-player emotional exploration puzzle game set in present day Wales. Progress your career, starting as a primary school teacher, while keeping your boss happy and looking out for the welfare of your students. Engage in dialogue, use your intuition, delegate, and make important decisions to get the best ending.”

And for concept 2, code-named *The Bunker 2101* (originally *Project 2125*), the elevator pitch is:

“A multi-player co-op survival adventure game set in a post-nuclear-apocalypse world. You’ve lived your whole life in an underground bunker, but society is crumbling around you and you choose to escape to the surface and take your chances outside. Fight enemies, trade resources, and solve puzzles to save your clan.”

I ran a survey among other students at UWTSD with three main sections. In the first section I asked questions about their age, gender, the games, and genres they played most. In the second section I asked specifically about some key mechanics, for example multiplayer vs single-player and whether they liked story driven games or action etc. In the third section I shared a little about each idea, including the elevator pitch, and asked them which they would

be most likely to choose if they could get just one for free (this wording had the purpose of taking money out of the question, however I mention this because the terminology did not quite have the effect I intended, with one person giving this as their reasoning “Weird thing is, I actually like the other option more as a game to be interested in. But the multiplayer game also sounds fun, albeit potentially only with other people. So getting the multiplayer game for free would feel nice since I don't feel like I'm losing money on a game I'd potentially wouldn't play as much”).

The outcome of this survey, though close, showed a preference for the second option. The main reasons were a preference for multiplayer, a preference for action over dialogue choices, and a preference for the setting/environment of the second option (note that concept art was not shown).

With this feedback I expanded upon the second option and used it as a focus for further research and project development. Changes continued to be made to the project after each play-testing session.

5.2 Technical Challenges

I faced a few challenges during the development of the project, this is a brief overview of them, how I dealt with them, and what effect they had on the final outcome of the practical work.

Why is everything pixelated?

The game is rendered at a smaller resolution (approximately 400 pixels high, always a divisor of the actual screen resolution) and upscaled. This provides much better performance on lower-end machines, creates a feeling of limited visibility in the game's underground environment, and allows for simpler models and textures. This trick was inspired by Lethal Company which renders at a fixed resolution of 800 by 600 (width by height). The main reasons for this are that a good looking game can be created with less effort, meaning that I can create more of the game in the same time, and with a style that is fairly pleasing and has been appreciated by playtesters.

It also allows for removing the effect when the player emerges from underground at the end of the game, to create a contrast where everything is not just brighter and more colourful but also more detailed.

Version changes.

Twice during the project development I updated the Godot engine version I was using. The first update was seamless and caused no issues, however the second update, from version 4.3 to 4.4 caused a few issues.

The reason for updating from 4.3 to 4.4 was mainly because of a new feature called 'ubershaders' designed to mitigate lag spikes which previously occurred while compiling shaders (in Godot engine, shaders are compiled when they are needed, so when a new material entered the view of the active camera it would freeze for a moment). Ubershaders run less efficient shader code immediately, compile the full shaders in the background, and swap it in when it is ready; this means that the stutter is not noticeable on most machines, despite technically lower performance from the intermediate shader code.

After updating to 4.4, the ubershader feature was working; however, two other issues presented themselves. Firstly, the game would not run on an older machine I was testing it on (Intel i5-4570S and Nvidia GT 710). By trying to create a new Godot project, which also crashed immediately, I determined this was indeed an issue with the Godot engine. The second issue was with baked global illumination and reflections; the global illumination quality was much decreased and no longer worked for baking with direct lighting, and the reflections were also much softer.

While I initially rolled back to 4.3, I had been in contact with a few of the Godot contributors about a bug with Android related to another project, and once a fix was introduced in 4.4.1 I tried that, however, again the previous issues persisted. With more help from Godot contributors a fix was made for the crash, and the lower quality reflection probes and global illumination were deemed intended functionality because they were also much more efficient and supported the main use cases for these features. With the code for the fix provided, I cloned the Godot source and merged the changes into my own version, and compiled this. While I making changes to the source code, I also gained access to the built-in shaders and modified a couple of them with a new tone mapping method that is still fast and preserves vivid colours better, which complemented the style of my game. I then moved some of my post production shaders into the default rendering pipeline because it is typically faster.

Without baked lighting working satisfactorily for my game, I opted to remove it altogether. This is not too much of an issue as my game is not hyper-realistic to start with. It also allowed me to have lights turned on and off by the player, and the basic ambient lighting is not much worse than proper bounce lighting. Reflections still are not as sharp as they were in 4.3; however, it is hard to notice through the pixelization of the screen.

Chapter 6: Findings

This chapter covers the findings from primary research, the results from surveys are in appendix A.

6.1 Primary research results

Market research survey:

This survey was run at the start of the project; it was used to gather information on what game idea people liked and what mechanics they were interested in. The majority of participants were within the intended demographic of the game. Participants gave some information about themselves, what games they played, what genres they preferred, and were finally asked to choose between the two elevator pitches for the game ideas I had created.

The outcome was in favour of multiplayer and action, over an emotional puzzle game.

