Process Documentation- Green Team

GitHub Repository Link

https://github.com/MarcusOWilliams/Software-Engineering-CW2

Table of Contents

General Overview of Weekly Sprint Documentation

Team Green's weekly sprint documentation consists of the following sections:

Sprint Overview - An overview section which consists of preview and review sub-sections. The preview recaps the previous week's learnings and sets the scene for the current week. The review sub-section is written at the end of each sprint and summarizes the documentation and development progress made in the current sprint. The review section also cross references tasks within the sprint.

Tasks - The Tasks section consists of individual and group tasks delegated amongst the team members. Each task is paired with the name of the team member who had responsibility for its completion. A reference code is provided for each task that is used in the backlog and throughout the sprint to update its status.

Ordered Backlog - The Ordered Backlog section consists of tasks that have been identified as necessary but are yet to be completed at the beginning of the sprint, those tasks that are still not complete by the end of the week have been pushed to the subsequent week's sprint. Each task also contains a priority number to inform the order of the backlog. Priority can also be inferred from the parent task and the task's date of creation and completion. There is an additional column for each task that provides the status of task at the end of each sprint.

Meeting Records - The Meeting Records section lists all the client and team member meetings. Timestamp, overview, duration and attendance is recorded for each meeting.

Customer Meeting Minutes - The Customer Meeting Minutes section contains details of the timestamp, moderator for the meeting, and the minutes taken by a team member along with agenda items and their respective summaries. The section ends with the action items planned for the current sprint.

Customer Interview and Analysis - The Customer Interview and Analysis section contains the highlights of the script dialogue (Q&A format) between the client and the team. A subsequent analysis of the dialogue is then given which sets the tone and priority of the work to be done in the current sprint.

Exception Handling - The Exception Handling section contains a list of the tasks (along with their reference codes) where challenges were faced, description of the challenges faced, and solutions that the team members found to rectify them.

User Stories - Each user story within the User Stories section begins with an individual task which is assigned a unique user story code such that it can be referenced in other sections of the sprint. Acceptance criteria to satisfy the user story is then detailed, followed by a priority number, version number, and date of amendment.

User Interface Design - This section depicts the progress achieved so far with regards to the design/graphic representation using screenshots from software tools such as blender.

User Story Tests - This section details all of the tests run on user stories in the current sprint. The user story is listed along with the test result. If the acceptance criteria of the user story are fulfilled, the test is considered to have passed, otherwise, it fails. If the test has failed, there is a column that describes the reason for failure.

Use Cases - This section contains the versioned use cases for the game. It consists of details for each use case, namely – the author, date of creation, purpose, the overview explaining the game scenario of the use case, cross reference codes (for use in other sections), actors, pre-conditions, and post conditions. Furthermore, the actor actions and system actions are listed in tables for each use case.

CRC Cards - This section is the software design documentation for the game the team developed. For each CRC card, the class names created, version, cross reference codes to use cases, responsibilities, and collaborators that make it work are listed. Additionally, a brief description is provided for each card to understand the underlying concept.

Please note: The sections within each sprint are based on the work completed that week. Therefore, not all weekly sprint documents require all the sections above.

1 Sprint 1 | 27th October – 2nd November

1.1 Sprint Overview

1.1.1 Preview

Going in to the first sprint, we wanted to address the fact that we had not met before and were unsure of each other's skillsets. Furthermore, we aimed to produce an idea to present to the customer for our first meeting.

1.1.2 Review

In our first meeting, each team member introduced themselves and their background, including what strengths they thought they could offer the team and what they were keen to learn and be involved with going forward. We then discussed which game development platform was best suited for our collective strengths and skill sets. Unity was chosen as the platform as two members of the team had prior experience using it. All other team members had little or no experience with game development but were interested in improving their skills (S1-T1). To begin conceptualising the game, we first set out by understanding the requirements. Numerous different ideas were discussed that fulfilled the requirements; however, we selected our five strongest ideas and developed them further to present to the customer (S1-T2). Zoe created a slide show which was used in the customer meeting to clearly explain our ideas (S1-T3).

1.2 Tasks

Code		Tasks
S1-T1	Whole Team	Introductions and discussion about experience, strengths and weaknesses. This is complete when everyone has introduced themselves
S1-T2	Whole Team	Brainstorming game ideas. This is complete upon group consensus of having sufficient original ideas to present to the customer
S1-T3	Zoe	Create a slide show to present our ideas to the customer
S1-T4	Rachan	Meeting minutes for customer meeting

1.3 Ordered Backlog

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
Whole Team (1)	S1- T1	02/11/21	02/11/21	Complete
Whole Team (2)	S1-T2	02/11/21	02/11/21	Complete
Zoe (3)	S1-T3	02/11/21	02/11/21	Complete
Rachan (3)	S1-T4	03/11/21	03/11/21	Complete

1.4 Meeting Records

Date & Time	Overview	Duration	Attended By
02/11/21 - 18:00 - 18:49	Initial group meeting - Introduction to teammates	49 minutes	All Team Members
03/11/21 - 12:00 - 12:14	Client Meeting	14 minutes	All Team Members

1.5.1 Customer Meeting Minutes

Time	Wednesday 3rd November 12:00-12:15 (Sprint 1)
Led By	Zoe
Minutes Taken By	Rachan

Agenda
1. Present Initial Ideas
2. Customer feedback

Agenda Item	Summary
Present Initial Ideas	Five ideas were presented to the client: • Music combat game – Fight to the beat of the music • Pipe game – Geometric puzzle • Mario inspired game – Jump over enemies and escape a dungeon • Guy Fawkes game – Historical education game • Escape the dungeon game – Escape a dungeon and collect coins
Customer Feedback	• Client found the pipe game particularly interesting – Different pipe pieces and configurations every time • Guy Fawkes game may lead to a one-off game. Aim to make a game that someone will play multiple times • A phone may be a better option to consider than laptop

Action Items

No.	Action
1	Come up with a simple idea that draws elements from all five of our ideas

1.5 Customer Interview and Analysis

Interview Highlights:

Q (Client): How do your game ideas work? Would the tempo in the Music Combat be fixed? Is it getting faster?
A (Team): We could adjust it to become faster and faster. Track the player, and then you have to move faster.
A (Client): Yes, ok. Sounds fine.
Q (Client): (About the pipe game) Can I think that the pipe will slide or do we slide to move?
A (Team): It's like you entered a pipe. You rotate the pipe, and you move through it.
A (client): Oh, alright. Ok.
Q (Team): We have a couple questions about the target audience, is this game designed for children or adults?
A (Client): Um, it's more interesting to see what thing you want to select from the ideas you already pitched. It's not something you have to worry about too much.
Q (Team): And then, would you like it to be a fun or an educational game?
A (Client): Um, you can have lots of problems with educational games. Education requires structure.
Q (Team): So, it would be better for us to choose a fun concept?
A (Client): Oh, I think you remind me of something with lots of potential. The pipes thing, you have this logic-based approach to give it educational meaning that solves that problem which involves doing rotation and whatever else it includes. It's developing multi-based problem solving.

Analysis:

- According to the answers the client provided, we should select the strongest concepts from each of the five game ideas and combine them to reach the most engaging idea.
- Furthermore, we had to consider which elements were compatible between the games.
- We should draw upon images and background stories for visualising the games. The pipe game is currently the strongest idea and focuses on problem solving, but it could still be combined with elements from the other games if we desired.
- First focus on the pipe gaming concept in Prison Escape. Consider combining it with the horizontal platform game and coin collecting described in Mario Adventures, as well as the scoring system in Dungeon Hunter.
- For this week, the primary task is to combine these elements into one intriguing game for the client.

1.6 Exception Handling

The challenges we faced during this week's tasks are outlined below, alongside their respective solutions:

Tasks	Challenges	Solutions
S1- T1	Obtaining a general overview of the team.	Keep talking – longer meetings if necessary.
S1- T2	1) Keeping track of several ideas. 2) Thinking of ideas. 3) Forming full ideas from partial ideas.	1) Note taking/minutes. 2) Open discussion/inspiration from other games. 3) Keep talking, come back to the idea if you reach a stand still.
S1-T3	Finding ways to represent the game ideas quickly and accurately without actually building it.	Use screenshots from existing games to convey game ideas.
S1-T4	N/A no challenge.	-
	Finding a time to meet that would suit everyone's schedule.	The team decided to meet on Tuesdays as this suited everyone's schedule and we were able to discuss what and how to present our ideas in the client meeting.

2   Sprint 2 | 3rd November – 9th November

2.1 Sprint Overview

2.1.1   Preview

Following the previous week's customer meeting, we decided that this sprint would be used to narrow down our game ideas down to one. We also wanted to decide how best portray our new idea in the next customer meeting. It was important to make sure we were in a good position to start producing the game by the next sprint, so we had this in mind while creating our tasks. As the team's skillset was identified in the previous week, we felt in a strong position to delegate the tasks.

2.1.2   Review

In this sprint, we solidified our game idea and presented a slide show to the client detailing our game rules along with mock-up images and a game video demonstrating the major concepts. After the client meeting, we discussed how we would build a version of the game with basic functionality (i.e., attaching straight pipes). We split our team into those responsible for game development and those responsible for project documentation based on experience and interest. This increased our tasks completion efficiency.

2.2 Tasks

Code		Tasks
S2-T1	Whole Team	Narrow down the game idea based on the customer meeting. This is complete upon group consensus that we have enough detail to present to the customer.
S2-T2	Zoe	Create a slide show (including graphics), to logically and graphically explain our narrowed down game idea to the customer in the 2nd meeting. This is complete upon Zoe's judgement.
S2-T3	Leo	Create a short mock-up video of the game to support the slide show for the customer. This is complete upon Leo's judgement.
S2-T4	Whole Team	Decide how technically to build the game.
S2-T5	Whole Team	Start contemplating some User Stories for the game idea.
S2-T6	Shawn (Chin)	Overview and interview analysis sections for sprint documentation.
S2-T7	Rachan	Amend meeting records for sprint documentation.
S2-T8	Michelle	Write preview section for sprint documentation and meeting minutes for customer meeting.

2.3 Backlog

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
Whole Team 1	S2- T1	03/11/21	06/11/21	Complete
Whole Team 2	S2-T4	03/11/21	06/11/21	Complete
Zoe 3	S2-T2	03/11/21	09/11/21	Complete
Leo 3	S2- T3	03/11/21	07/11/21	Complete
Whole Team 4	S2-T5	03/11/21	09/11/21	Complete
Shawn (Chin)	S2-T6	03/11/21	09/11/21	Complete
Rachan	S2-T7	03/11/21	09/11/21	Complete
Michelle	S2-T8	03/11/21	10/11/21	Complete

2.4 Meeting Records

2.4.1   Meetings

Date & Time	Overview	Duration	Attended by
Tuesday (9th November 2021) - 18:00 - 19:15	Internal meeting	75 minutes	All Team Members
Wednesday (10th November 2021) - 12:00 - 12:14	Client Meeting	14 minutes	All Team Members
Wednesday (10th November 2021) - 12:15 - 12:56	Internal Meeting	41 minutes	All Team Members

2.4.2   Customer Meeting Minutes

Time	Wednesday 10th November 12:00-12:15 (Sprint 2)
Led By	Zoe
Minutes Taken By	Michelle
Participants	All team members and customer

Agenda

1. Recap ideas presented in previous meeting
2. Present idea with combined features
3. Go through action plan for the next sprint

Agenda Item	Summary
Recap ideas presented in previous meeting – Presented by Matthew	- Music combat game – Fight to the beat of the music - Pipe game – Geometric puzzle - Mario inspired game – Jump over enemies and escape a dungeon - Guy Fawkes game – Historical education game - Escape the dungeon game – Escape a dungeon and collect coins
Present idea with combined features – Presented by Zoe	- The screen moves from right to left - Player controls a little character - Water is coming and you must build the pipe to escape - Choose from different pipe shapes - Click to rotate the pipe and drag on drop to connect pipes - Coins to get/ obstacles to avoid/ characterised the pipes (frozen/poisonous) - Background music – The longer you play the faster the screen will scroll and the faster the music will play - Educational component was decided not to be included - Client liked the idea - Client previously liked the story element of the gunpowder plot - Client suggests setting game underwater with fish swimming around - Client suggests perhaps sewer or drainage related - Client specifically liked the characterised pipes feature

	• Client suggests prioritising developing a simplified game – straight pipes flowing and ability to manipulate them
Go through action plan for the next sprint	• Assign ourselves roles • Organise a weekly schedule for the upcoming week • Assign development manager and documentations manager • Client suggests using a tool that allows exportation of documentation • Create a simplified straight pipe game

Action Items

No.	Action
1	Assign roles to team members
2	Organise a weekly schedule for the next week
3	Create a simplified straight pipe game

2.5 Customer Interview and Analysis

Interview Highlights:

Q (Client): How was it developed?

A (Team): Firstly, we would like to recap our ideas last week to show you how we combined our ideas. We had the Music Combat game, where we had to press on the beat, we had the escape the dungeon game where you had to jump on the enemies, the Guy Fawkes educational game, the dungeon pipes game which was a logic-puzzle, and then games playing as a monster and collect coins. So, our combined idea is a new pipe escaping game where the player collects the pipes and builds them from left to right so that there could be a route for the character escaping from the flood in the dungeon.

Q (Client): Ok, is that going to join up with the, um, the Gunpowder Plot thing or not?

A (Team): So, we decided that the educational component wasn't necessary, considering what we discussed last week as it's not going to teach you a concept.

A (Client): Right. Right.

Q (Client): So, we are bringing together the music part with the pipe stuff, and anything else?

A (Team): And then the scrolling screen acts like having the chase element. Then the coins and the Mario style obstacles you must avoid are inspired by our Mario Bro's themed game…

A (Client): OK! Good! Yep! So, it looks like a game.

Q (Team): Yeah. Do you like the idea?

A (Client): Yes, I do. That's very nice.

Q (Team): Would you like any additional features, or do you have any favourite concepts so we can prioritise the development?

A (Client): Um, I suggest that you prioritise ideas of alternative pipes once you have an end-to-end functional game. Starting with a basic functional concept first, like just building straight pipes, then add additional functions to make game more challenging.

Analysis:

- The client was satisfied with our game concept.
- Initially develop a game with basic functionality such as building straight pipes.
- Complete weekly sprint track recording, and use tools which allow us to export the documentation.
- Establish our work division in the development team, aiming to build a functional straight pipe building game. The documentation team should keep track of weekly tasks and game developments.

2.6 User Stories

User Story: Starting the game R1	Acceptance Criteria
As a Player, I want to start the game, So that I can play the game.	Criterion 1. IF the player is at the menu screen... WHEN the player clicks the "play" button...
Priority: 5/5 Version: 1 Date: 08/11/21	THEN start the game.

User Story: Selecting Pipes R2	Acceptance Criteria
As a Player, I want to select pipe pieces, So that I can add them to my pipe system.	Criterion 1. IF the character is still alive… AND the game isn't paused… WHEN the player clicks on a pipe piece… THEN select the pipe piece (prime it for adding to the pipe system) …
Priority: 5/5 Version: 1 Date: 08/11/21	AND display a box around it.

User Story: Adding pipes R3	Acceptance Criteria
As a Player, I want to add pipe pieces to a pipe system, So that my character doesn't die.	Criterion 1. IF the pipe piece has the correct rotation to fit onto the last pipe piece in the system… AND the character is still alive… AND the game isn't paused… AND the pipe piece is selected… WHEN the player presses "enter" … THEN add the pipe piece to the pipe system… AND move at a set speed along the pipe until it reaches the end. Criterion 2. IF the pipe piece doesn't have the correct rotation to fit onto the last pipe piece in the system… AND the character is still alive… AND the game isn't paused…
Priority: 5/5 Version: 1 Date: 08/11/21	AND the pipe piece is selected… WHEN the player presses "enter" … THEN do nothing.

User Story: Character Movement R4	Acceptance Criteria
As a Game Developer, I want the character to move to the end of the pipe system, So that they don't die.	Criterion 1. IF the character is not at the end of the pipe system already… AND the game is in a state of play… THEN get the character to journey to the end of the pipe system.
Priority: 5/5 Version: 1 Date: 08/11/21	

2.7 Exception Handling

The challenges we faced during this sprint's tasks are outlined below, alongside their respective solutions:

Tasks	Challenges	Solutions
S2- T1	Wide range of ideas, it was initially difficult to fully explore one idea before getting side-tracked onto another.	Use the customer meeting points to keep constrain the ideas available to us.
S2- T2	N/A straightforward	-

S2-T3	Initially tried to create a quick mock-up of the game in Unity and record a video of that. This was time-consuming.	I opted to edit a video together in Adobe Premiere, using key frame animation – much faster!
S2-T4	Different ideas as to how to build the game.	Check where the strengths of the team lie.
S2-T5	Getting a set structure to follow for User Stories.	Check documentation form SE lectures.
S2-T6	N/A no challenge	-
S2-T7	N/A no challenge	-
S2-T8	N/A no challenge	-
	Only two members of the team knew how to use Unity.	The development team spent time familiarising themselves with Unity.
	Most team members did not know how to use GitHub.	Marcus made a document to help everyone learn how to use GitHub.

3   Sprint 3 | 10th November – 16th November

3.1   Sprint Overview

3.1.1   Preview

In the previous sprint we wanted to create a short mock-up of the game but opted instead to create an edited video. This week we wanted to complete the mock-up. We also felt that we needed to create a few more tasks that will help us start developing the game despite having expectations that the game development would start this sprint.

3.1.2   Review

After 2 sprints of working as a team, our teamwork and efficiency was increasing. As a result, in this sprint we tried to use more team collaboration tools (e.g., GitHub or Google Docs) to further increase our efficiency. By using a variety of Unity tools, we then managed to build a simple game with pipe selection, addition, and adding, but no rotation. For the documentation, we also discussed a backlog for future tasks, and created user stories, use cases, and CRC cards. Immediately following the client meeting, we had a further group meeting and discussed about how to make the pipes rotate and move, how to increase the complexity and difficulty of the game, and how to enrich user stories and use cases further. We also discussed the UI design and game art design in this sprint.

3.2   Tasks

Code	Team Members	Tasks
S3-T1	Leo	Create a simple functional mock-up of the game (with pipe selection, addition, adding, but no rotation) using a variety of Unity tools. Create User Stories as you go.
S3-T2	Marcus	Set up a GitHub Repository to work on the game.
S3-T3	Marcus, Matthew, Claude, Zoe, Michelle, Shawn (Chin), Rachan	Study Unity, and use the simple mock-up game to understand some common tools we'll be using.
S3-T4	Marcus	Add a character with basic movement animations to the game and make the pipes look more realistic using a model made in blender.
S3-T5	Whole Team	Discuss a backlog of future tasks to display. Add to the development backlog (see below).
S3-T6	Shawn (Chin)	Overview section for sprint documentation.
S3-T7	Rachan	Amend meeting records to sprint documentation.
S3-T8	Michelle	Write preview section for sprint documentation and meeting minutes for customer meeting.
TBD	Whole Team	Create User Stories for the game.
TBD	Whole Team	Create Use Cases for the game.
TBD	Whole Team	Create CRC cards for the game.
TBD	Whole Team	Create core functionality of the game.
TBD	Whole Team	Implement dungeon design to the game.
TBD	Whole Team	Add features.

3.3 Backlog

Note: The TBD tasks are un-ordered, un-designated tasks created during the task S3-T5.

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
Whole Team 1	S3-T3	10/11/21	10/11/21	Complete
Leo 1	S3- T1	10/11/21	13/11/21	Complete
Marcus 1	S3-T2	10/11/21	14/11/21	Complete
Marcus 2	S3-T4	10/11/21	16/11/21	Complete
Whole Team 2	S3- T5	10/11/21	16/11/21	Complete
Shawn (Chin)	S3-T6	10/11/21	16/11/21	Complete
Rachan	S3-T7	10/11/21	15/11/21	Complete
Michelle	S3-T8	10/11/21	17/11/21	Complete
Whole Team 4	TBD	10/11/21	-	Not started
Whole Team 5	TBD	10/11/21	-	Not started
Whole Team 6	TBD	10/11/21	-	Not started
Whole Team 7	TBD	10/11/21	-	Not started
Whole Team 8	TBD	10/11/21	-	Not started
Whole Team 9	TBD	10/11/21	-	Not started

3.4 Meeting Records

3.4.1 Meetings

Date & Time	Overview	Duration	Attended By
Tuesday (16th November 2021) - 18:00 - 18:52	Internal Meeting	52 minutes	All Team members
Wednesday (17th November 2021) - 12:00 - 12:17	Client Meeting	17 minutes	All Team members
Wednesday (17th November 2021) - 12:30 - 13:44	Internal Meeting	74 minutes	All Team members

3.4.2 Minutes

Time	Wednesday 17th November 12:00-12:15 (Sprint 3)
Led By	Leo
Minutes Taken By	Michelle
Participants	Whole Team and Customer

Agenda

1. Show mock-up of the game to client
2. Discuss plans for the next sprint

Agenda Item	Summary

Show mock-up of the game to client	• Client liked the initial mock-up • It wasn't clear to the client that there would be multiple pipes to choose from
Discuss plans for the next sprint	• Add a menu • Implement a scoring/point system • Pipe generation planning for the game to always be winnable • Client suggests pipes that can go back. The team felt that was unnecessary as you can access the right part of the screen with forward pipes • Store and display the high score on the menu • Client suggests start thinking about testing for difficulty, playability etc.

Action Items

No.	Action
1	Improve documentation
2	Implement plans for next sprint

3.5   Customer Interview and Analysis

Interview Highlights:

Q (Team): This is the initial demo of our game. Do you have any suggestions?

A (Client): I see that these pipes are on pre-set angles or welded on automatically. Maybe considering how to rotate these pipes is your next task.

Q (Client): Have you thought about adding game complexity? What do you think?

A (Team): We felt that adding pipe properties, such as pipes made of ice (which will melt due to heat), water falling from the sky (drains into pipes and drowns characters), obstacles (stones, etc., prevent players from placing pipes). We may consider these in the future.

Q (Team): This is an example of our half-finished documentation. Is there anything you think we need to add?

A (Client): Your user stories and use cases need to be expanded. They seem to have less content.

Q (Client): It looks like you haven't divided up your teams yet. Can you do that before the next meeting?

A (Team): Of course, we're going to do that right after this meeting.

Analysis:

• The client will play the game only towards the end when it is almost completely functional.
• The client approved a few ideas on adding complexity to the game (coins and obstacles).
• We should receive feedback on testing by non-developer team members. Make sure to ask the right kind of questions.
• Documentation needs more elaboration in user stories, use cases, etc.

3.6   User Stories

The User Stories R5, R6, R7, and R8 were added this week.

3.6.1   R5

User Story: Character Dying R5	Acceptance Criteria
As a Game Developer, I want to kill the character if he falls too far behind, So that the player has the goal to keep them alive.	Criterion 1. IF the character is alive… WHEN the character touches the left-hand edge of the screen… THEN declare game over.
Priority: 5/5 Version: 1 Date: 13/11/21	

3.6.2   R6

User Story: Rotating pipes R6	Acceptance Criteria
As a Player, I want to rotate selected pipes, So that I can choose their rotation when I add them to the pipe system.	Criterion 1. IF the character is alive… AND the game isn't paused… AND the pipe piece is selected… WHEN I press a left or right arrow key… THEN rotate the pipe piece 90 degrees in the direction of the arrow key.
Priority: 5/5 Version: 1 Date: 13/11/21	Criterion 2. IF the character is dead… AND the pipe piece is selected… WHEN I press a left or right arrow key… THEN do nothing. Criterion 3. IF the game can be paused AND the game is paused… AND the pipe piece is selected… WHEN I press a left or right arrow key… THEN do nothing.

3.6.3   R7

User Story: Pipe pieces for selection R7	Acceptance Criteria
As a Game Developer, I want random pipe pieces to show up for the player which can always be used to beat the game, So that the game is never impossible.	Criterion 1. IF the player starts the game… WHEN the player clicks to start or restart the game… THEN continuously create random pipe pieces… AND display these pipe pieces to the player at points along the game.

|	
Priority: 5/5 Version: 1 Date: 13/11/21	

3.6.4   R8

| User Story: Score R8	Acceptance Criteria
As a Player, I want to see my score as I play, So that I can see my progress.	Criterion 1. IF the player is playing the game… THEN their current score should be displayed.
Priority: 4/5 Version: 1 Date: 13/11/21	

3.6.5   R9

User Story: High Score R9	Acceptance Criteria
As a Player, I want to see my high score, So that I know what my best played game was.	Criterion 1. IF the player is on the home menu… THEN their high score should be displayed. Criterion 2.
Priority: 4/5 Version: 1 Date: 13/11/21	IF the player has just died… AND they achieved their high score THEN their high score should be saved

3.7   User Interface Design

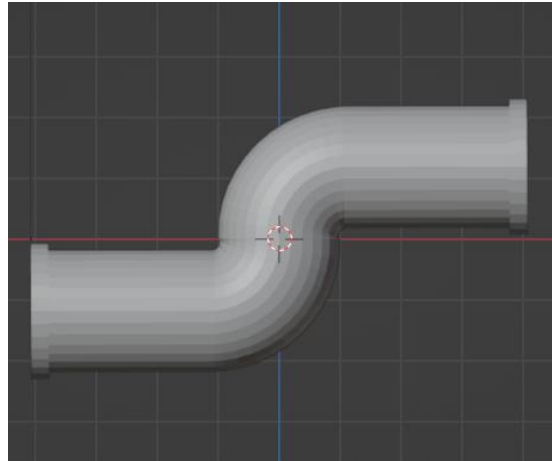### 3.7.1   Game progress
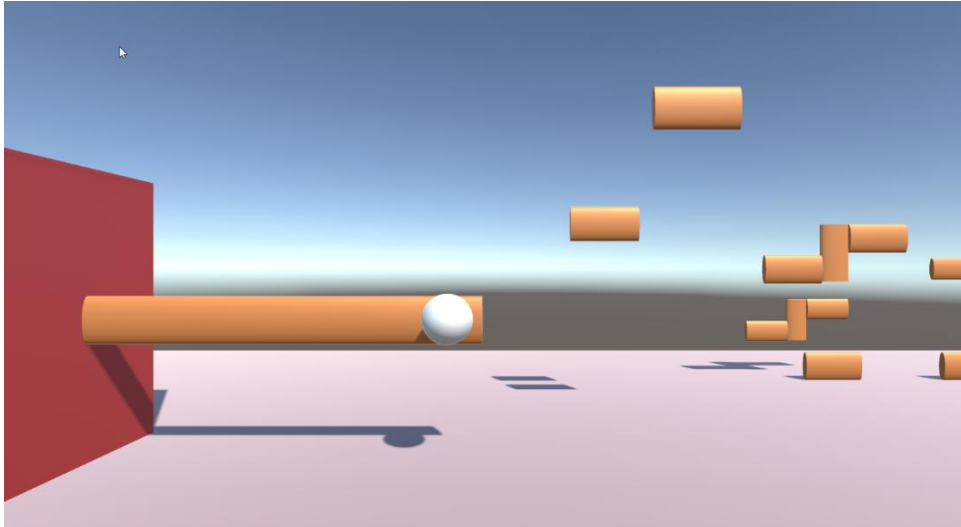
Initial prototype
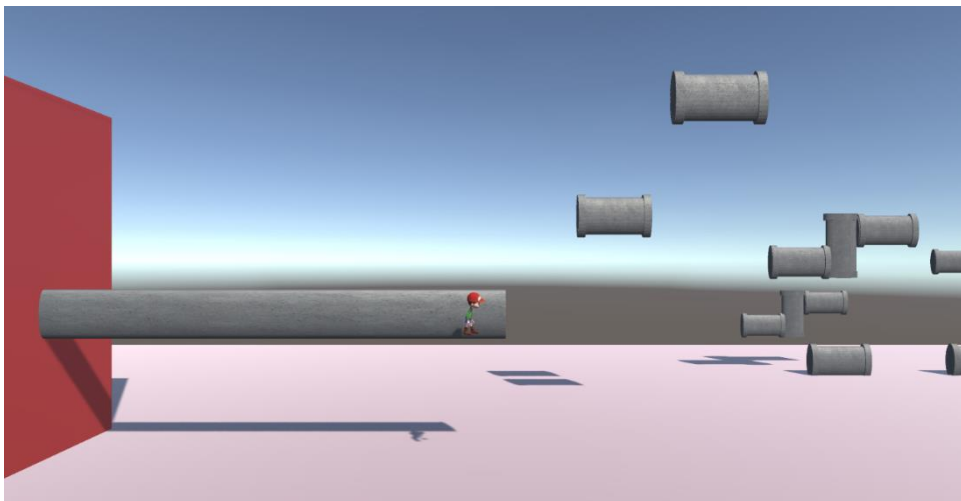
Character and pipes added

3.7.2   Pipe creation in Blender

Straight Pipe

S shaped pipe

3.8 Exception Handling

The challenges we faced during this sprint's tasks are outlined below, alongside their respective solutions:

Tasks	Challenges	Solutions
S3- T1	Figuring out how to structure the mock-up was difficult.	I used a similar process to CRC card creation to identify temporary classes, and a temporary flow of logic between classes.
S3- T2	Making sure everyone understands how to setup and use GitHub and why we use it.	I created a step-by-step tutorial of how to use GitHub as well as a recording of myself walking through the process of setting up and using the repository on a local machine.
S3-T3	Trouble getting the original version of the game available to everyone because the GitHub repository was still being created.	Went to campus to get faster WiFi, and transferred the .zip file by WeTransfer rather than using teams as was originally planned.
S3-T4	The character animations cause slight movements of the character away from its collider.	I had to bake the positions into the animation pose so that the animations did not affect the position of the character
S3-T5	Without having defined the requirements or design with user stories, use cases, and CRC cards, it was hard to identify detailed tasks to add to the backlog with respect to development.	Create more general future tasks, which could contain an array of more detailed smaller tasks yet are themselves ordered by priority within the backlog.
S3-T6	N/A no challenge.	-
S3-T7	N/A no challenge.	-
S3-T8	N/A no challenge.	-
	Responsibility for execution not taken.	Assigned roles and responsibilities to each team member.

4 Sprint 4 | 17th November – 23rd November

4.1 Sprint Overview

4.1.1 Preview

After the completion of the last sprint, we had created our first iteration of the game. Going into the fourth sprint, we planned to continue with the development of the game, with a particular focus on the creation of user stories, use cases, and CRC cards. These were discussed in the previous sprint and a few user stories were created. We had expectations that we would create these during this sprint. We also wanted to start working on the UI to adhere to the dungeon theme.

4.1.2 Review

At the start of this sprint, we broke down the work into designated roles for each team member so that we were able to manage a greater number of tasks in one sprint. The documentation team started to create more structured and logical sprint documents from this sprint and created further content for the game. The development team were intending to build more core functional classes of the game like pipe generation, rotation, scoring, and a menu with a dungeon design. However, after meeting with client, it was suggested that whilst still working on the game development, a greater focus should be placed on documentation.

4.2 Tasks

This sprint was split into two sections. As a development team, we completed the 'First Tasks' before moving on to the 'Second Tasks' later on in the Sprint.

4.2.1 First Tasks

Code	Team Members	Tasks
S4.1-T1	Development Team (Marcus, Zoe, Matthew, Leo)	Create User Stories for the game.
S4.1-T2	Development Team (Marcus, Zoe, Matthew, Leo)	Create Use Cases for the game.
S4.1-T3	Development Team (Marcus, Zoe, Matthew, Leo)	Create CRC cards for the game.
S4.1-T4	Whole Team	Designate roles for this project.
S4.1-T5	Development Team (Marcus, Zoe, Matthew, Leo)	Add detail to the backlog under the parent tasks "Create core functionality of the game", "Implement dungeon design to the game", "Add features.".
S4.1-T6	Shawn (Chin)	Overview and user interface design sections for sprint documentation.
S4.1-T7	Rachan	Amend meeting records to sprint documentation.
S4.1-T8	Michelle	Write preview section for sprint documentation and format sprint documentation and meeting minutes for customer meeting.

4.2.2   Parent Tasks

Note: Parent tasks are those which contain various smaller tasks. They are ranked in order of priority (e.g., PT1 is more important than PT2, so any tasks in PT1 take priority over any from PT2). From here on, tasks shall refer to their parent task in the Priority column in brackets.

The parent tasks in the above backlog were formed from the TBD tasks from Sprint 3.

Code	Team Members	Tasks
PT1	Development Team (Marcus, Zoe, Matthew, Leo)	Create core functionality of the game.
PT2	Development Team (Marcus, Zoe, Matthew, Leo) + Shawn	Implement dungeon design to the game.
PT3	Development Team (Marcus, Zoe, Matthew, Leo)	Add features.

4.2.3   Second Tasks

Code	Team Members	Tasks
S4.2-T1	Leo	Refactor the pipe functionality and character movement from the mock-up of the game to reflect the CRC card design. This is complete when the acceptance criteria of R2, R3, R4, R5 is fulfilled and the use case tests for Use Case 3 and 6 are passed.
S4.2-T2	Leo	Add pipe rotation to the game with logic to decide if pipe piece can be added to pipe system. This is complete when the acceptance criteria of R3, R6 is fulfilled and the use case tests for Use Case 3 are passed.
S4.2-T3	Zoe	Create and implement the basic functionality of the score class. This is complete when the acceptance criteria of R8, R9 is fulfilled and the use case tests for Use Case 7 is passed.
S4.2-T4	Matthew	Create and implement the basic functionality of the menu class. This is complete when the acceptance criteria of R1, R9, R10 is fulfilled and the use case tests for Use Case 8 is passed.
S4.2-T5	Marcus	Create and implement the basic functionality of the pipe generation class. This is complete when the acceptance criteria of R7 is fulfilled and the use case tests for Use Case 2 is passed.
S4.2-T6	Shawn	Design the menu background. This is complete upon customer approval.

4.2.4   Other tasks formed from S4.1-T5 + bugs to fix at the end of Sprint 4

Code	Team Members	Tasks
PT1-S4.2-7		
S4.2-7-T1	Dev Team	Allow character to enter both sides of the pipe when rotating.
S4.2-7-T2	Dev Team	Implement high score saving, and menu/game-over display.

S4.2-7-T3	Dev Team	Change the game over wall, either to another character or water etc.
S4.2-7-T4	Dev Team	Make character die if it touches the top or bottom of the screen.
S4.2-7-T5	Dev Team	Add coin generation.
S4.2-7-T6	Dev Team	Implement logic to prevent adding a pipe onto itself.
S4.2-7-T7	Dev Team	Add a pause and play button during play (that works in accordance with previously defined documentation).
S4.2-7-T8	Dev Team	Implement coin collection to increase score.
S4.2-7-T9	Dev Team	Highlight the pipe piece that is currently selected by the player.
S4.2-7-T10	Dev Team	Users test the game to get feedback on functionality.
S4.2-7-T11	Dev Team	Add obstacle generation.
S4.2-7-T12	Dev Team	Get camera to speed up continuously as the game plays.
S4.2-7-T13	Dev Team	Implement death on obstacle collision.
S4.2-7-T14	Dev Team	Add a game over screen, with a restart and home button.
S4.2-7-T15	Dev Team	Make character appear within pipes rather than in front of them.
S4.2-7-T16	Dev Team	Stop rotation of pipes after game over (or in pause if pause is possible).
S4.2-7-T17	Dev Team	Implement pausing the game.
S4.2-7-T18	Dev Team	Add a restart and home button during play.
PT2-S4.2-7		
S4.2-7-T18	Dev Team	Add the menu background to the game (from Shawn).
S4.2-7-T19	Dev Team	Add the rolling background (from Shawn) to the game.
S4.2-7-T20	Dev Team	Change the character to a more appropriate design.
S4.2-7-T21	Dev Team	Add lighting to the scene.
S4.2-7-T22	Dev Team	Stylize UI to match dungeon theme.
S4.2-7-T23	Dev Team	Users test the game to get feedback on design.
PT3-S4.2-7		
*** Not needed until the above tasks are complete.		

4.3 Backlog

4.3.1 First Tasks Ordered Backlog

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
Whole Team 1	S4.1-T4	17/11/21	17/11/21	Complete
Dev Team 2	S4.1- T1 (prev. TBD)	17/11/21	18/11/21	Complete
Dev Team 3	S4.1-T2 (prev. TBD)	17/11/21	19/11/21	Complete
Dev Team 4	S4.1-T3 (prev. TBD)	17/11/21	20/11/21	Complete
Dev Team 5	S4.1-T5	17/11/21	21/11/21	Completed
Shawn (Chin) 2	S4.1-T6	17/11/21	22/11/21	Completed
Rachan 2	S4.1-T7	17/11/21	22/11/21	Completed
Michelle 2	S4.1-T8	17/11/21	24/11/21	
Dev Team 8 (prev. WT)	PT1 (parent task – no set sprint zone)	10/11/21	-	Not started
Dev Team 9 (prev. WT)	PT2	10/11/21	-	Not started

Dev Team 10 (prev. WT)	PT3	10/11/21	-	Not started

4.3.2 Second Tasks Ordered Backlog

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
Dev Team	PT1	10/11/21	-	Ongoing
(1) Leo 1	S4.2- T1	17/11/21	20/11/21	Ongoing
(1) Zoe 1	S4.2-T3	17/11/21	22/11/21	Ongoing
(1) Matthew 1	S4.2-T4	17/11/21	-	Ongoing
(1) Marcus 1	S4.2-T5	17/11/21	22/11/21	Complete
(1) Leo 2	S4.2-T2	17/11/21	-	Ongoing
(1) TBD	S4.2-7-T1	21/11/21	-	Not Started
(1) TBD	S4.2-7-T2	21/11/21	-	Not Started
(1) TBD	S4.2-7-T3	21/11/21	-	Not Started
(1) TBD	S4.2-7-T4	21/11/21	-	Not Started
(1) TBD	S4.2-7-T5	21/11/21	-	Not Started
(1) TBD	S4.2-7-T6	21/11/21	-	Not Started
(1) TBD	S4.2-7-T7	21/11/21	-	Not Started
(1) TBD	S4.2-7-T8	21/11/21	-	Not Started
(1) TBD	S4.2-7-T9	21/11/21	-	Not Started
(1) TBD	S4.2-7-T10	21/11/21	-	Not Started
(1) TBD	S4.2-7-T11	21/11/21	-	Not Started
(1) TBD	S4.2-7-T12	21/11/21	-	Not Started
(1) TBD	S4.2-7-T13	21/11/21	-	Not Started
(1) TBD	S4.2-7-T14	21/11/21	-	Not Started
(1) TBD	S4.2-7-T15	21/11/21	-	Not Started
(1) TBD	S4.2-7-T16	21/11/21	-	Not Started
(1) TBD	S4.2-7-T17	21/11/21	-	Not Started
Dev Team	PT2	10/11/21	-	Ongoing
(2) Shawn 1	S4.2-T6	17/11/21	-	Complete
(2) TBD	S4.2-7-T18	21/11/21	-	Not Started
(2) TBD	S4.2-7-T19	21/11/21	-	Not Started
(2) TBD	S4.2-7-T20	21/11/21	-	Not Started
(2) TBD	S4.2-7-T21	21/11/21	-	Not Started
(2) TBD	S4.2-7-T22	21/11/21	-	Not Started
(2) TBD	S4.2-7-T23	21/11/21	-	Not Started
Dev Team	PT3	10/11/21	-	Not Started

4.4 Meeting Records

4.4.1 Meetings

Overview	Duration	Date & Time	Attended By
Development Internal meeting	40 minutes	Friday (19th November 2021) - 16:00 - 16:40	Marcus, Zoe, Leo, Matthew

Documentation Internal meeting	50 minutes	Saturday (20th November 2021) - 12:00 - 12:50	Michelle, Rachan
Internal meeting (Development x Documentation)	19 minutes	Sunday (21st November 2021) - 16:00-16:19	Marcus, Rachan
Client Meeting	15 minutes	Wednesday (24th November 2021) - 11:45 - 12:00	All Team members

4.4.2   Minutes

Time	Wednesday 24th November 12:00-12:15 (Sprint 4)
Led By	Rachan and Leo
Minutes Taken By	Michelle
Participants	Whole team and customer

Agenda

1. Discuss documentation
2. Discuss what has been achieved in the previous sprint

Agenda Item	Summary
Discuss documentation	• Need to add section numbers and page numbers to documentation
Discuss what has been achieved in the previous sprint	• Pipe logic was added • Menu is in progress • Rotation of pipes and continuous pipe generation • Focused on core functionality first • Client asked when the design will be implemented. This will be after further progress of the core functionality • Split the development team – half to fix the bugs, and the other half to work on progressing the game functionality • Finish the core functionality and add the current designs by the next week • Add other features later factoring in the complexity • Priority of features: coins, obstacles to avoid, more complex pipe shape, pipe characterisation, beat bonus if you place pipe to the beat of the music • Decided to lock roles in development, documentation, and design rather than switching round each week • Further down the line it is planned for more people to join the documentation team

Action Items

No.	Action
1	Finish the core functionality add the current designs.
2	Add section numbers and page numbers to documentation.