Playtest 1 feedback:

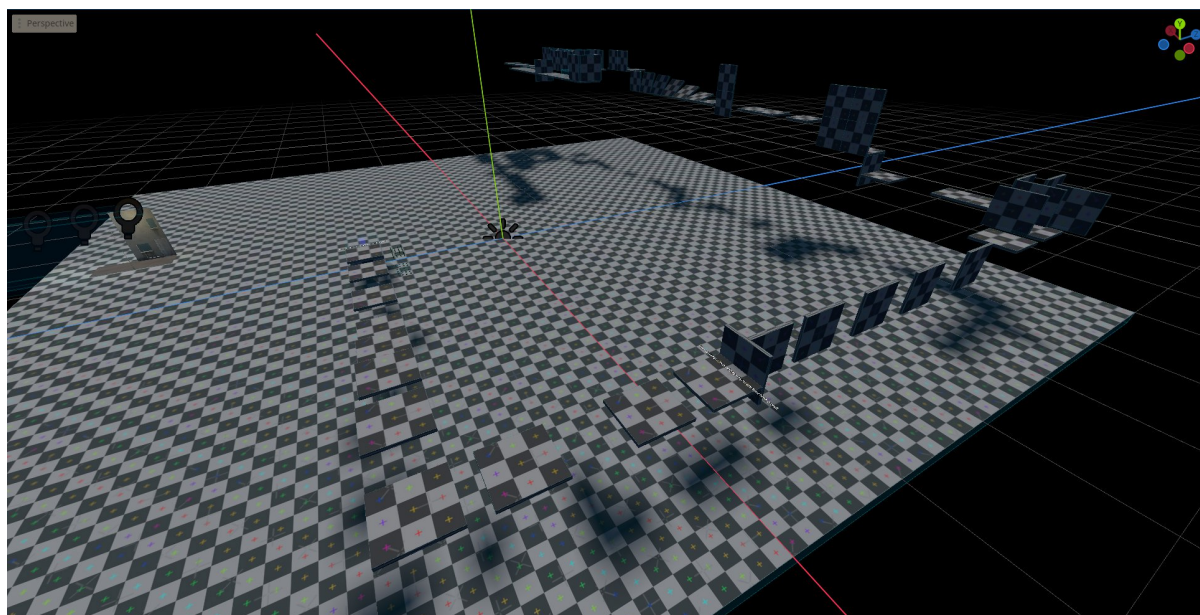


Figure 15: Screenshot of parkour area in playtesting version 1.

This was the second survey, run at the end of the first playtesting session. Playtesting was carried out on university computers, and users were given brief instructions for the controls etc., and given a link for the survey at the end. I was present during the testing and observed how players were approaching the game and where they got stuck.

The timed parkour section ended up being very popular with the testers and sparked competition between them, leading to many playing for much longer because they were trying to get the best score. It was created for the purpose of testing the player movement and determining whether coyote time had a positive effect on player satisfaction. The users with the coyote time feature enabled did appear less frustrated and more satisfied overall. I had hoped to swap users over after the initial blind test, but this was not possible due to time constraints.

The outcome was overall positive, with a general interest in the game. A few bugs were found, and a few ideas given, for example clearer crosshair using inverted colours was added after the testing.

Playtest 2 feedback:



Figure 16: Screenshot of starting flat in playtesting version 2.

Due to personal circumstances, I was unable to test this version with as many people; it, however, was still a useful test.

This test consisted of the first two levels of the game, and was the first time the tests had included textures and multiplayer. This test was focused on multiplayer, the graphics, the inventory, and very early development enemies. Two groups were tested side by side, some together in multiplayer and others in single-player. The multiplayer groups seemed to enjoy the game much more and left more positive feedback; however, one of the multiplayer groups didn't kill a single enemy, didn't find any of the items inside the starting area, and didn't explore the left side of the street they started on; while all the single-player testers explored these

areas, killed at least one of the enemies, and picked up most of the items. The other multiplayer group did interact with the enemies and map more, although it was mostly one person who found all the items. This shows that although the testers in multiplayer interacted with the mechanics and found their own ways to have fun, they paid much less attention to the intended route for progression; but they did play for longer overall. This could be countered by having a smarter progression system that ensured players interacted with necessary items and areas before allowing for progress.

Feedback for the other aspects of the test was mostly positive.

6.2 Overview of findings and comparison with previous research

Overall, the results of primary research have been well aligned with my previous research. Multiplayer has proven to be the most important tool for creating longer play times and greater satisfaction among my testers.

Chapter 7: Summary

This research has covered various proven methods that can be implemented during development for improving player engagement. The literature review covered various reasons why people play games and what design choices appeal to particular demographics, and the case studies covered which methods have been used in a selection of successful games. The leading strategies for improving player engagement are improving replayability, focusing on the social aspect, ensuring the player feels competent and in control, and creating shareable moments. The methodology used in the practical work and primary research has been covered and aligns with the results of the literature review. Playtesting showed theories presented in the literature review have been successfully integrated into the practical work. The research has shown the success of multiple methods for increasing player engagement and audience engagement.

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Appendix A: Results from Surveys

Links to the results of each survey, with personal information removed where it was supplied.

Survey 1, start of project:

https://docs.google.com/spreadsheets/d/11Yh_DECAFfxlbAbjINjjZhpAZbwjXiKHVJe1-it8PJs/edit?usp=sharing

Survey 2, after first playtesting session:

https://docs.google.com/spreadsheets/d/1MGkksknOveTZOO0ybPf-6rjF2b_A8ixu5IUEpe3_yYk/edit?usp=sharing

Survey 3, after second playtesting session:

<https://docs.google.com/spreadsheets/d/1UDxdp3pkloBsamJYa1JeFZ6ialaM1YSJZc94CbGcYA8/edit?usp=sharing>

Appendix B: Use of Generative AI

Subsection 1: Generative AI used in practical work

Generative AI was used for a few textures, these will be specified by file name and in-game asset name along with the viva / practical submission.

Subsection 2: Generative AI used in this written report

Generative AI was used to aid with research. The tools used were Google Gemini and Google AI search results.