4.5 Customer Interview and Analysis

Interview Highlights:

Q (Team): Does the half-finished game we've shown so far meet your requirements? What improvements do you think we should make?

A (Client): Cool! I like it!

Q (Client): I was wondering what you would do to increase the fun and complexity of the game?

A (Team): I think we can add obstacles and coins to add complexity and fun to the game.

Q (Team): What do you think of our documentation? Is there anything that needs to be improved?

A (Client): It looks like you've done a lot of work, but some details still need to be worked out. First, in the customer interviews section, you need to summarize and analyse the records of each customer interview and compare what you have accomplished in your current sprint.

Q (Team): We have found a background picture and an interface picture for our game. Would you please check whether it is suitable?

A (Client): Cool! I think that's fair enough.

Analysis:

In this meeting, the customer was interested in the details and extensions of the game. The client put forward some detailed requirements which need to be considered for the next week's meeting. This mainly includes the revision of documentation, including the records and analysis of each customer interview, as well as detailed records of development content.

The customer was satisfied with the game development we have achieved so far but felt like we had fallen behind on documentation. We will therefore pay greater attention to this over the remainder of the sprint and the subsequent sprint.

4.6 User Stories

The User Stories R10, R11, R12, R13, R14, R15, R16, R17, R18, R19 and R20 were added this week.

4.6.1 R10

User Story: Menu R10	Acceptance Criteria
As a Player, I want to have a home menu, So that I can control when I play the game.	Criterion 1. IF the player loads up the game... THEN take the player to the home menu.
Priority: 4/5 Version: 1 Date: 17/11/21	

4.6.2   R11

User Story: Animate Character R11	Acceptance Criteria
As a Player, I want my character to be animated when moving, standing still and idle, So that the overall game experience feels more natural.	Criterion 1. IF the character is alive... WHEN it begins/stops moving... THEN a change in animations need to occur to indicate how the player is moving.
Priority: 3/5 Version: 1 Date: 17/11/21	Criterion 2. IF the character dies... THEN there needs to be an animation showing to the player that they have died.

4.6.3   R12

User Story: Continuing/Pausing the game R12	Acceptance Criteria
As a Player, I want to pause/continue the game in progress, So that I can take breaks.	Criterion 1. IF the character is alive… AND the game isn't paused… WHEN the player clicks the "pause" button…. THEN pause the game. Criterion 2. IF the character is alive…
Priority: 3/5 Version: 1 Date: 17/11/21	AND the game is paused… WHEN the player clicks the "play" button…. THEN continue the game.

4.6.4   R13

User Obstacle generation + R13	Acceptance Criteria
As a Player, I want obstacles to be generated in my path So, the game becomes more challenging, and more pipe configuration are needed.	Criterion 1. IF the player is alive and moving... THEN new obstacles need to be generated continuously.
Priority: 3/5 Version: 1 Date: 17/11/21	Criterion 2. IF the player builds the pipe and hits an obstacle... WHEN the character touches the obstacle... THEN the player should die, and the game should be over.

4.6.5   R14

User Story: Restart Game R14	Acceptance Criteria
As a Player, I want to restart the game, So that I can quickly start the game over if I want to.	Criterion 1. IF the character is alive... WHEN I click the restart button... THEN restart the game.

	Criterion 2. IF It's game over screen... WHEN I click the restart button... THEN restart the game. Criterion 3. IF It's pause screen... WHEN I click the restart button... THEN restart the game.
Priority: 2/5 Version: 1 Date: 17/11/21	

4.6.6   R15

User Story: Go home R15	Acceptance Criteria
As a Player, I want to go to the home menu, So that I can exit the game to show my high score.	Criterion 1. IF the player is in pause or in game over screen... WHEN I click the home button… THEN take the player to the home menu.
Priority: 2/5 Version: 1 Date: 17/11/21	

4.6.7   R16

User Story: Coin Collection R16	Acceptance Criteria
As a Player, I want to be able to collect coins to add a bonus to my score, So that there is more incentive to move my pipe in certain directions.	Criterion 1. IF the player is alive and moving... THEN new coins need to be generated continuously.
Priority: 2/5 Version: 1 Date: 17/11/21	Criterion 2. IF the player builds the pipe to reach a coin... WHEN the character touches the coin... THEN the coin object should be removed, and a point bonus should be added to the score.

4.6.8   R17

User Story: Special Pipes R17	Acceptance Criteria
As a Player, I want to be able to select pipes with special features, such as slowing down the game, So that I have more time to choose my next move.	Criterion 1. IF the player is alive and moving... THEN a special pipe should be able to be selected if randomly generated, and it have the desired effect.
Priority: 1/5 Version: 1 Date: 17/11/21	

4.6.9 R18

User Story: Beat Bonus R18	Acceptance Criteria
As a Player, I want to gain extra points by attaching my selected pipe piece in time with the music, So that there is an added layer of difficulty but also a further way to increase my score.	Criterion 1. IF the player is alive and moving... WHEN the selected pipe is attached in time with the music... THEN a point bonus should be added to the score.
Priority: 1/5 Version: 1 Date: 17/11/21	

4.6.10 R19

User Story: Increasing Pipe Generation Speed R19	Acceptance Criteria
As a Player, I want the pipes to generate with increasing speed as I progress through the game, So that there is less time to choose a correct pipe (increasing difficulty level) thus keeping the game engaging.	Criterion 1. IF the player is alive and moving... THEN incrementally increase the pipe generation speed.
Priority: 1/5 Version: 1 Date: 17/11/21	

4.6.11 R20

User Story: Increase the Number of Pipes Generated R20	Acceptance Criteria
As a Player... I want more pipes to be generated at a time as I progress through the game, So that it becomes less obvious which pipes to choose (increasing difficulty level) thus keeping the game engaging.	Criterion 1. IF the player is alive and moving... THEN incrementally increase the number of pipes generated at a time.
Priority: 1/5 Version: 1 Date: 17/11/21	

4.6.12 R21

User Story: Move the camera to the right at an increasing velocity during gameplay R21	Acceptance Criteria
As a Game Developer... I want the player to have to keep up with the moving screen, So that they have a goal and come across items in the game.	Criterion 1. IF the player is alive... AND the game isn't paused.... THEN move the screen to the right at an increasing velocity.
Priority: 5/5 Version: 1 Date: 17/11/21	

4.6.13 R22

User Story: Save the high score R22	Acceptance Criteria
As a Player... I want the game to remember and display my high score, So that I can aim to beat it.	Criterion 1. IF the player is alive... AND the player has surpassed their previous high score THEN save the new high score for display on the menu.
Priority: 3/5 Version: 1 Date: 17/11/21	

4.6.14 R23

User Story: Exit the game from within the game R23	Acceptance Criteria
As a Player... I want to be able to close down the application from within the game, So that I can easily close the application down without using my task manager.	Criterion 1. IF the player is on the menu THEN display an exit button that closes the application when clicked.
Priority: 3/5 Version: 1 Date: 17/11/21	

4.7 User Story Tests

The following test was completed at the end of Sprint 4. If the User Story's acceptance criteria is fulfilled, the test is passed.

User Story	Test Result (acceptance criteria)	Reason for failure
R1	Pass	-
R2	Fail	No pipe highlighting for selected pipes.
R3	Fail	Unable to add a pipe at all rotations that should be possible.
R4	Pass	-
R5	Pass	-
R6	Fail	Can still rotate pipe pieces after death.
R7	Fail	The pipe generation method has not been tuned to gameplay yet, so not enough pipes are generated.
R8	Pass	-
R9	Fail	The player's high score is not saved so cannot be displayed.
R10	Pass	-
R11	Pass	-
R12	Fail	No pause or resume button implemented.

R13	Fail	No obstacle functionality implemented.
R14	Fail	No restart buttons implemented.
R15	Fail	No home buttons implemented.
R16	Fail	No coin functionality implemented.
R17	Fail	No special pipe functionality implemented.
R18	Fail	No beat bonus functionality implemented.
R19	Fail	Pipe generation does not increase in speed.
R20	Fail	Number of pipes generated does not increase wit time.
R21	Fail	Camera moves to right but not at increasing velocity.
R22	Fail	High score is not saved.
R23	Pass	-

4.8   Use Cases

Use Cases 1-16 were created this week. Please note that these Use Cases were created from the User Stories with more urgent priority. User Stories regarding additional features (e.g., special pipes) were left out as these were deemed unnecessary at this stage.

4.8.1   Use Case 1

UC1 - Version 1

UC1-1	Use Case	Play the game (high-level)
UC1-2	Author	Leo Grant
UC1-3	Date	18/11/21
UC1-4	Purpose	For the user to play the game
UC1-5	Overview	Starts when player opens up the game file. The system displays a menu to the player. The player clicks the start button. The system starts the game. The player doesn't achieve a high score else <u>Alternative 1</u>: The player achieves their high score. The system declares game over upon player death.
UC1-6	Cross Reference	R1, R10
UC1-7	Actors	Player
UC1-8	Pre-Condition	UC1-Pre-1: The game has been installed successfully to a machine which is compatible with the game.
UC1-9	Post-Conditions	UC1-Post-1: The system is in a game over state.

Actor Actions	System Actions
1. Player loads up the game file.	
	2. System loads home menu.
3. Player clicks the start button.	
	4. System starts the game.
5. Player plays the game.	
	6. System records player death has occurred.
	7. System changes to game over state.

UC1-10	Alternative Flow of Events:	• The player achieves their high score. Before Step 7, system should record the new high score.
UC1-11	Exceptional Flow of Events:	• None.

4.8.2   Use Case 2

UC2 - Version 1

UC2-1	Use Case	The player plays the game - Step 5 of UC1 - (low-level)
UC2-2	Author	Leo Grant
UC2-3	Date	18/11/21
UC2-4	Purpose	The player view should continuously move whilst the player is in game.
UC2-5	Overview	The system moves the camera view continuously to the right. The player clicks the pause button. System stops the camera moving. The player clicks the resume button. The system resumes the camera movement. The system eventually declares game over. The system stops the camera movement.
UC2-6	Cross Reference	R21
UC2-7	Actors	Player
UC2-8	Pre-Condition	UC2-Pre-1: The game is playing. UC2-Pre-1: The game is not paused.
UC2-9	Post-Conditions	UC2-Post-1: The player has played the game.

Actor Actions	System Actions
	1. System moves camera continuously to the right.
2. Player clicks pause button.	
	3. System stops camera movement.
4. Player clicks resume button.	
	5. System resumes camera movement.
	6. System eventually declares game over.
	7. System stops camera movement.

UC2-10	Alternative Flow of Events:	• None.
UC2-11	Exceptional Flow of Events:	• None.

4.8.3 Use Case 3

<u>UC3 - Version 1</u>

UC3-1	Use Case	Selecting and changing selection of a pipe piece- Step 5 of UC1 - (medium-level)
UC3-2	Author	Leo Grant
UC3-3	Date	18/11/21
UC3-4	Purpose	For the user to choose which pipe piece to interact with.
UC3-5	Overview	Starts when the player starts or restarts the game. The system loads up the game. The player clicks on a pipe piece. The system records this pipe piece as only interactable pipe piece. The player clicks on a different pipe piece else <u>Alternative 1:</u> The player clicks on something that's not selectable (pipe system or anything else not a pipe piece). The system records this pipe piece as only interactable pipe piece.
UC3-6	Cross Reference	R2
UC3-7	Actors	Player
UC3-8	Pre-Condition	UC3-Pre-1: The game has just been started or restarted. UC3-Pre-2: The game is not paused.

Actor Actions	System Actions
1. Player starts/restarts the game.	
	2. System loads up the game.
3. Player clicks on a pipe piece.	4. System records this pipe piece as only interactable pipe piece.
5. Player clicks a different pipe piece.	6. System records this pipe piece as only interactable pipe piece.

UC3-10	Alternative Flow of Events:	• The player clicks on something that's not selectable (pipe system or anything else not a pipe piece). The system records that nothing is selected, wait at Step 2.
UC3-11	Exceptional Flow of Events:	• None.

4.8.4   Use Case 4

<u>UC4 - Version 1</u>

UC4-1	Use Case	Selecting and highlighting a pipe piece - Steps 3 to 6 of UC3 & Step 4 of UC7 – (low-level)
UC4-2	Author	Leo Grant
UC4-3	Date	18/11/21
UC4-4	Purpose	For the user to identify the selected pipe piece
UC4-5	Overview	Starts when the player clicks on a pipe piece. The system records this pipe piece as only interactable pipe piece. The system highlights the pipe piece to the player. The player clicks on a different pipe piece else <u>Alternative 1:</u> The player clicks on something that's not selectable (pipe system or anything else not a pipe piece). The system records this new pipe piece as the only interactable pipe piece. The system de-activates the highlighting on the old, selected pipe piece, and highlights the new selected pipe piece.
UC4-6	Cross Reference	R2
UC4-7	Actors	Player
UC4-8	Pre-Condition	UC4-Pre-1: The game has just been started or restarted. UC4-Pre-2: The game is not paused. UC4-Pre-3: The selected pipe pieces are all in the correct orientation to add them to the pipe system.
UC4-9	Post-Conditions	UC4-Post-1: The player has seen which pipe pieces he has selected and unselected via highlighting.

Actor Actions	System Actions
1. Player clicks on a pipe piece.	
	2. System records this pipe piece as only interactable pipe piece.
	3. System highlights selected pipe piece.
4. Player clicks on a different pipe piece.	
	5. System records this pipe piece as only interactable pipe piece.
	6. System highlights selected pipe piece, and de-activates highlighting on previously selected pipe piece.
7. Player presses return key.	
	7. System adds the pipe piece to the pipe system.
	8. System removes interactable quality of selected pipe piece (stops it being selected).
	9. System removes the highlight of the just added pipe piece.

UC4-10	Alternative Flow of Events:	• The player clicks on something that's not selectable (pipe system or anything else not a pipe piece). The system records that nothing is selected and removes highlighting on that previously selected pipe piece. System waits for Step 1.
UC4-11	Exceptional Flow of Events:	• None.

4.8.5 Use Case 5

<u>UC5 - Version 1</u>

UC5-1	Use Case	Player finds new pipes to select (pipe generation) - Steps 1 to 4 of UC3 – (low-level)
UC5-2	Author	Marcus Williams
UC5-3	Date	18/11/21
UC5-4	Purpose	The player must find pipe pieces to select to add them to the pipe system and play the game.
UC5-5	Overview	Starts when the player starts or restarts the game. The system loads up the game. System instantiates pipe pieces into view for the player to select from. System moves camera to the right. System generates new pipe pieces off screen (for the camera to then move them into view). The player clicks on a generated pipe piece. The system records this pipe piece as only interactable pipe piece. The system eventually declares game over else <u>Alternative 1</u>: The game is paused. System stops pipe generation.
UC5-6	Cross Reference	R7
UC5-7	Actors	Player

UC5-8	Pre-Condition	UC5-Pre-1: The player has the game file loaded up.
		UC5-Pre-2: The system must have an array of possible pipe objects to select from.
UC5-9	Post-Conditions	UC5-Post-1: Pipe generation is stopped/paused.
		UC5-Post-2: The player has selected a pipe piece.

Actor Actions	System Actions
1. Player starts/restarts the game.	2. System loads up the game.
	3. System instantiates pipe pieces into view.
	4. System moves camera to the right.
	5. System generates new pipe pieces as the camera moves right.
6. Player clicks a pipe piece.	7. System records this pipe piece as only interactable pipe piece.
	8. System (eventually) declares game over.
	9. System stops pipe generation.

UC5-10	Alternative Flow of Events:	• The game is paused. System pauses any further pipe generation until game is resumed.
UC5-11	Exceptional Flow of Events:	• None.

4.8.6 Use Case 6

<div align="center">UC6 - Version 1</div>

UC6-1	Use Case	Rotating the pipe pieces - Step 5 of UC1 - (medium-level)
UC6-2	Author	Marcus Williams
UC6-3	Date	18/11/21
UC6-4	Purpose	A player should be able to rotate pipes before adding them to the pipe system.
UC6-5	Overview	Starts when the player presses the right keypad else Alternative 1: Player presses left keypad. The system checks that a pipe piece is selected. A pipe piece is selected, else Alternative 2: A pipe piece is not selected. The system rotates the selected pipe piece clockwise 90 degrees. System updates information regarding that pipe's rotation.
UC6-6	Cross Reference	R6
UC6-7	Actors	Player
UC6-8	Pre-Condition	UC6-Pre-1: The game is playing.
		UC6-Pre-2: The game is not paused.
		UC6-Pre-3: A pipe piece has been selected.

UC6-9	Post-Conditions	UC6-Post-1: A pipe piece has been rotated has been rotated 90 degrees clockwise or anticlockwise.

Actor Actions	System Actions
1. Player presses right keypad.	2. System validates there is a pipe piece selected. 3. System rotates that pipe piece 90 degrees clockwise. 4. System updates information about that pipe's rotation.

UC6-10	Alternative Flow of Events:	• The player presses left keypad. System performs same actions except Step 3 rotates pipe anti-clockwise 90 degrees. • A pipe piece is not selected. The system does nothing in response to the players keypad input.
UC6-11	Exceptional Flow of Events:	• Player presses both left and right keypad down at the same time. System ignores keypad input.

4.8.7 Use Case 7

<u>UC7 - Version 1</u>

UC7-1	Use Case	Adding the pipe pieces to the pipe system - Step 5 of UC1 - (medium-level)
UC7-2	Author	Leo Grant
UC7-3	Date	18/11/21
UC7-4	Purpose	A player should be able to add pipes to the pipe system to give the character something to move through.
UC7-5	Overview	Starts when the player presses the return key. The system checks that a pipe piece is selected. A pipe piece is selected else <u>Alternative 1</u>: A pipe piece isn't selected. The system checks if it is in the correct orientation to add to the pipe system. The pipe piece is in the correct orientation else <u>Alternative 2</u>: The pipe piece is not in the correct orientation. The system adds the pipe piece to the pipe system.
UC7-6	Cross Reference	R3
UC7-7	Actors	Player
UC7-8	Pre-Condition	UC7-Pre-1: The game is playing. UC7-Pre-2: The game is not paused. UC7-Pre-3: A pipe piece has been selected.
UC7-9	Post-Conditions	UC7-Post-1: A pipe piece has been added to the pipe system.

Actor Actions	System Actions
1. Player presses the return key.	2. System validates there is a pipe piece selected. 3. System validates the pipe piece is in the correct orientation to fit onto the pipe system. 4. System adds the pipe piece to the end of the pipe system.

UC7-10	Alternative Flow of Events:	• A pipe piece isn't selected. The system does nothing in response to the players return key input. • Incorrect orientation of pipe piece for pipe system. The system does nothing in response to the players return key input.
UC7-11	Exceptional Flow of Events:	• Player presses both a left or right keypad input AND a return key input at the same time. System first rotates pipe, then attempts to add it to the system with new orientation.

4.8.8   Use Case 8

<u>UC8 - Version 1</u>

UC8-1	Use Case	Player makes character move – Continuation of Step 4 UC7 – (low-level)
UC8-2	Author	Leo Grant / Marcus Williams
UC8-3	Date	18/11/21
UC8-4	Purpose	The character should run to the end of the newly added pipe.
UC8-5	Overview	Starts when player presses return on a selected pipe piece. System adds a pipe to the pipe system. System moves character through the pipe to the end of the pipe system. System animates the character running. Character reaches the end of the pipe system else <u>Alternative 1</u>: the character dies before they reach the end of the pipe system. The character animation returns to an idle state.
UC8-6	Cross Reference	R3, R4, R11
UC8-7	Actors	Player
UC8-8	Pre-Condition	UC8-Pre-1: The pipe piece selected is in the correct orientation to add it to the pipe system. UC8-Pre-2: The game is in play. UC8-Pre-3: The game isn't paused. UC8-Pre-4: The character isn't moving.
UC8-9	Post-Conditions	UC8-Post-1: The character has run to the end of the newly added pipe in the pipe system.

Actor Actions	System Actions
1. Player presses return on selected pipe piece.	2. System adds pipe piece to pipe system. 3. System moves character through the pipe, to the end of the pipe system, all the while animating the character running. 4. System returns character animation to an idle state.

UC8-10	Alternative Flow of Events:	• The character dies. The system stops the character moving. The system plays a character death animation.
UC8-11	Exceptional Flow of Events:	• The system declares game over before the character reaches the end of the pipe system. The system should stop the character movement.

4.8.9   Use Case 9

UC9 - Version 1

UC9-1	Use Case	Pausing and resuming the game - Step 5 of UC1 - (medium-level)
UC9-2	Author	Zoe Broad
UC9-3	Date	18/11/21
UC9-4	Purpose	The player should be able to pause and resume the game.
UC9-5	Overview	Starts when the system loads the game. Player clicks on the pause button. System pauses the game and displays a pause screen. Player clicks resume button else Alternative 1: Player clicks the exit button else Alternative 2: Player clicks the restart button. The system resumes the game.
UC9-6	Cross Reference	R12, R14, R15
UC9-7	Actors	Player
UC9-8	Pre-Condition	UC9-Pre-1: The character does not die before the player clicks the pause button.
UC9-9	Post-Conditions	UC9-Post-1: The game has resumed from the pause point.

Actor Actions	System Actions
	1. System loads up the game (gameplay)
2. The player clicks the pause button.	
	3. The system pauses the game. 4. The system loads up the pause screen.
5. The player clicks the resume button.	
	6. The system removes the pause screen. 7. The system resumes the game.

UC9-10	Alternative Flow of Events:	• The player clicks the exit button. The system should take the player to the home menu. • The player clicks the restart button. The system restarts the game (start form Step 1).
UC9-11	Exceptional Flow of Events:	• A power cut means the game progress is lost and the player cannot select neither resume nor quit from the pause menu as it is no longer displayed.

4.8.10 Use Case 10

<u>UC10 - Version 1</u>

UC10-1	Use Case	Navigating to the home menu – UC1 Steps 1, 5, 7 - (medium-level)
UC10-2	Author	Matthew Fleischer
UC10-3	Date	18/11/21
UC10-4	Purpose	A player should be able to navigate to the home menu at any point in the game.
UC10-5	Overview	Starts when the character dies else <u>Alternative 1</u>: Starts when the game file is first loaded up, else <u>Alternative 2</u>: Starts when gameplay begins. System changes to a game over state. Player clicks the home button. System loads up the home menu.
UC10-6	Cross Reference	R10
U10-7	Actors	Player
UC10-8	Pre-Condition	UC10-Pre-1: The character has just died.
UC10-9	Post-Conditions	UC10-Post-1: The home menu has been loaded up.

Actor Actions 2. The player clicks on the home button.	System Actions 1. The system loads up the game over state. 3. System loads up the home menu.

UC10-10	Alternative Flow of Events:	• The game file has just been loaded up. The system automatically displays the home menu. • The character is still alive and the game is in play. Follow UC9 with Alternative 1.
UC10-11	Exceptional Flow of Events:	• None.

4.8.11 Use Case 11

<u>UC11 - Version 1</u>

UC11-1	Use Case	Starting the game from the beginning – UC1 Steps 1, 5, 7 - (medium-level)

UC11-2	Author	Leo Grant
UC11-3	Date	18/11/21
UC11-4	Purpose	A player should be able to start the game from the beginning at any point in the game.
UC11-5	Overview	Starts when the character dies else Alternative 1: Starts when the game file is first loaded up, else Alternative 2: Starts when gameplay begins. System changes to a game over state. Player clicks the restart button. System loads up the game from the beginning.
UC11-6	Cross Reference	R1, R14
UC11-7	Actors	Player
UC11-8	Pre-Condition	UC11-Pre-1: The character has just died.
UC11-9	Post-Conditions	UC11-Post-1: A new game has been loaded up.

Actor Actions	System Actions
	1. The system loads up the game over state.
2. The player clicks on the restart button.	3. System loads up a new game.

UC11-10	Alternative Flow of Events:	• The game file has just been loaded up. The system automatically displays the home menu. Player clicks on start button, then move to Step 3. • The character is still alive and the game is in play. Follow UC9 with Alternative 2.
UC11-11	Exceptional Flow of Events:	• None.

4.8.12 Use Case 12

<u>UC12 - Version 1</u>

UC12-1	Use Case	Achieving a high score – UC1 Step 5 - (medium-level)
UC12-2	Author	Leo Grant
UC12-3	Date	18/11/21
UC12-4	Purpose	The system should recognise and store the player's high score.
UC12-5	Overview	Starts when the player achieves their high score in game. The system validates that the score is the high score. The system saves the score as the new high score.
UC12-6	Cross Reference	R22
UC12-7	Actors	Player
UC12-8	Pre-Condition	UC12-Pre-1: The game is playing. UC12-Pre-2: The game is not paused.
UC12-9	Post-Conditions	UC12-Post-1: A new high score has been saved to the game.

Actor Actions	System Actions
1. Player achieves high score whilst playing the game.	2. System validates that the score achieved is a high score. 3. System saves the current score as the high score.

UC12-10	Alternative Flow of Events:	• None.
UC12-11	Exceptional Flow of Events:	• The player achieves their high score, and then the power cuts out. The system should have saved a reference to the new high score before the power cuts out.

4.8.13 Use Case 13

UC13 - Version 1

UC15-1	Use Case	Player loses the game – UC1 Step 5, 6 & 7- (medium-level)
UC15-2	Author	Zoe Broad
UC15-3	Date	18/11/21
UC15-4	Purpose	The player should be able to lose the game, otherwise it would become boring.
UC15-5	Overview	Starts when the system starts the game. System generates obstacles (similar to UC5 with pipes). The player adds a pipe to the system (see UC3,4,5,6, and 7). The system moves the character through the pipe (see UC8). The system is triggered when the character touches an obstacle else Alternative 1: The system is triggered when the character touches the left-hand side of the screen. The system declares a game over state. System stops generating new obstacles.
UC15-6	Cross Reference	R5, R13
UC15-7	Actors	Player
UC15-8	Pre-Condition	UC15-Pre-1: The system is in the progress of starting the game.
UC15-9	Post-Conditions	UC15-Post-1: The system is in a game over state.

Actor Actions	System Actions
	1. The system starts a new game.
	2. System starts obstacle generation.
3. The player adds a pipe to the pipe system.	
	4. The system adds a pipe to the pipe system.
	5. The system moves the character through the pipe system.
	6. The system is triggered when the character touches an obstacle.
	7. The system changes to a game over state.
	8. System stops obstacle generation.

UC15-10	Alternative Flow of Events:	• The system is triggered when the character touches the left-hand side of the screen. Move to Step 6.
UC15-11	Exceptional Flow of Events:	• The system is triggered by an obstacle collision, and a screen collision. The system should move to Step 6.

4.8.14 Use Case 14

<u>UC14 - Version 1</u>

UC14-1	Use Case	Player loses game – Step 6 of UC15 – (low-level)
UC14-2	Author	Leo Grant
UC14-3	Date	18/11/21
UC14-4	Purpose	Upon character death, the game over options must be presented, and interaction with the lost game prohibited.
UC14-5	Overview	Starts when the character has just died. The system stops camera movement. The system stops pipe selection. The system stops pipe rotation (of existing selection). The system stops pipe adding (to the pipe system). The system loads up a game over menu. The player tries to interact with the pipes. The system prevents this. Alternative 1: The player clicks on the home menu button.
UC14-6	Cross Reference	R4, R6, R15
UC14-7	Actors	Player
UC14-8	Pre-Condition	UC14-Pre-1: The character has just died. UC14-Pre-2: The player had a pipe selected before they died. UC14-Pre-3: The selected player pipe was in the correct orientation to be added to the pipe system.
UC14-9	Post-Conditions	UC14-Post-1: The system has loaded up the game over state.

Actor Actions	System Actions
	1. The system records the character has died.
	2. The system stops camera movement.
	3. The system stops character movement.
	4. The system stops pipe selection, rotation, and addition to the pipe system.
	5. The system loads up the game over menu.
6. The player presses the left or right keypad button.	6. No response
7. The player presses the return key.	7. No response.
8. The player clicks on a different pipe piece.	8. No response.

UC14-10	Alternative Flow of Events:	• The player clicks on something that's not selectable (pipe system or anything else not a pipe piece). The system records that nothing is selected, wait at Step 2. • The player clicks on the home menu button. The system loads up the home menu.
UC14-11	Exceptional Flow of Events:	• None.

4.8.15 Use Case 15

<u>UC15 - Version 1</u>

UC15-1	Use Case	Player increases their score – UC1 Step 5 - (medium-level)
UC15-2	Author	Leo Grant
UC15-3	Date	18/11/21
UC15-4	Purpose	The player should be able to increase their score to aim to achieve a high score.
UC15-5	Overview	Starts when the system loads up a new game. The player adds a pipe piece (see UC3,4,5,6, and 7). The system moves the character through the pipe (see UC8). The system increases the score of the player relative to the maximum right horizontal displacement reached by the character. The player adds another pipe. The system moves the character through this new pipe. The system is triggered by the collision of the player with a coin. The system adds extra points to the player's score.
UC15-6	Cross Reference	R8, R16
UC15-7	Actors	Player
UC15-8	Pre-Condition	UC15-Pre-1: The system is in the progress of starting the game.
UC15-9	Post-Conditions	UC15-Post-1: The player's score has increased

Actor Actions	System Actions
	1. The system loads up a new game.
2. The player adds a pipe to the pipe system.	
	3. The system adds a pipe to the pipe system.
	4. The system moves the character through the pipe system.
	5. The score increases relative to the maximum right horizontal displacement reached by the character.
6. The player adds another pipe to the pipe system (through the path of a coin).	
	7. The system adds the pipe to the pipe system.
	8. The system moves the character through the pipe system.
	9. The system is triggered by the collision of the player with a coin, and adds extra points to the player's score.

UC15-10	Alternative Flow of Events:	• None.
UC15-11	Exceptional Flow of Events:	• None.

4.8.16 Use Case 16

UC15 - Version 1

UC16-1	Use Case	Player exits the game application – UC1 Step 5 - (medium-level)
UC16-2	Author	Leo Grant
UC16-3	Date	18/11/21
UC16-4	Purpose	The player should be able to exit the application from the home menu.
UC16-5	Overview	Starts when the system loads up the home menu. The player clicks on the exit button. The system closes down the application.
UC16-6	Cross Reference	R23
UC16-7	Actors	Player
UC16-8	Pre-Condition	UC16-Pre-1: The system is in the progress of loading up the home menu.
UC16-9	Post-Conditions	UC16-Post-1: The game has been shut down.

Actor Actions	System Actions
2. Player clicks on the exit button.	1. The system loads up home menu.
	3. System closes the application.

UC16-10	Alternative Flow of Events:	• None.
UC16-11	Exceptional Flow of Events:	• None.

4.9   Use Case Tests

The following test was completed at the end of Sprint 4. The test passes if the use case runs as defined.

Use Case	Test Result	Reason for failure
UC1	Fail	The high score has not been recorded by the system.
UC2	Pass	
UC3	Pass	
UC4	Fail	Pipe piece is not highlighted when selected.
UC5	Pass	
UC6	Pass	
UC7	Fail	Not all correctly orientated pipe pieces may be added to the pipe system.
UC8	Fail	Character still moves to the end of the pipe when dead.
UC9	Fail	Pausing and resuming not implemented.
UC10	Fail	No home button to take player to main menu from game over state.
UC11	Fail	No way to restart the game from the beginning whilst in game.
UC12	Fail	System does not validate or store high score.
UC13	Pass	-
UC14	Fail	Character movement, pipe selection, pipe rotation and pipe addition may all still occur after character death.
UC15	Fail	Coin functionality not implemented.
UC16	Pass	-

4.10 CRC Cards

All of the CRC cards below were created this week.

4.10.1 character_Controller

Class Name: character_Controller	
Version: 1	
Cross Reference: UC1, UC8, UC13	
Responsibilities: Move character (i) & (ii) Detect character death (game over) Declare game over (ii)	Collaborators: (i) pipe_System (ii) game_State_Controller (iii) animation_Controller

Description:

(i)   pipe_System adds movement positions to a queue for the character to move through.

(ii)   Character movement may be paused if the game state is paused, or in game over. Also game_State changed to game over upon character death.

(iii)   The state of the character will be identified in the character_Controller class using bools: isRunning, and isGameOver to identify when the character should animate running, death, and standing still.

4.10.2 game_State_Controller

Class Name: game_State_Controller	
Version: 1	
Cross Reference: UC1, UC9, UC10, UC13, UC14	
Responsibilities: Set game_State ("menu" (ii), "play" (i)(ii)(iii)(iv), "game_over" (iii)(iv), "pause" (ii)(iii)(iv))	Collaborators: (i) camera_Controller (ii) pipes_Interface (iii) character_Controller (iv) game_UI_Controller (v) obstacle_Generation (vi) coins_Controller (vii) score (viii) pipe_Generation

Description:

(i)   The camera moves if the game_State == "play".

(ii)   The player is stopped from selecting, rotating and adding pipe pieces to the system if game_State != "play".

(iii)   The character stops moving if game_State == "pause" or "game over", and continues moving to its target position if game_State == "play".

(iv)   The game_UI_Controller displays the game over UI when game_State == "game_over". Additionally, the game_UI_Controller can set the game_State to "pause" and then back to "play" or "menu" depending on user input. The pause screen should be blocked from access when game_State == "game_over."

(v)   Obstacle_Generation only create new obstacles in a game_State of "play".

(vi)   coins_Controller should only be generate new coins in a game_State of "play".

(vii)   The score is only calculated and displayed to the user whilst the game_State == "play".

(viii) pipe_Generation should only instantiate pipes whilst the game_State == "play".

4.10.3 pipe_System

Class Name: pipe_System	
Version: 1	
Cross Reference: UC1, UC7, UC8	
Responsibilities: Hold the pipe system (specifically, all the checkpoint game objects through which the character travels). Add pipes to the pipe system (i) & (ii) Add pipe checkpoints to the character_Controller movement queue. Checks if submitted pipe piece can be added to the pipe system. (i)	Collaborators: (i) pipes_Interface (ii) pipe_Properties (iii) character_Controller

Description:

(i) The pipes_Interface sends the pipe_System a pipe game object to add to the system. The pipe_System checks it may be added and adds it if possible.

(ii) The pipe_System uses detail from the pipe_Properties class on that pipe to check if the pipe can be added to the pipe system.

(iii) pipe_System adds movement positions to a queue for the character to move through.

4.10.4 pipes_Interface

Class Name: pipes_Interface	
Version: 1	
Cross Reference: UC3, UC6 & UC7	
Responsibilities: Select pipe pieces (iii) Checks for input to rotate Pipe pieces (i) & (iii) Checks for input to add pipes to the pipe system (ii) & (iii)	Collaborators: (i) pipe_Properties (ii) pipe_System (iii) game_State_Controller

Description:

(i) If input found by the pipes_Interface class is to rotate the selected pipe, send this message on to the specific pipe object's pipe_Properties to rotate it. Additionally, tell pipe_properties to highlight the pipe piece or un-highlight it (depending on user selection).

(ii) If input found by the Pipes Interface class is to add the selected pipe to the pipe system, send this message on to the pipe_System class to do so (if possible), with a reference to the specific pipe object in question.

(iii) A pipe may not be selected or de-selected if game_State doesn't equal "play". This barrier to selection entry should also apply to rotation and addition of pipes.

4.10.5 pipe_Properties

Class Name: pipe_Properties	
Version: 1	
Cross Reference: UC4, UC6	
Responsibilities: Stores information about pipe rotation. (ii) Rotates the pipe piece. (i) Highlights / un-highlights the pipe piece. (i)	Collaborators: (i) pipes_Interface (ii) pipe_System

Description:

(i)   The pipes_Interface will send a message to the pipe_Properties script to rotate the game object it's attached to, upon user input. The pipe_Properties class will update its information about the rotation of the pipe. Additionally, the pipes_Interface will tell the pipe_Properties class to highlight or de-highlight itself, depending on user selection status in the pipes_Interface class.

4.10.6 game_UI_Controller

Class Name: game_UI_Controller	
Version: 1	
Cross Reference: UC1, UC9, UC10, UC11, UC16	
Responsibilities: Menu (ii) Display high score on menu (i) Start game (ii) Exit game (ii) Pause game (ii) Continue game (ii) Restart game (ii) Return to menu (at game over and at pause) (ii) Display current score in game	Collaborators: (i) score (ii) game_State_Controller

Description:

(i)   The score class stores the high score which is accessed by game_UI_Controller to display this number on the menu.

(ii)   The game state should be changed by the game_UI_Controller when the buttons on the menu (start, exit), whilst playing (pause, continue, restart) are pressed, and on the game over screen (restart, return to menu)

(iii)

4.10.7 score

Class Name: score	
Version: 1	
Cross Reference: UC1, UC12, UC15	
Responsibilities: Store high score Calculate score during play (i) Display score during play (i)	Collaborators: (i) game_State_Controller

Description:

(i)   The score is only calculated and displayed to the user whilst the game_State == "play".

4.10.8 pipe_Generation

Class Name: pipe_Generation	
Version: 1	
Cross Reference: UC1, UC5	
Responsibilities: Instantiate a set of initial pipes when the game starts Create new pipes as the game progresses (i) Decide what pipes need to be added to make sure progress is not impossible	Collaborators: (i) game_State_Controller

Description:

   (i)   Instantiates pipes whilst the game_State == "play".

4.10.9 animation_Controller

Class Name: animation_Controller	
Version: 1	
Cross Reference: UC1, UC8	
Responsibilities: Run the appropriate character animation based on the state of the character (i) (I.e. running, standing still, climbing, or dead)	Collaborators: (i) character_Controller

Description:

   (i)   The state of the character will be identified in the character_Controller class using bools: isRunning, and isGameOver to identify when the character should animate running, death, and standing still.

4.10.10 coins_Controller

Class Name: coins_Controller	
Version: 1	
Cross Reference: UC1, UC15	
Responsibilities: Create new coins as the game is played (ii) Delete coin objects if the character collides with them. Update the score (i)	Collaborators: (i) score (ii) game_State_Controller

Description:

   (i)   The coin class should identify when it collides with the character, and send this info to the score class.

   (ii)   New coins should only be generated in a game_State of "play".

4.10.11 obstacle_Generation

Class Name: obstacle_Generation	
Version: 1	
Cross Reference: UC1, UC13	
Responsibilities: Create new obstacles as the game progresses (i) When the character collides with an obstacle the game should be over (i) & (ii)	Collaborators: (i) game_State_Controller (ii) character_Controller

Description:

(i) Only create new obstacles in a game_State of "play".

(ii) If the character hits and obstacle, change game_State to "game_over", and change isGameOver character bool to true for the death animation to run.

4.10.12 camera_Controller

Class Name: camera_Controller	
Version: 1	
Cross Reference: UC1, UC2	
Responsibilities: Move horizontally (left to right) at a steadily increasing speed (i)	Collaborators: (i) game_State_Controller

Description:

(i) Only move right if the game_State == "play".

4.11 User interface design

4.11.1 Game Progress
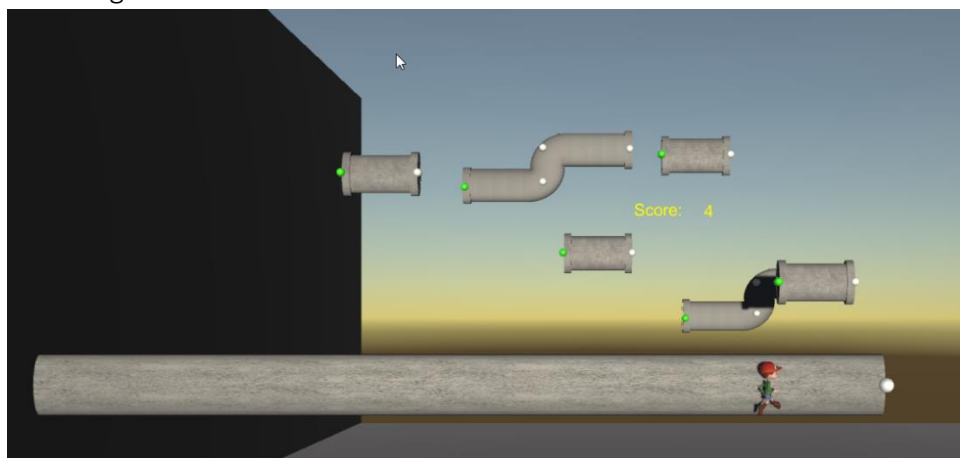
4.11.2 Dark Tunnel Style

4.11.3 Dungeon entry style

4.11.4 Mysterious Gates Style

4.12 Exception Handling

The challenges we faced during this sprint's tasks are outlined below, alongside their respective solutions:

Tasks	Challenges	Solutions
S4.1- T1	Capturing every requirement for our project.	Use the customer meetings for guidance and allow for versioning and addition of user stories in the future.
S4.1- T2	Ensuring that the Use Case was correctly presented.	The documentation examples provided in moodle was useful to model our approach.
S4.1- T3	Capturing all functionality of a class.	Just getting something down was useful. We could then tidy up from there.
S4.1- T4	Defining the roles.	Long discussion to outline the responsibilities of each role.
S4.1- T5	Deciding where to generate pipes so they don't overlap too much.	Create an empty game object to base the positioning of newly generated pipes from, give set positions of starting pipes and increase the time between pipe generations.
S4.1-T6	N/A No challenge.	-
S4.1-T7	N/A No challenge.	-
S4.1-T8	N/A No challenge.	-
S4.2- T1	1)Remembering what I had originally created, and how it worked together. 2)Gradually adapting the mock-up to the new format.	1)Reading the comments. 2)Regular testing that the game still compiles and runs as expected in the Unity Editor.
S4.2- T2	Creating logic to identify if a pipe may be added on to the pipe system.	Incremental changes with an incremental progress aim (e.g., first focus on the logic for just one end of the pipe fitting on to the pipe system before considering the second).
S4.2- T3	Positioning the score in the screen was difficult as it appeared in different positions to each dev. Team member.	Everyone use a fixed screen ratio when developing the game.
S4.2- T4	Creating buttons, at first 3d text objects were used for aesthetic reasons but there were problems implementing the functionality.	The UI button object replaced it as it was much more intuitive, and while it had a predetermined look. Was much faster to work with.
S4.2- T5	Similar issues to pipe generation.	Implement same process as for pipe generation.
S4.2- T6	N/A No challenges.	N/A
	Team member don't have work transparency in each other's work.	Shawn updates JIRA board every week with tasks so that everyone's work is transparent to each other.

5   Sprint 5 | 24th November – 30th November

5.1   Sprint Overview

5.1.1   Preview

After our customer meeting at the end of the last sprint, we knew we wanted to finish the core functionality of the game by the end of sprint 5. By splitting the development team with half working on bugs and the other half working on progressing the functionality, we felt we were in a good position to complete this. We also wanted to make the game look more aesthetically appealing by adhering to the dungeon theme. In the last sprint Shawn created a menu screen and a rolling background screen which are planned to be implemented into the game in this sprint. We feel that this will significantly improve the look and user experience of the game.

5.1.2   Review

In sprint 5, we developed even stronger teamwork. Within one sprint, we created a well-functioning pipe game with pipe generation, rotation, selection, and other features like coin collection, scoring, etc. We also optimized the game art design and UI design with further dungeon themed backgrounds. In this sprint we didn't have a client meeting, but we still held group meetings to discuss our progress and what we planned to do next. After the group meetings, we all agreed to improve the game in 4 ways: making it harder to win, making it more aesthetically pleasing, making it more entertaining for players, and making it easier to navigate.

5.2   Tasks

This sprint was split into two main sections, we spent the first few days of the week focussing on documentation and completing the task S5.1. The second part of the sprint focussed on the more development focussed tasks in S5.2.

5.2.1   First Tasks

Code	Team Members	Tasks
S5.1-T1	Development Team (Marcus, Zoe, Matthew, Leo)	Create a separate sprint summary section solely for development, to keep track of work and increase transparency for documentation.
S5.1-T2	Shawn (Chin)	Overview section for sprint documentation, and backgrounds of the menu and the game for development.
S5.1-T3	Rachan	Amend meeting records to sprint documentation.
S5.1-T4	Michelle	Write preview section for sprint documentation.

5.2.2   Second Tasks

The ongoing tasks at the end of Sprint 4 were encapsulated within the "Other tasks formed from S4.1-T5 + bugs to fix at the end of Sprint 4:" section in Sprint 4. Therefore, they are not explicitly written in the backlog below, but continue to be represented.

Code	Team Members	Tasks
S5.2-T1	Marcus	(prev. S4.2-7-T1 and helps toward S4.2-T2): Allow character to enter both sides of the pipe when rotating.

S5.2-T2	Marcus	(prev. S4.2-7-T5): Add coin generation.
S5.2-T3	Marcus	(prev. S4.2-7-T15): Make character appear within pipes rather than in front of them.
S5.2-T4	Leo	(prev. S4.2-7-T4): Make character die if it touches the top or bottom of the screen.
S5.2-T5	Zoe	(prev. S4.2-7-T2 and helps toward S4.2-T4): Implement high score saving, and menu/game-over display.
S5.2-T6	Matthew	(prev. S4.2-7-T18): Add the menu background to the game.
S5.2-T7	Matthew	(prev. S4.2-7-T19): Add the rolling background (from Shawn) to the game.

5.3   Backlog

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
Dev. Team 1	S5.1-T1	24/11/21	25/11/21	Complete
Shawn (Chin) 1	S5.1-T2	24/11/21	29/11/21	Complete
Rachan 1	S5.1-T3	24/11/21	28/11/21	Complete
Michelle 1	S5.1-T4	24/11/21	24/11/21	Complete
Dev Team	PT1	10/11/21	-	Ongoing
(1) Marcus 1	S5.2-T1	21/11/21	27/11/21	Complete
(1) Marcus 2	S5.2-T2	21/11/21	27/11/21	Complete
(1) Marcus 3	S5.2-T3	21/11/21	27/11/21	Complete
(1) Leo 1	S5.2-T4	21/11/21	28/11/21	Complete
(1) Zoe 1	S5.2-T5	21/11/21	09/12/21 Completed in S7-T2	Ongoing
(1) TBD	S4.2-7-T3	21/11/21	-	Not Started
(1) TBD	S4.2-7-T6	21/11/21	-	Not Started
(1) TBD	S4.2-7-T7	21/11/21	-	Not Started
(1) TBD	S4.2-7-T8	21/11/21	-	Not Started
(1) TBD	S4.2-7-T9	21/11/21	-	Not Started
(1) TBD	S4.2-7-T10	21/11/21	-	Not Started
(1) TBD	S4.2-7-T11	21/11/21	-	Not Started
(1) TBD	S4.2-7-T12	21/11/21	-	Not Started
(1) TBD	S4.2-7-T13	21/11/21	-	Not Started
(1) TBD	S4.2-7-T14	21/11/21	-	Not Started
(1) TBD	S4.2-7-T16	21/11/21	-	Not Started
(1) TBD	S4.2-7-T17	21/11/21	-	Not Started
Dev Team	PT2	10/11/21	-	Ongoing
(1) Matthew 1	S5.2-T6	17/11/21	02/12/21 Completed in S6-T5	Ongoing
(2) Matthew 2	S5.2-T7	21/11/21	02/12/21 Completed in S6-T6	Ongoing
(2) TBD	S4.2-7-T20	21/11/21	-	Not Started
(2) TBD	S4.2-7-T21	21/11/21	-	Not Started
(2) TBD	S4.2-7-T22	21/11/21	-	Not Started

| (2) TBD | S4.2-7-T23 | 21/11/21 | - | Not Started |
| Dev Team | PT3 | 10/11/21 | - | Not Started |

5.4   Meeting Records

Overview	Duration	Date & Time	Attended By
Internal meeting	80 minutes	Wednesday (24th November 2021) - 12:00 – 13:20	All Team members
Internal meeting	60 minutes	Sunday (28th November 2021) - 15:30 - 16:30	All Team members
Internal meeting	60 minutes	Tuesday (30th November 2021) - 18:00 - 19:00	All Team members
Internal meeting	90 minutes	Wednesday (1st December 2021) - 17:00 – 18:30	All Team members

5.5   Customer Interview and Analysis

We did not have a customer meeting in sprint 5. Instead, we hosted our own additional group meeting and assigned the tasks for this sprint.

5.6   User Stories

The User Story, R5, was updated to include character death at the top and bottom of the screen.

5.6.1   R5

User Story: Character Dying R5	Acceptance Criteria
As a Game Developer, I want to kill the character if he falls too far behind, So that the player has the goal to keep them alive.	Criterion 1. IF the character is alive… WHEN the character touches the left-hand edge of the screen… THEN declare game over.
Priority: 5/5 Version: 2 Date: 29/11/21	Criterion 1. IF the character is alive… WHEN the character touches the top edge of the screen… THEN declare game over. Criterion 1. IF the character is alive… WHEN the character touches the bottom edge of the screen… THEN declare game over.

5.7 User Story Tests

The following tests were completed at the end of Sprint 5. If the User Story's acceptance criteria are fulfilled, the test was passed.

User Story	Test Result (acceptance criteria)	Reason for failure
R1	Pass	-
R2	Fail	No pipe highlighting for selected pipes.
R3	Pass	-
R4	Pass	-
R5	Pass	-
R6	Pass	-
R7	Pass	-
R8	Pass	-
R9	Fail	The player's high score is not saved so cannot be displayed.
R10	Pass	-
R11	Pass	-
R12	Fail	No pause or resume button implemented.
R13	Fail	No obstacle functionality implemented.
R14	Fail	No restart buttons implemented.
R15	Fail	No home buttons implemented.
R16	Pass	-
R17	Fail	No special pipe functionality implemented.
R18	Fail	No beat bonus functionality implemented.
R19	Fail	Pipe generation does not increase in speed.
R20	Fail	Number of pipes generated does not increase wit time.
R21	Fail	Camera moves to right but not at increasing velocity.
R22	Fail	High score is not saved.
R23	Pass	-

5.8 Use Cases

The Use Case 13 was updated to include character death at the top and bottom of the screen.

5.8.1 Use Case 13

UC13 - Version 2

UC13-1	Use Case	Player loses the game – UC1 Step 5, 6 & 7- (medium-level)
UC13-2	Author	Zoe Broad
UC13-3	Date	29/11/21

UC13-4	Purpose	The player should be able to lose the game, otherwise it would become boring.
UC13-5	Overview	Starts when the system starts the game. System generates obstacles (similar to UC5 with pipes). The player adds a pipe to the system (see UC3,4,5,6, and 7). The system moves the character through the pipe (see UC8). The system is triggered when the character touches an obstacle else <u>Alternative 1:</u> The system is triggered when the character touches the top, bottom, or left-hand side of the screen. The system declares a game over state. System stops generating new obstacles.
UC13-6	Cross Reference	R5, R13
UC13-7	Actors	Player
UC13-8	Pre-Condition	UC13-Pre-1: The system is in the progress of starting the game.
UC13-9	Post-Conditions	UC13-Post-1: The system is in a game over state.

Actor Actions	System Actions
	1. The system starts a new game.
	2. System starts obstacle generation.
3. The player adds a pipe to the pipe system.	4. The system adds a pipe to the pipe system.
	5. The system moves the character through the pipe system.
	6. The system is triggered when the character touches an obstacle.
	7. The system changes to a game over state.
	8. System stops obstacle generation.

UC13-10	Alternative Flow of Events:	• The system is triggered when the character touches the top, bottom, or left-hand side of the screen. Move to Step 6.
UC13-11	Exceptional Flow of Events:	• The system is triggered by an obstacle collision, and a screen collision. The system should move to Step 6.

5.9   Use Case Tests

The following test was completed at the end of Sprint 5. The test passes if the use case runs as defined.

Use Case	Test Result	Reason for failure
UC1	Fail	The high score has not been recorded by the system.
UC2	Pass	-

UC3	Pass	-
UC4	Fail	Pipe piece is not highlighted when selected.
UC5	Pass	-
UC6	Pass	-
UC7	Pass	-
UC8	Pass	-
UC9	Fail	Pausing and resuming not implemented.
UC10	Fail	No home button to take player to main menu from game over state.
UC11	Fail	No way to restart the game from the beginning whilst in game.
UC12	Fail	System does not validate or store high score.
UC13	Pass	-
UC14	Pass	-
UC15	Pass	-
UC16	Pass	-

5.10 User Interface Design

5.10.1 Game Progress
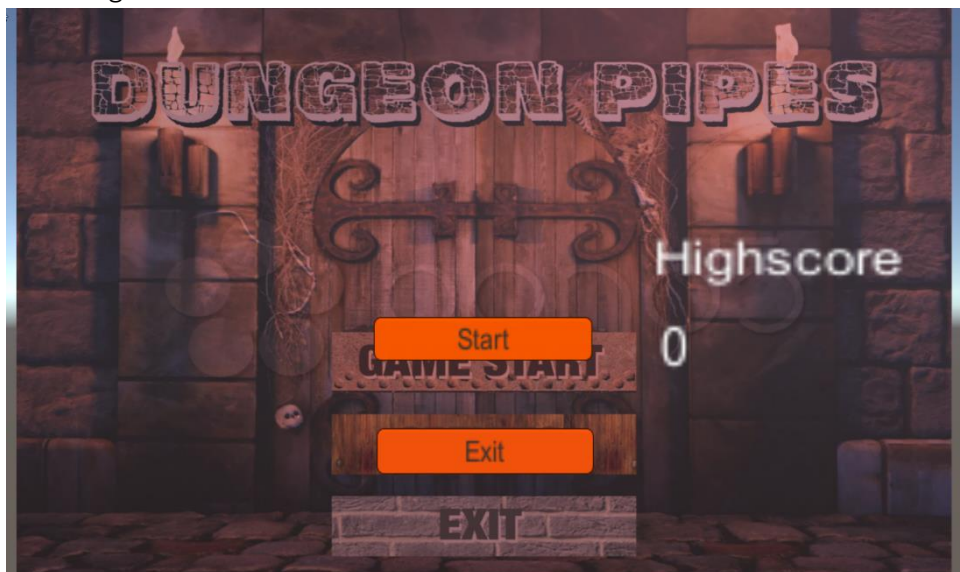
Main Menu
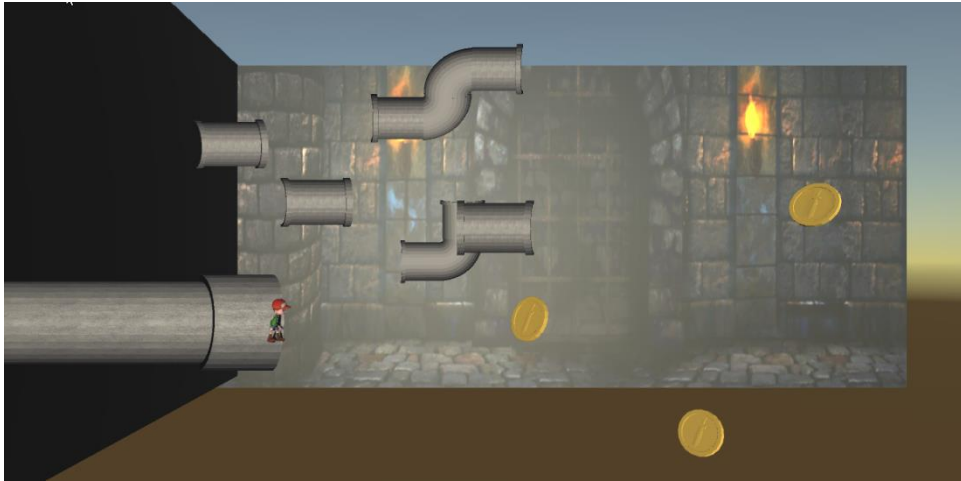
Updated game design

5.10.2 Coin design in Blender

5.11 Exception Handling

The challenges we faced during this sprint's tasks are outlined below, alongside their respective solutions:

Tasks	Challenges	Solutions
S5.1-T1	Organising all the content.	Planning the content creation before making any.
S5.1-T2	N/A Fairly straightforward.	-
S5.1-T3	N/A Fairly straightforward.	-
S5.1-T4	N/A No challenges.	-
S5.2- T1	1) Check if pipes can be added from either side.	1) Use the position of both the entry and exit of the pipe and check it against the position of main pipe exit.

	2)If pipe is added backwards the position it attaches from needs to change.	2) If the pipe is reversed, first add it at the parent checkpoint (start of pipe) then move it by the difference in distance between the first and last checkpoint.
S5.2- T2	Keep coin rotation and depth the same for all coins.	Create an empty game object with the coin prefab inside at the correct position, then instantiate this game object rather than the coin prefab.
S5.2-T3	Some turning pipes did not scale as expected, for example the S shape pipe would not scale correctly along the Y axis.	Break the pipes down into smaller segments that could scale correctly then combine them all under one parent object.
S5.2-T4	N/A Fairly straightforward.	-
S5.2-T5	N/A No challenges.	Ongoing.
S5.2-T6	Adding the image to the menu was relatively simple, the only issue being the plane had the wrong dimensions for the image.	Resize the menu and camera so the image did not appear to be stretched.
S5.2-T7	Creating enough planes for the background to go on forever.	Ongoing.

6 Sprint 6 | 1ˢᵗ December – 7ᵗʰ December

6.1 Sprint Overview

6.1.1 Preview

Despite not having a customer meeting at the end of the last sprint, we feel that we remain in a good position to continue to improve the functionality of our game and create tasks accordingly. We feel that we have made excellent progress as a group so far. We plan to continue to improve the aesthetic of the game such as adding music and improving the rolling background so there are enough planes for it to go on forever. When the rolling background was implemented in the previous sprint, we found that it would eventually end, so we wanted to fix this. We also wanted to change how the difficulty of the game evolves over time by adding a beat bonus which would be implemented by Matthew.

6.1.2 Review

Since we didn't have any customer meetings last sprint, we assigned ourselves the task of making the game more challenging and entertaining for the user. As a result, we released our first downloadable version of the game for non-development members to test. We also added two pieces of background music, one to the menu and one to the game. Furthermore, we fixed some minor bugs and optimized the controls. Additionally, we constructed the backstory for how the game starts, why the boy character is in the dungeon, and why he is running through the pipes, etc.

In terms of documentation, we checked the content and structure of our sprint documents and made them more logical. By the end of this sprint, we had thoroughly checked all our sprint documents and rearranged them such that they all followed an identical format and structure. However, there were still several submission requirements that we did not fully understand. We made a list of all of these and asked the TAs and the client about them. In the client meeting, we received more concrete feedback regarding our documentation and development optimization.

6.2 Tasks

Code	Team Members	Tasks
S6-T1	Marcus	(Previously S4.2-T11): Add obstacle generation.
S6-T2	Marcus	(Previously S4.2-T13): Implement death on obstacle collision.
S6-T3	Marcus	Add additional pipes.
S6-T4	Marcus	Implement the option to change the pipe entry if multiple connections exist.
S6-T5	Leo	(Extends from S5.2-T6): Improve menu background look.
S6-T6	Leo	(Extends from S5.2-T7): Implement rolling background.
S6-T7	Matthew	Change how the game becomes harder over time.
S6-T8	Zoe	(Previously S4.2-T17): Implement pausing the game.
S6-T9	Marcus	Add animations for ascending and descending in pipes.
S6-T10	Matthew	Source copyright free Music for the game and menu and add it to the game and menu.
S6-T11	Shawn (Chin)	Overview and interview analysis sections for sprint documentation, and the configuration beta test for development.
S6-T12	Rachan	Amend meeting records to sprint documentation.

S6-T13	Michelle	Write preview section for sprint documentation and meeting minutes for customer meeting.

6.3   Backlog

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
Shawn (Chin) 1	S6-T11	01/12/21	05/12/21	Complete
Rachan 1	S6-T12	01/12/21	07/12/21	Complete
Michelle 1	S6-T13	01/12/21	08/12/21	Complete
Dev Team	PT1	10/11/21	-	Ongoing
(1) Marcus	S6-T1	21/11/21	02/12/21	Complete
(1) Marcus	S6-T2	21/11/21	02/12/21	Complete
(1) Marcus + Leo	S6-T3	01/12/21	04/12/21	Complete
(1) Marcus	S6-T4	04/11/21	04/12/21	Complete
(1) Matthew	S6-T7	01/11/21	-	Ongoing
Dev Team	PT2	10/11/21	-	Ongoing
(2) Leo	S6_T5	21/11/21	02/12/21	Complete
(2) Leo	S6-T6	21/11/21	02/12/21	Complete
(2) Marcus	S6-T9	01/12/21	-	Ongoing
(2) Matthew	S6-T10	01/12/21	-	Complete
Dev Team	PT3	10/11/21	-	Ongoing
(3) Zoe	S6-T8	21/11/21	02/12/21	Complete

6.4   Meeting Records

6.4.1   Meetings

Overview	Duration	Date & Time	Attended By
Internal meeting	60 minutes	Sunday (5th December 2021) - 17:00 – 18:00	All Team members
Internal meeting	60 minutes	Tuesday (7th December 2021) - 16:00 - 17:00	All Team members
Client meeting	15 minutes	Wednesday (8th December 2021) - 12:00 – 12:15	All Team members

6.4.2   Minutes

Time	Wednesday 8th December 11:45-12:00 (Sprint 6)
Led By	Leo and Zoe
Minutes Taken By	Michelle

Agenda

1. Demonstrate new features of the game

2. Gaps in functionality
3. Discuss documentation

Agenda Item	Summary
Demonstrate new features of the game	• Music, highlight of pipes, new shaped pipes, additionally functionality to choose which side to add on, coins that add to the score, added obstacles, rolling background. • Customer suggests tweaking transparency on pause screen. • Customer asked about levels – team mentioned beat bonus which is being worked on by Matthew.
Gaps in functionality	• Discussed gaps in functionality that is feasible to complete between now and the deadline. • Link the score to the high score on the menu as the saving doesn't currently work. • Pipes can overlap so this needs to be fixed. • Once the game has been cleaned up, it will become deliverable so could potentially add more functionality.
Discuss documentation	• Meeting report needs to say what we took from it i.e., who has been assigned what. • Documentation tasks should be included in the backlog.

Action Items

No.	Action
1	Tweak transparency on pause screen
2	Fix the pipe overlap
3	Extend meeting report with tasks assigned
4	Add documentation tasks to backlog

6.5   Customer Interview and Analysis

Interview Highlights:

(Demonstrating our game)

Q (Client): Is that another problem?

A (Team): That is another obstacle to avoid, or it will hit you.

A (Client): It's just all great. Ok, cool, cool. I can also see you get a lot of background stuff in there, and everything is kind of flowing smoothly.

Q (Client): Um, do we have any levels as such?

A (Team): Yeah, we are working on the idea of "Beat Bonus" to increase the difficulties and raise the reward of it.

A (Client): Ok.

Q (Client): What else between now and the end could be done?

A (Team): We have the link to the high score on the menu. The saving doesn't currently work well. Another part is about the pipes overlapping. It doesn't interrupt the game, but we will fix it. There's

still a lot of things to clean up in general next week, and we want to make it more deliverable as a final product. Anything extra would be a bonus beyond that.

A (Client): Yep. Yes. Ok.

Q (Client): Is the documentation all on track?

A (Team): Yes.

(Presenting our documentation)

Q (Team): Is that something we must include in the backlog, the documentation part?

A (Client): Yep. They would be part of what your project must include.

Analysis:

- We were confident that most of our work, including the game and documentation, was on track and doing well so far.
- We can stick to our plans and clean up in general during the next sprint. We can aim to make it more deliverable as a final product.
- We still must split up all the remaining parts of this project, such as the product documentation and optimizations of the game. This should be finished by the next sprint.

6.6   User Stories
A new user story was created in this sprint regarding the background of the game (R24), as well as the criteria for checking pipe pieces before adding them to the pipe system (R25)

6.6.1   R24

User Story: Roll the background R24	Acceptance Criteria
As a Game developer, I want to implement a rolling background, So that the player always has a background behind them as they play.	Criterion 1. IF the player is coming to the end of the background image… THEN create a new background image next to the existing one…
Priority: 3/5 Version: 1 Date: 02/12/21	AND ready the deletion of the current background image for when it is off-screen.

6.6.2   R25

User Story: Pipe overlap prevention R25	Acceptance Criteria
As a Game developer, I want to prevent the pipe system overlapping onto itself, So that the realism of the game is increased.	Criterion 1. IF the player tries to add a pie piece to the pipe system… AND the pipe piece in its current orientation would overlap onto the pipe system.

Priority: 2/5 Version: 1 Date: 03/12/21	THEN prevent this pipe piece being added to the system.

6.7   User Story Tests

The following test was completed at the end of Sprint 6. If the User Story's acceptance criteria are fulfilled, the test is passed. R19, and R20 were scrapped from the requirements of the game in this sprint.

User Story	Test Result (acceptance criteria)	Reason for failure
R1	Pass	-
R2	Pass	-
R3	Pass	-
R4	Pass	-
R5	Pass	-
R6	Pass	-
R7	Pass	-
R8	Pass	-
R9	Fail	The player's high score is not saved so cannot be displayed.
R10	Pass	-
R11	Pass	-
R12	Pass	-
R13	Fail	No obstacle functionality implemented.
R14	Fail	No restart buttons implemented.
R15	Pass	-
R16	Pass	-
R17	Fail	No special pipe functionality implemented.
R18	Fail	No beat bonus functionality implemented.
R19	N/A	-
R20	N/A	-
R21	Pass	-
R22	Fail	High score is not saved.
R23	Pass	-
R24	Pass	-
R25	Fail	Pipe piece may still be added such that they overlap in the pipe system.

6.8   Use Cases

Use Case 2 was updated this week.

6.8.1   UC2

UC2 - Version 2

UC2-1	Use Case	The player plays the game (moving camera, rolling background) - Step 5 of UC1 - (low-level)
UC2-2	Author	Leo Grant
UC2-3	Date	02/12/21
UC2-4	Purpose	The player view should continuously move whilst the player is in game, and the background should always be visible.
UC2-5	Overview	The system moves the camera view continuously to the right. System creates a background image for the camera view to move into, before it reaches the end of the current background. The player clicks the pause button. System stops the camera moving. The player clicks the resume button. The system resumes the camera movement. System creates a background image for the camera view to move into before it reaches the end of the current background. The system eventually declares game over. The system stops the camera movement (and background generation).
UC2-6	Cross Reference	R21, R24
UC2-7	Actors	Player
UC2-8	Pre-Condition	UC2-Pre-1: The game is playing. UC2-Pre-1: The game is not paused.
UC2-9	Post-Conditions	UC2-Post-1: The player has played the game.

Actor Actions	System Actions
	1. System moves camera continuously to the right.
	2. System creates a background image for the camera view to move into, before it reaches the end of the current background.
3. Player clicks pause button.	4. System stops camera movement.
5. Player clicks resume button.	6. System resumes camera movement.
	7. System creates a background image for the camera view to move into, before it reaches the end of the current background.
	8. System eventually declares game over.
	9. System stops camera movement (and background generation).

UC2-10	Alternative Flow of Events:	• None.
UC2-11	Exceptional Flow of Events:	• None.

6.9 Use Case Tests

The following test was completed at the end of Sprint 6. The test passes if the use case runs as defined.

Use Case	Test Result	Reason for failure
UC1	Fail	The high score has not been recorded by the system.
UC2	Pass	-
UC3	Pass	-
UC4	Pass	-
UC5	Pass	-
UC6	Pass	-
UC7	Pass	-
UC8	Pass	-
UC9	Pass	-
UC10	Pass	-
UC11	Fail	No way to restart the game from the beginning whilst in game.
UC12	Fail	System does not validate or store high score.
UC13	Pass	-
UC14	Pass	-
UC15	Pass	-
UC16	Pass	-

6.10 CRC Cards

The following CRC cards were either created or updated in this sprint.

6.10.1 game_UI_Controller

Class Name: game_UI_Controller	
Version: 2	
Cross Reference: UC1, UC9, UC10, UC11	
Responsibilities: Resume game (i) Pause game (i) Restart game Return to menu (at game over and at pause) (i)	Collaborators: (i) game_State_Controller

Description:

(i)   The game_State should be changed by the game_UI_Controller to "pause" when the pause button is clicked in game. Additionally, the resume button and restart button should set/re-set the game_State to "play", and the 'return to menu' button should change the game_State to "menu".

6.10.2 menu_UI_Controller

Class Name: menu_UI_Controller	
Version: 1	
Cross Reference: UC1, UC16	
Responsibilities: Start game (i) Exit game (i) Display high score (ii)	Collaborators: (i) game_State_Controller (ii) SaveGame

Description:

(i)   The game_State should be changed by the menu_UI_Controller to "play" when the Start button is clicked.

(ii) The value of the high score is accessed via the SaveGame class, to display on the menu.

6.10.3 SaveGame

Class Name: SaveGame	
Version: 1	
Cross Reference: UC12	
Responsibilities: Store and save the high score and coin count of the player.	Collaborators: (i) score (ii) menu_UI_Controller

Description:

(i)   The score class will send a new high score to the SaveGame class for it to save.

(i)   The menu_UI_Controller accesses the high score and coin count from the SaveGame class to display on the menu. When the game is exited from the menu or a save button is pressed the current coin count and high score values should be saved to the save files.

6.10.4 score

Class Name: score	
Version: 2	
Cross Reference: UC1, UC12, UC15	
Responsibilities: Calculate score during play (i) Display score during game (i) Set highscore (ii)	Collaborators: (i) game_State_Controller (ii) SaveGame

Description:

1. The score is only calculated whilst the game is in a play state. The score is only displayed whilst the game scene is active (not menu scene).

2. The score can check with highscore if the new score is higher than the high score. If it is, it will change the value of the field SaveGame in highscore class.

6.10.5 coin

Class Name: coin	
Version: 1	

Cross Reference: UC1	
Responsibilities: Spin the coin object whilst in a state of play	Collaborators: (i) game_State_Controller

Description:

1. Spin the coins whilst the game_State == "play".

6.10.6 background_Controller

Class Name: background_Controller	
Version: 1	
Cross Reference: UC1, UC2	
Responsibilities: Create new backgrounds as the camera moves Destroy old backgrounds as the camera moves	Collaborators: (i) game_State_Controller

Description:

1. While the game_State == "pause" keep waiting to destroy the old backgrounds (so as to avoid them disappearing in view).

6.10.7 game_State_Controller

Class Name: game_State_Controller	
Version: 2	
Cross Reference: UC1, UC9, UC10, UC13, UC14	
Responsibilities: Set game_State ("menu" (ii), "play" (i)(ii)(iii)(iv), "game_over" (iii)(iv), "pause" (ii)(iii)(iv))	Collaborators: (i) camera_Controller (ii) pipes_Interface (iii) character_Controller (iv) game_UI_Controller (v) obstacle_Generation (vi) coins_Controller (vii) score (viii) pipe_Generation (ix) menu_UI_Controller (x) coin (xi) background_Controller

Description:

1. The camera moves if the game_State == "play".
2. The player is stopped from selecting, rotating and adding pipe pieces to the system if game_State != "play".
3. The character stops moving if game_State == "pause" or "game over", and continues moving to its target position if game_State == "play".
4. The game_UI_Controller displays the game over UI when game_State == "game_over". Additionally, the game_UI_Controller can set the game_State to "pause" and then back to "play" or "menu" depending on user input. The pause screen should be blocked from access when game_State == "game_over."

5. Obstacle_Generation only creates new obstacles in a game_State of "play".
6. coins_Controller should only be generating new coins in a game_State of "play".
7. The score is only calculated and displayed to the user whilst the game_State == "play".
8. pipe_Generation should only instantiate pipes whilst the game_State == "play".
9. The game_State should be changed by the menu_UI_Controller to "play" when the Start button is clicked on the menu.
10. coin class should spin the coin whilst the game_State == "play".
11. While the game_State == "pause" keep waiting to destroy the old backgrounds (so as to avoid them disappearing in view).

6.11 User Interface Design

6.11.1 Game Progress

Main menu
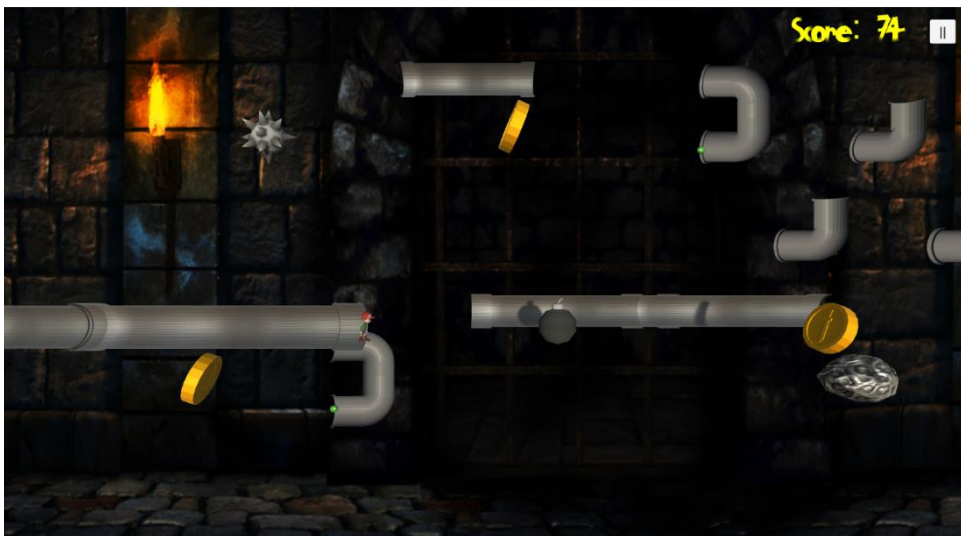
Game view

6.11.2 Additional pipe generation
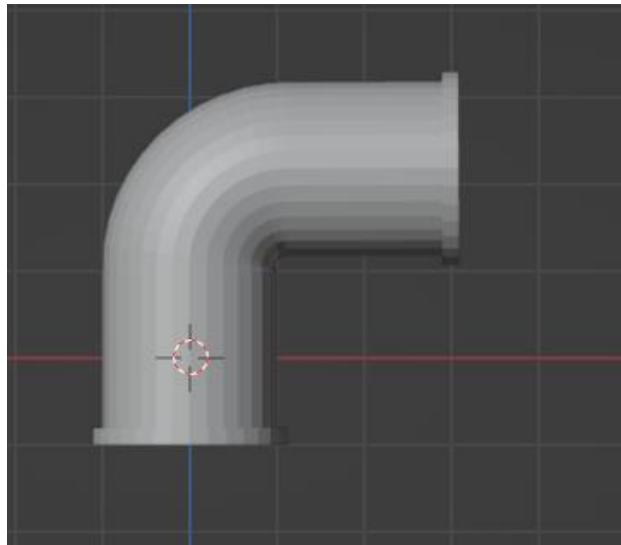
Turning pipe, now working both ways
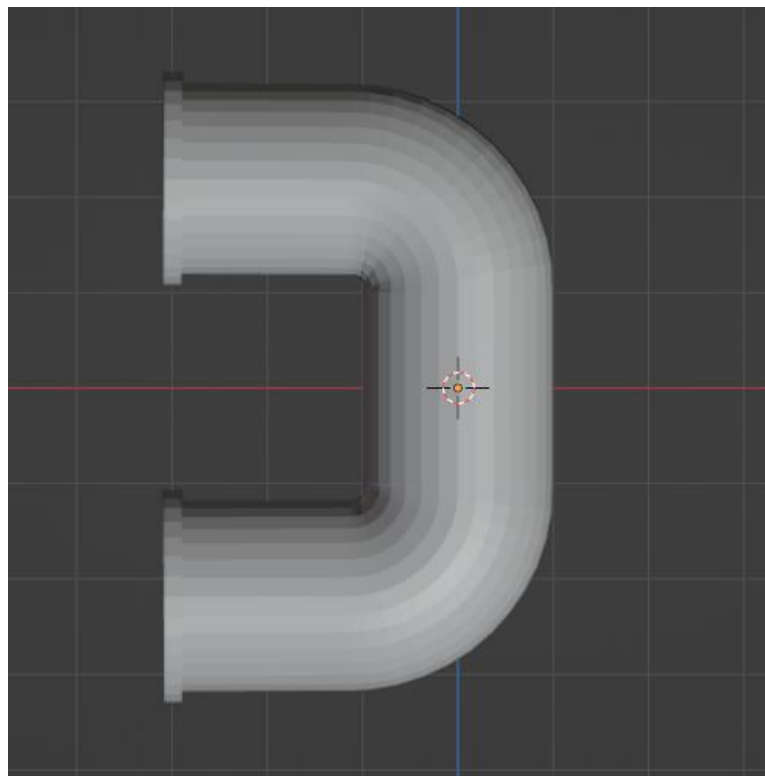
U shaped pipe

6.12 Exception Handling

The challenges we faced during this sprint's tasks are outlined below, alongside their respective solutions:

Tasks	Challenges	Solutions
S6-T1	Used the same ideas as pipe generation, so it was relatively straightforward.	N/A
S6-T2	Getting the correct size for the collider so the character did not die when it	Make the colliders slightly smaller than the obstacle appears.

	appeared to o past the obstacle (this was a problem if the obstacle was passed near the front of the screen due to the perspective).	
S6-T3	N/A No challenges.	N/A
S6-T4	Making the character remove the correct way through the pipe if the entry point was changed.	Use the isReversed Boolean created for pipe rotation if the player changes the entry and exit point of the pipe.
S6-T5	The colours and style of the menu were lacking.	Add a new font, add lighting, change the background to a UI sprite so that the colour was more vibrant.
S6-T6	Challenging mechanism to conceptualize before implementation.	Trial and error worked well.
S6-T7	Initially made the game increase speed every frame, but different computers have different frame rates.	Increased speed with a timer (with help from Marcus) instead so it would increase at the same rate for all PC's.
S6-T8	Ensuring the score did not keep increasing once the user pressed pause.	Increment the score based on the characters x-position rather than by time.
S6-T8	Allowing the user to consider their options whilst on the pause menu.	Increased the transparency of the pause menu background.
S6-T9	N/A Fairly straightforward.	N/A
S6-T10	N/A No challenges.	N/A
S6-T11	N/A Fairly straightforward.	N/A
S6-T12	N/A Fairly straightforward.	N/A
S6-T13	N/A Fairly straightforward.	N/A

7 Sprint 7 | 8th December – 15th December

7.1 Sprint Overview

7.1.1 Preview

Going into our final sprint, we feel that we are in a good position to produce a deliverable that will satisfy our client. There are a few points that we feel need further work, such as solving the issue of pipes overlapping and linking the high score to the one shown on the main menu. We feel that once these tasks are resolved, the game will be deliverable and there could possibly be time to add example 'placeholder' functionality for future developers such as a shop for the user to spend their collected coins. We want to also add the backstory to the game and implement a specific backstory scene as this will make the game more intriguing by providing the user with more context. We also want to finish our documentation, which includes both sprint and product documentation, and we feel that we are in a good position to accomplish this.

7.1.2 Review

This sprint was our last sprint for this project. For the development, all the major tasks regarding functionality were complete, the software of the game was fully executable, and we finished every feature of our game, including the new features (i.e., Backstory, Controls, and Coin Shop). These features were demonstrated and approved in the final customer meeting. By this point, the team had developed a good understanding of the documentation requirements for such additional functionality, and were therefore able to add the extra documentation to the Sprint documents. We did have some interesting ideas left to enrich the content and the gameplay of our game, but due to the scope of this project, we recorded these ideas as future optimizations. It. Is worth re-iterating that the current version of our game is now fully functional and operating smoothly. We divided the work for the remaining documentation, and we planned to finish most of the documentation by the end of this sprint. The workload for the final sprint was the most balanced out of all the sprints between the team members. By this point we had developed clear roles within the team, and so task designation was straightforward, as well as workload estimations. The main difficulty we experienced was an ambiguous requirement for product documentation, but this was addressed in the informal customer meeting at the end of this last sprint. In this last client meeting, we showed the latest version of the game, the process documentation, and the product documentation. All feedback was positive and was incorporated into our final changes.

7.2 Tasks

Code	Team Members	Tasks
Development Tasks		
S7-T1	Marcus	(Previously S6-T9) Finish fixing animations for up and down movement.
S7-T2	Marcus	(Previously S5.2-T5) Finish Implementing High score.
S7-T3	Leo	Refactor code to match CRC card descriptions and fulfil more requirements.
S7-T4	Marcus	Add a coin count so the player can track how many coins they have collected.
S7-T5	Claude	Create a backstory for the game.
S7-T6	Marcus	Implement a backstory scene in the game.
S7-T7	Marcus	Design and add a controls menu.

S7-T8	Marcus	Rotate animations when moving backwards.
S7-T9	Marcus	Allow game data to be saved and not reset every time the game is launched.
S7-T10	Marcus	Add a shop for the player to spend their coins.
S7-T11	Shawn (Chin)	Add background image and user manual for Controls of game (Shawn).
S7-T12	Shawn (Chin)	Add background image to Story of game (Shawn).
	Documentation Tasks	
S7-T13	Marcus & Zoe	Create the maintenance guide.
S7-T14	Matthew	Create the installation guide.
S7-T15	Shawn (Chin)	Create the user manual, and overview and interview analysis sections for sprint documentation.
S7-T16	Michelle	Write preview section for sprint documentation and meeting minutes for customer meeting and format sprint and product documentation.

Documentation tasks:

Whole team: Add your tasks to the product backlog along with challenges and solutions.

7.3   Backlog

Priority	Tasks	Date of Creation	Date of Completion	Status at End of Sprint
(1) Shawn (Chin)	S7-T11	08/12/21	09/12/21	Completed
(3) Shawn (Chin)	S7-T12	08/12/21	09/12/21	Completed
(4) Marcus & Zoe	S7-T13	08/12/21	14/12/21	Completed
(1) Matthew	S7-T14	08/12/21	14/12/21	Completed
(4) Shawn (Chin)	S7-T15	08/12/21	14/12/21	Completed
(1) Michelle	S7-T16	08/12/21	15/12/21	Completed
Dev Team	PT1	10/11/21	15/12/21	Completed
(1) Marcus	S7-T2	08/12/21	12/12/21	Completed
(1) Leo	S7-T3	08/12/21	09/12/21	Completed
Dev Team	PT2	10/11/21	15/12/21	Completed
(2) Marcus	S6-T1	8/12/21	08/12/21	Completed
(2) Claude	S7-T5	08/12/21	08/12/21	Completed
(2) Marcus	S7-T8	08/12/21	11/12/21	Completed

(2) Shawn + Marcus	S7-T7	08/12/21	10/12/21	Completed
Dev Team	PT3	10/11/21	15/12/21	Completed
(3) Marcus	S7-T4	08/12/21	09/12/21	Completed
(3) Marcus	S7-T6	08/12/21	10/12/21	Completed
(3) Marcus	S7-T9	11/12/21	11/12/21	Completed
(3) Marcus	S7-T10	11/12/21	13/12/21	Completed

7.4   Meeting Records:

7.4.1   Meetings

Overview	Duration	Date & Time	Attended By
Internal meeting	60 minutes	Wednesday (8th December 2021) - 12:15 – 13:15	All Team members
Internal meeting	45 minutes	Sunday (12th December 2021) - 18:00 - 18:45	All Team members
Internal meeting	60 minutes	Tuesday (14th December 2021) - 18:00 – 19:00	All Team members
Client meeting	20 minutes	Wednesday (15th December 2021) - 10:50 – 11:10	All Team members

7.4.2   Minutes

Time	Wednesday 15th December 10:50-11:10 (Sprint 7)
Led By	Rachan and Zoe
Minutes Taken By	Michelle

Agenda

1. Overview of the Maintenance Guide
2. Overview of Sprint Documentation

Agenda Item	Summary
Overview of Maintenance Guide	- Section heading aren't numbered and the format isn't complete – explained that formatting outside of teams has these things - Documentation techniques make boring documents accessible - Contents of document looks good - Look further into GitHub to develop the Maintenance Guide
Overview of Sprint Documentation	Customer wanted Preview and Review at the beginning of each sprint – This is what we planned to do, and this is what happened

	• Customer asked to change the Interview and Analysis section – Change to Q, A, Analysis format
Final Comments on Game	• Customer feels that we managed to make the initial sketches into a real game

Action Items

No.	Action
1	Complete formatting of Maintenance Guide
2	Look further into GitHub
3	Update format of Sprint documentation

7.5   Customer Interview and Analysis

Interview Highlights:

Q (Team): This is the complete version of our pipeline game. Do you think it meets your requirements?

A (Client): Good job! I think it looks great and has lots of features.

Q (Team): This is the documentation we are working on now. Do you have any details that need to be modified?

A (Client): I'm impressed that you seem to have everything near completion by Wednesday. I think your customer interview and analysis section needs to be revised – it should be in the form of Q & A, followed by analysis.

Analysis:

In this meeting, the client expressed their appreciation for the completion of our game and suggested some minor modifications for our documentation. We will revise the format and proofread all the details before the deadline.

7.6   User Stories

The following user stories were created in this sprint.

7.6.1   R26

User Story: Viewing a back story R25	Acceptance Criteria
As a Player... I want to read a back story of the character in the game, So that the gameplay has context and feels more immersive and purposeful.	Criterion 1. IF the player is on the menu THEN display a story button that IF this story button is clicked THEN display the back story of the character
Priority: 3/5	

Version: 1	
Date: 08/12/21	

7.6.2   R27

User Story: Viewing controls instructions R26	Acceptance Criteria
As a Player… I want to read about the controls of the game, So that I know how to play the game.	Criterion 1. IF the player is on the menu THEN display a controls button that IF this controls button is clicked THEN display the control instructions to the player
Priority: 3/5 Version: 1 Date: 08/12/21	

7.6.3   R28

User Story: Accessing the Coin Shop R27	Acceptance Criteria
As a Player… I want to be able to spend my coins at a coin shop, So that it is more fun to collect them in game.	Criterion 1. IF the player is on the menu THEN display a Coin Shop button that IF this Coin Shop button is clicked THEN give the player access to the coin shop.
Priority: 3/5 Version: 1 Date: 08/12/21	

7.7   User Story Tests

The following test was completed at the end of Sprint 7. If the User Story's acceptance criteria is fulfilled, the test is passed.

User Story	Test Result (acceptance criteria)	Reason for failure
R1	Pass	-
R2	Pass	-
R3	Pass	-
R4	Pass	-
R5	Pass	-
R6	Pass	-
R7	Pass	-
R8	Pass	-
R9	Pass	-
R10	Pass	-
R11	Pass	-
R12	Pass	-
R13	Pass	-
R14	Pass	-
R15	Pass	-
R16	Pass	-
R17	Fail	No special pipe functionality implemented.

R18	Fail	No beat bonus functionality implemented.
R19	N/A	-
R20	N/A	-
R21	Pass	-
R22	Pass	-
R23	Pass	-
R24	Pass	-
R25	Fail	Pipe piece may still be added such that they overlap in the pipe system.
R26	Pass	-
R27	Pass	-
R28	Pass	-

7.8 Use Cases

The following use cases were created in this sprint.

7.8.1 Use Case 17

UC17 - Version 1

UC17-1	Use Case	Checking player controls – UC1 Step 2 - (medium-level)
UC17-2	Author	Leo Grant
UC17-3	Date	10/12/21
UC17-4	Purpose	The player should be able to access instructions as to how to play the game.
UC17-5	Overview	Starts when the system loads up the home menu. The player clicks on the controls button. The system loads up the controls. The player clicks on the return home button. The system loads up the menu.
UC17-6	Cross Reference	R27
UC17-7	Actors	Player
UC17-8	Pre-Condition	UC17-Pre-1: The game is open (not playing), but the system is already being directed to load the home menu.
UC17-9	Post-Conditions	UC17-Post-1: The player has been instructed on how to play the game and may now start the game from the menu.

Actor Actions	System Actions
2. Player clicks on the controls button. 4. Player clicks on the return home button.	1. System loads up the home menu. 3. System loads up the controls description page. 5. System loads up the main home menu.

UC17-10	Alternative Flow of Events:	• None.
UC17-11	Exceptional Flow of Events:	• None.

7.8.2   Use Case 18

<u>UC18 - Version 1</u>

UC18-1	Use Case	Checking character backstory – UC1 Step 2 - (medium-level)
UC18-2	Author	Leo Grant
UC18-3	Date	10/12/21
UC18-4	Purpose	The player should be able to access the characters backstory.
UC18-5	Overview	Starts when the system loads up the home menu. The player clicks on the story button. The system loads up the story. The player clicks on the return home button. The system loads up the menu.
UC18-6	Cross Reference	R26
UC18-7	Actors	Player
UC18-8	Pre-Condition	UC18-Pre-1: The game is open (not playing), but the system is already being directed to load the home menu.
UC18-9	Post-Conditions	UC18-Post-1: The player has seen the backstory of the game and may now start the game from the menu.

Actor Actions	System Actions
2. Player clicks on the story button. 4. Player clicks on the return home button.	1. System loads up the home menu. 3. System loads up the story page. 5. System loads up the main home menu.

UC18-10	Alternative Flow of Events:	• None.
UC18-11	Exceptional Flow of Events:	• None.

7.8.3 Use Case 19

<p align="center">UC19 - Version 1</p>

UC19-1	Use Case	Exploring the Coin Shop – UC1 Step 2 (medium-level)
UC19-2	Author	Leo Grant
UC19-3	Date	10/12/21
UC19-4	Purpose	The player should be able to access a coin shop to spend their coins.
UC19-5	Overview	Starts when the system loads up the home menu. The player clicks on the Coin Shop button. The system loads up the Coin Shop. The player clicks on the return home button. The system loads up the menu.
UC19-6	Cross Reference	R28
UC19-7	Actors	Player
UC19-8	Pre-Condition	UC19-Pre-1: The game is open (not playing), but the system is already being directed to load the home menu.
UC19-9	Post-Conditions	UC19-Post-1: The player has seen been allowed access to the coin shop.

Actor Actions	System Actions
	1. System loads up the home menu.
2. Player clicks on the Coin Shop button.	
	3. System loads up the Coin Shop.
4. Player clicks on the return home button.	
	5. System loads up the main home menu.

UC19-10	Alternative Flow of Events:	• None.
UC19-11	Exceptional Flow of Events:	• None.

7.9 Use Case Tests

The following test was completed at the end of Sprint 7. The test passes if the use case runs as defined.

Use Case	Test Result	Reason for failure
UC1	Pass	-
UC2	Pass	-
UC3	Pass	-
UC4	Pass	-
UC5	Pass	-
UC6	Pass	-
UC7	Pass	-
UC8	Pass	-

UC9	Pass	-
UC10	Pass	-
UC11	Pass	-
UC12	Pass	-
UC13	Pass	-
UC14	Pass	-
UC15	Pass	-
UC16	Pass	-
UC17	Pass	-
UC18	Pass	-
UC19	Pass	-

7.10 CRC Cards

The following CRC cards were either created or updated in this sprint

7.10.1 menu_UI_Controller

Class Name: menu_UI_Controller	
Version: 3	
Cross Reference: UC1, UC16, UC17, UC18, UC17, UC19	
Responsibilities: Start game (i) Exit game (i) Display high score (ii) Load character backstory scene (iii) Load player controls scene (iv) Load Coin Shop Scene (v)	Collaborators: (i) game_State_Controller (ii) SaveGame (iii) BackStory_UI_Controller (iv) Controls_UI_Controller (v) CoinShop

Description wrt. Collaborators:

(iii) The game_State should be changed by the menu_UI_Controller to "play" when the Start button is clicked.
(iv) The value of the high score is accessed via the SaveGame class, to display on the menu.
(v) Load character backstory scene and return to main menu via BackStory_UI_Controller.
(vi) Load character backstory scene and return to main menu via Controls_UI_Controller.
(vii) Load character backstory scene and return to main menu via CoinShop.

7.10.2 BackStory_UI_Controller

Class Name: BackStory_UI_Controller	
Version: 1	
Cross Reference: UC18	
Responsibilities: Facilitates the user returning to the main menu from Backstory scene by pressing the back button.	Collaborators: (I) menu_UI_Controller

Description:

(i)   menu_UI_Controller use to load backstory scene. BackStory_UI_Controller used to load home menu.

7.10.3 Controls_UI_Controller

Class Name: Controls_UI_Controller

Version: 1	
Cross Reference: UC17	
Responsibilities: Facilitates the user returning to the main menu from Controls scene by pressing the back button.	Collaborators: (I) menu_UI_Controller

Description wrt. Collaborators:

(i)   menu_UI_Controller use to load Controls scene. Controls_UI_Controller used to load home menu.

7.10.4 CoinShop

Class Name: CoinShop	
Version: 1	
Cross Reference: UC19	
Responsibilities: Allow the purchase of additional support with coins if the user has enough saved coins (ii) Updated coin count if coins are spent (ii) Add bonus/multiplier to the score of the next game (iii) Facilitates the user returning to the main menu from Coin Shop scene by pressing the back button. (i)	Collaborators: (I) menu_UI_Controller (ii) SaveGame (iii) score

Description wrt. Collaborators:

(i)   menu_UI_Controller use to load Coin Shop scene. CoinShop used to load home menu.

(ii)   Uses the coin count of the SaveGame class to buy items from the shop. It then reduces the coin count stored in the SaveGame class.

(iii)   Works with the score class to change the score calculation algorithm depending on Coin Shop purchases.

7.10.5 SaveGame

Class Name: SaveGame	
Version: 2	
Cross Reference: UC12	
Responsibilities: Store and save the high score and coin count of the player.	Collaborators: (i) score (ii) menu_UI_Controller (iii) CoinShop

Description:

(ii) The score class will send a new high score to the SaveGame class for it to save.

(iii) The menu_UI_Controller accesses the high score and coin count from the SaveGame class to display on the menu. When the game is exited from the menu or a save button is pressed the current coin count and high score values should be saved to the save files.

(iv) Works with the score class to change the score calculation algorithm depending on Coin Shop purchases.

7.11 User Interface Design

Game Progress

Main menu

Controls
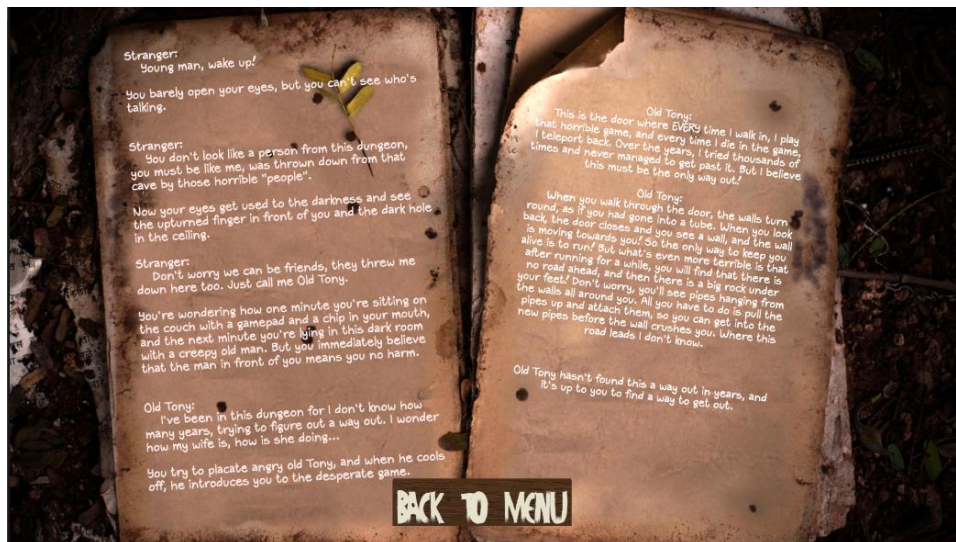
Story
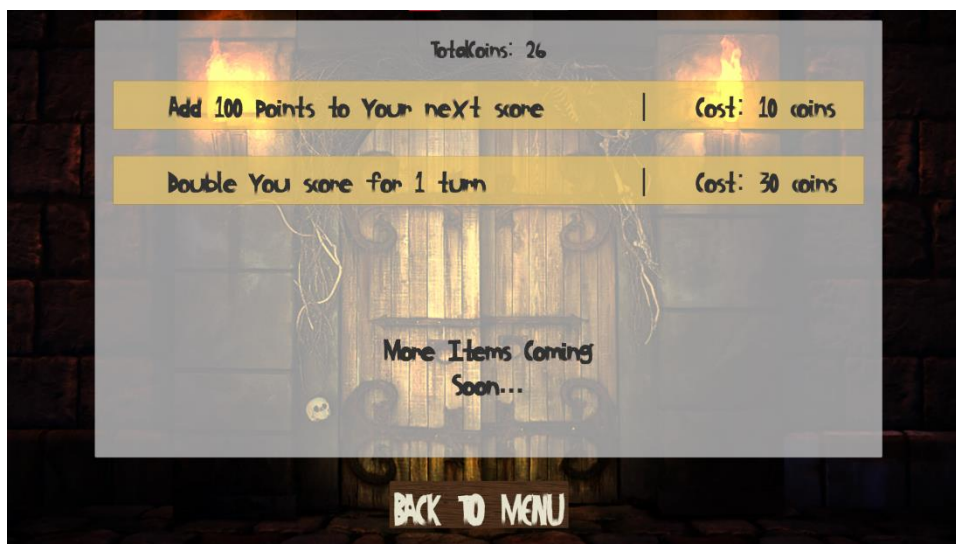
Coin Shop

7.12 Exception Handling

The challenges we faced during this sprint's tasks are outlined below, alongside their respective solutions:

Tasks	Challenges	Solutions
S7-T1	The change in character position was too subtle to be recognised.	Move the code from Update() to FixedUpdate() to increase the time between when it is called.
S7-T2	High Score text was not updating.	Accidently had a second script that was used as a placeholder that was overwriting the

		high score to 0 every time the menu was loaded.
S7-T3	Renaming files and classes lead to lots of errors in trying to run the game and GitHub Merging.	Make sure all class names and script names are the same.

Recreate a new development branch on GitHub. |
S7-T5	N/A No challenges.	N/A
S7-T6	N/A No challenges.	N/A
S7-T6	The button on the main menu was not acting correctly.	The child text object of the button had a large blank text box that would trigger the button if clicked, so the size of the text box needed to be reduced to fit the button size.
S7-T8	N/A No challenges.	N/A
S7-T9	The saved values were being loaded every time the menu scene started, even after a death, so if the player had a higher score, it would still default to the saved value.	Only load the values from the save files once, by only doing it if the current values are lower than those that are saved (this will only happen if the player has just launched the game), for coin count this had to be slightly altered once the player had the ability to spend coins.
S7-10	Implementing the bonus points into the score proved harder than expected, the score would not show correctly, it would either only state the bonus score or increase far too quickly.	I solved the issue by adding setting the additional bonus score in the start function than adding this score each update frame, to keep it from being lost. For the multiplier I set a separate Boolean, this was required so the score multiplier could be toggled to off once it had been used, but the score would still contain the multiplier for the remainder of that turn.
S7-T11	N/A No challenges.	N/A
S7-T12	N/A No challenges.	N/A
S7-T13	Finding the right level of detail to add to the guide, how much experience does the reader have?	Give a well-balanced view, with some of the unity basics explained, but with additional resources suggested if the user does not have much experience.
S7-T13	Ensuring there wasn't too much repetition in the guide.	Compared all scene/script descriptions to identify any similarities, then added references to those above.
S7-T14	N/A No challenges.	N/A
S7-T15	N/A No challenges.	N/A
S7-T16	N/A No challenges.	N/A

8 Appendix

8.1 User feedback questionnaires

Over the course of the project, we conducted tests of our game with people outside of the development team, these people included the friends and family of the group, we asked participants to play the game and fill out a questionnaire based on their experience playing the game. We used the questionnaires along with any extra feedback from the player to help prioritise tasks and discover new things to improve the game experience. Below are the completed questionnaires, each is dated so can be linked to a specific sprint. The questions were selected from a previous study that required user responses to a game.

Questionnaire 1
Received 28/11/21 – Sprint 5

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
Sometimes I lose track of time while playing the game.	○	●	○	○	○	○	○	○
I enjoy the sound effects in the game.	○	○	○	○	○	○	○	●
I am very focused on my own performance while playing the game.	○	○	○	●	○	○	○	○
I tend to spend more time playing the game than I have planned.	○	○	●	○	○	○	○	○
I think it is easy to learn how to play the game.	○	○	○	○	○	●	○	○
I enjoy playing the game.	○	○	○	●	○	○	○	○
I am in suspense about whether I will succeed in the game.	○	○	●	○	○	○	○	○
I think the information provided in the game (e.g., onscreen messages, help) is clear.	○	●	○	○	○	○	○	○
I am captivated by the game's story from the beginning.	○	●	○	○	○	○	○	○
I think the graphics of the game fit the mood or style of the game.	○	○	○	○	●	○	○	○
I feel successful when I overcome the obstacles in the game	○	○	○	●	○	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game is unique or original.	○	○	○	○	◉	○	○	○
I do not care to check events that are happening in the real world during the game.	○	○	◉	○	○	○	○	○
I think the game is fun.	○	○	○	◉	○	○	○	○
I always know how to achieve my goals/objectives in the game.	○	○	○	○	◉	○	○	○
I find the controls of the game to be straightforward.	○	○	○	○	◉	○	○	○
I enjoy the game's graphics.	○	○	○	◉	○	○	○	○
I want to do as well as possible during the game.	○	◉	○	○	○	○	○	○
Whenever I stopped playing the game I cannot wait to start playing it again.	○	◉	○	○	○	○	○	○
I enjoy the fantasy or story provided by the game.	○	○	◉	○	○	○	○	○
I feel very confident while playing the game.	○	○	○	○	◉	○	○	○
I am likely to recommend this game to others.	○	◉	○	○	○	○	○	○
I temporarily forget about my everyday worries while playing the game.	○	○	◉	○	○	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game's audio fits the mood or style of the game.	○	○	○	○	○	○	○	●
I feel bored while playing the game.	○	○	○	○	●	○	○	○
I feel the game trains me well in all of the controls.	○	○	○	●	○	○	○	○
I enjoy the music in the game.	○	○	○	○	○	○	○	●
I find my skills gradually improve through the course of overcoming the challenges in the game.	○	○	○	●	○	○	○	○
I can clearly understand the game's story.	○	●	○	○	○	○	○	○
I cannot tell that I am getting tired while playing the game.	○	○	●	○	○	○	○	○
I find the game's menus to be user friendly.	○	○	○	●	○	○	○	○
I feel the game gives me enough freedom to act how I want.	○	○	○	●	○	○	○	○
If given the chance, I want to play this game again.	○	○	●	○	○	○	○	○
I feel detached from the outside world while playing the game.	○	○	●	○	○	○	○	○
I find the game's interface to be easy to navigate.	○	○	○	○	●	○	○	○
I think the game is visually appealing.	○	○	○	●	○	○	○	○
I feel the game's audio (e.g., sound effects, music) enhances my gaming experience.	○	○	○	○	○	○	○	●
I can block out most other distractions when playing the game.	○	○	○	●	○	○	○	○

Questionnaire 2

Received 28/11/21 – Sprint 5

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
Sometimes I lose track of time while playing the game.	○	○	⊖	○	○	○	○	○
I enjoy the sound effects in the game.	○	○	○	○	○	○	○	⊖
I am very focused on my own performance while playing the game.	○	○	⊖	○	○	○	○	○
I tend to spend more time playing the game than I have planned.	○	⊖	○	○	○	○	○	○
I think it is easy to learn how to play the game.	○	○	○	○	⊖	○	○	○
I enjoy playing the game.	○	⊖	○	○	○	○	○	○
I am in suspense about whether I will succeed in the game.	○	○	○	○	○	○	○	○
I think the information provided in the game (e.g., onscreen messages, help) is clear.	○	○	○	○	⊖	○	○	○
I am captivated by the game's story from the beginning.	○	○	⊖	○	○	○	○	○
I think the graphics of the game fit the mood or style of the game.	○	○	⊖	○	○	○	○	○
I feel successful when I overcome the obstacles in the game.	○	○	○	⊖	○	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game is unique or original.	○	○	○	○	●	○	○	○
I do not care to check events that are happening in the real world during the game.	○	●	○	○	○	○	○	○
I think the game is fun.	○	●	○	○	○	○	○	○
I always know how to achieve my goals/objectives in the game.	○	○	○	○	●	○	○	○
I find the controls of the game to be straightforward.	○	○	○	○	○	●	○	○
I enjoy the game's graphics.	○	○	●	○	○	○	○	○
I want to do as well as possible during the game.	○	○	●	○	○	○	○	○
Whenever I stopped playing the game I cannot wait to start playing it again.	○	●	○	○	○	○	○	○
I enjoy the fantasy or story provided by the game.	○	●	○	○	○	○	○	○
I feel very confident while playing the game.	○	●	○	○	○	○	○	○
I am likely to recommend this game to others.	○	●	○	○	○	○	○	○
I temporarily forget about my everyday worries while playing the game.	○	●	○	○	○	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game's audio fits the mood or style of the game.	○	○	○	○	○	○	○	⊖
I feel bored while playing the game.	○	○	○	○	⊖	○	○	○
I feel the game trains me well in all of the controls.	○	○	○	○	⊖	○	○	○
I enjoy the music in the game.	○	○	○	○	○	○	○	⊖
I find my skills gradually improve through the course of overcoming the challenges in the game.	○	○	○	⊖	○	○	○	○
I can clearly understand the game's story.	○	○	○	⊖	○	○	○	○
I cannot tell that I am getting tired while playing the game.	○	○	⊖	○	○	○	○	○
I find the game's menus to be user friendly.	○	○	○	○	⊖	○	○	○
I feel the game gives me enough freedom to act how I want.	○	○	○	⊖	○	○	○	○
If given the chance, I want to play this game again.	○	⊖	○	○	○	○	○	○
I feel detached from the outside world while playing the game.	○	⊖	○	○	○	○	○	○
I find the game's interface to be easy to navigate.	○	○	○	○	○	⊖	○	○
I think the game is visually appealing.	○	○	○	○	○	○	○	⊖
I feel the game's audio (e.g., sound effects, music) enhances my gaming experience.	○	○	○	○	○	○	○	○
I can block out most other distractions when playing the game.	○	○	○	⊖	○	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
Sometimes I lose track of time while playing the game.	○	○	○	✔	○	○	○	○
I enjoy the sound effects in the game.	○	○	○	○	○	○	✔	○
I am very focused on my own performance while playing the game.	○	○	✔	○	○	○	○	○
I tend to spend more time playing the game than I have planned.	○	○	○	○	✔	○	○	○
I think it is easy to learn how to play the game.	○	○	○	○	✔	○	○	○
I enjoy playing the game.	○	○	○	✔	○	○	○	○
I am in suspense about whether I will succeed in the game.	○	○	○	○	✔	○	○	○
I think the information provided in the game (e.g., onscreen messages, help) is clear.	○	○	✔	○	○	○	○	○
I am captivated by the game's story from the beginning.	○	○	✔	○	○	○	○	○
I think the graphics of the game fit the mood or style of the game.	○	○	○	○	✔	○	○	○
I feel successful when I overcome the obstacles in the game.	○	○	○	○	○	○	✔	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game is unique or original.	○	○	○	○	✔	○	○	○
I do not care to check events that are happening in the real world during the game.	○	○	○	✔	○	○	○	○
I think the game is fun.	○	○	○	○	✔	○	○	○
I always know how to achieve my goals/objectives in the game.	○	○	○	○	○	✔	○	○
I find the controls of the game to be straightforward.	○	○	✔	○	○	○	○	○
I enjoy the game's graphics.	○	✔	○	○	○	○	○	○
I want to do as well as possible during the game.	○	○	○	✔	○	○	○	○
Whenever I stopped playing the game I cannot wait to start playing it again.	○	○	○	✔	○	○	○	○
I enjoy the fantasy or story provided by the game.	○	○	○	✔	○	○	○	○
I feel very confident while playing the game.	○	○	○	○	○	✔	○	○
I am likely to recommend this game to others.	○	○	○	✔	○	○	○	○
I temporarily forget about my everyday worries while playing the game.	○	○	○	○	✔	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game's audio fits the mood or style of the game.	○	○	○	○	○	○	✓	○
I feel bored while playing the game.	○	✓	○	○	○	○	○	○
I feel the game trains me well in all of the controls.	○	○	○	✓	○	○	○	○
I enjoy the music in the game.	○	○	○	○	○	○	✓	○
I find my skills gradually improve through the course of overcoming the challenges in the game.	○	○	○	○	○	✓	○	○
I can clearly understand the game's story.	○	○	○	✓	○	○	○	○
I cannot tell that I am getting tired while playing the game.	○	✓	○	○	○	○	○	○
I find the game's menus to be user friendly.	○	○	○	○	○	✓	○	○
I feel the game gives me enough freedom to act how I want.	○	○	○	○	○	✓	○	○
If given the chance, I want to play this game again.	○	○	○	○	✓	○	○	○
I feel detached from the outside world while playing the game.	○	○	○	✓	○	○	○	○
I find the game's interface to be easy to navigate.	○	○	○	○	○	✓	○	○
I think the game is visually appealing.	○	○	✓	○	○	○	○	○
I feel the game's audio (e.g., sound effects, music) enhances my gaming experience.	○	○	○	○	○	○	✓	○
I can block out most other distractions when playing the game.	○	○	✓	○	○	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
Sometimes I lose track of time while playing the game.	○	○	○	○	●	○	○	○
I enjoy the sound effects in the game.	○	○	○	○	○	●	○	○
I am very focused on my own performance while playing the game.	○	○	○	○	○	●	○	○
I tend to spend more time playing the game than I have planned.	○	○	○	○	○	●	○	○
I think it is easy to learn how to play the game.	○	○	○	○	○	●	○	○
I enjoy playing the game.	○	○	○	○	○	●	○	○
I am in suspense about whether I will succeed in the game.	○	○	○	○	○	●	○	○
I think the information provided in the game (e.g., onscreen messages, help) is clear.	○	○	○	○	○	●	○	○
I am captivated by the game's story from the beginning.	○	○	○	●	○	○	○	○
I think the graphics of the game fit the mood or style of the game.	○	○	○	○	○	●	○	○
I feel successful when I overcome the obstacles in the game.	○	○	○	○	○	●	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game is unique or original.	○	○	○	○	●	○	○	○
I do not care to check events that are happening in the real world during the game.	○	○	○	○	○	●	○	○
I think the game is fun.	○	○	○	○	○	●	○	○
I always know how to achieve my goals/objectives in the game.	○	○	○	○	○	○	●	○
I find the controls of the game to be straightforward.	○	○	○	○	○	●	○	○
I enjoy the game's graphics.	○	○	○	○	○	○	●	○
I want to do as well as possible during the game.	○	○	○	○	○	○	●	○
Whenever I stopped playing the game I cannot wait to start playing it again.	○	○	●	○	○	○	○	○
I enjoy the fantasy or story provided by the game.	○	○	○	○	○	●	○	○
I feel very confident while playing the game.	○	○	○	●	○	○	○	○
I am likely to recommend this game to others.	○	○	○	○	○	●	○	○
I temporarily forget about my everyday worries while playing the game.	○	●	○	○	○	○	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game's audio fits the mood or style of the game.	○	○	○	○	○	○	●	○
I feel bored while playing the game.	○	○	●	○	○	○	○	○
I feel the game trains me well in all of the controls.	○	○	○	○	○	●	○	○
I enjoy the music in the game.	○	○	○	○	○	●	○	○
I find my skills gradually improve through the course of overcoming the challenges in the game.	○	○	○	○	●	○	○	○
I can clearly understand the game's story.	○	○	○	○	○	○	●	○
I cannot tell that I am getting tired while playing the game.	○	○	○	●	○	○	○	○
I find the game's menus to be user friendly.	○	○	○	○	○	○	●	○
I feel the game gives me enough freedom to act how I want.	○	○	○	○	○	●	○	○
If given the chance, I want to play this game again.	○	○	○	○	○	●	○	○
I feel detached from the outside world while playing the game.	○	○	○	●	○	○	○	○
I find the game's interface to be easy to navigate.	○	○	○	○	○	○	●	○
I think the game is visually appealing.	○	○	○	○	○	○	●	○
I feel the game's audio (e.g., sound effects, music) enhances my gaming experience.	○	○	○	○	○	○	●	○
I can block out most other distractions when playing the game.	○	○	○	○	●	○	○	○

Questionnaire 5

Received 14/12/21 – Sprint 7

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
Sometimes I lose track of time while playing the game.	○	○	○	○	●	○	○	○
I enjoy the sound effects in the game.	○	○	○	○	○	●	○	○
I am very focused on my own performance while playing the game.	○	○	○	○	○	○	●	○
I tend to spend more time playing the game than I have planned.	○	○	○	○	●	○	○	○
I think it is easy to learn how to play the game.	○	○	○	○	○	○	●	○
I enjoy playing the game.	○	○	○	○	○	○	●	○
I am in suspense about whether I will succeed in the game.	○	○	○	○	○	●	○	○
I think the information provided in the game (e.g., onscreen messages, help) is clear.	○	○	○	○	○	●	○	○
I am captivated by the game's story from the beginning.	○	○	○	○	●	○	○	○
I think the graphics of the game fit the mood or style of the game.	○	○	○	○	○	○	●	○
I feel successful when I overcome the obstacles in the game.	○	○	○	○	○	●	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game is unique or original.	○	○	○	○	○	●	○	○
I do not care to check events that are happening in the real world during the game.	○	○	○	○	●	○	○	○
I think the game is fun.	○	○	○	○	○	●	○	○
I always know how to achieve my goals/objectives in the game.	○	○	○	○	●	○	○	○
I find the controls of the game to be straightforward.	○	○	○	○	○	●	○	○
I enjoy the game's graphics.	○	○	○	○	○	●	○	○
I want to do as well as possible during the game.	○	○	○	○	○	●	○	○
Whenever I stopped playing the game I cannot wait to start playing it again.	○	○	○	●	○	○	○	○
I enjoy the fantasy or story provided by the game.	○	○	○	○	●	○	○	○
I feel very confident while playing the game.	○	○	○	●	○	○	○	○
I am likely to recommend this game to others.	○	○	○	○	●	○	○	○
I temporarily forget about my everyday worries while playing the game.	○	○	○	○	○	●	○	○

Statement	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I think the game's audio fits the mood or style of the game.	○	○	○	○	○	⬤	○	○
I feel bored while playing the game.	○	⬤	○	○	○	○	○	○
I feel the game trains me well in all of the controls.	○	○	○	○	⬤	○	○	○
I enjoy the music in the game.	○	○	○	○	○	⬤	○	○
I find my skills gradually improve through the course of overcoming the challenges in the game.	○	○	○	○	⬤	○	○	○
I can clearly understand the game's story.	○	○	○	○	⬤	○	○	○
I cannot tell that I am getting tired while playing the game.	○	○	○	⬤	○	○	○	○
I find the game's menus to be user friendly.	○	○	○	○	○	⬤	○	○
I feel the game gives me enough freedom to act how I want.	○	○	○	○	○	⬤	○	○
If given the chance, I want to play this game again.	○	○	○	○	⬤	○	○	○
I feel detached from the outside world while playing the game.	○	○	○	○	⬤	○	○	○
I find the game's interface to be easy to navigate.	○	○	○	○	○	○	⬤	○
I think the game is visually appealing.	○	○	○	○	○	⬤	○	○
I feel the game's audio (e.g., sound effects, music) enhances my gaming experience.	○	○	○	○	⬤	○	○	○
I can block out most other distractions when playing the game.	○	○	○	○	○	⬤	○	○