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Nguyen Dinh Nam

# Effective Game Product Development

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<p>The purpose of this thesis was to study the process of making a game software for commercialization in an efficient way. As the game industry is still young and growing rapidly, the foundational knowledge is unlike the economy or music ones. There are rooms for experimenting and innovating as well as the demand for talents to produce games with decent qualities to expand and push the boundaries of the market.</p> <p>First half of the paper shapes around the key elements of the game development process to fit in the scheme of business and production. This part will see through the ultimate purpose of having a transcendent pipeline so that the product can reach its best version of outcome.</p> <p>The rest of the thesis focuses on the results of the literature review which is the craftsmanship of LilyPop, an artistic arcade two-hour game produced, part-time, in 19 months. This part also explains how the execution makes use of the researched theories and how I applied them. By having a concentration on the artistry of both the artwork and storyline, the game attempts to shift the spotlight of the industry towards games that create a beautiful platform to introspect and reflect on players' life experiences like its precedents: Journey or Gris.</p>	
Keywords	Game, project, development, management, production

## Contents

### List of Abbreviations

1	Introduction	1
2	The quest for a delicate workflow	1
3	The core components of game development	4
3.1	Game design and writing story	4
3.2	Graphics	6
3.3	Music and sounds	7
3.4	Project management	7
3.5	Business development	8
4	LilyPop	11
4.1	Timeline	11
4.2	Game Development Process	16
4.2.1	Arcade Game Design	17
4.2.2	2D Artistic And Abstract Graphics	21
4.2.3	Programming	29
4.2.4	A Full Album Of Music And Sounds.	35
4.2.5	A Bittersweet Story	36
4.2.6	Project Management	38
4.2.7	Business Development	41
5	Results	43
6	Conclusion	44
	References	45
	Appendices	
	Appendix 1. Title of the Appendix	
	Appendix 2. Title of the Appendix	

## List of Abbreviations

DLC	Downloadable Content.
LOL	League Of Legends.
MOBA	Multiplayer Online Battle Arena.

## 1 Introduction

In a developing world focused on digital products and software, computer games have evolved into an enormous industry competitively generating revenue with other entertainment mediums like movies and music. In their book, Jane McGonigal mentioned that, developers, by the year of 2012, had turned these digital creations into an industry that had the potential to create 52 billion euros annually. To support this, the author also brought in head counts of gamers participating in online game communities in different game-centric areas, and the numbers prove to be explosive [1, pp.3-4]. Counting all the gaming platforms together: console, PC and mobile phone, the figures show that there are 4 million gamers in the Middle East, 10 million in Russia, 105 million in India, 10 million in Vietnam, 10 million in Mexico, 13 million in Central and South America, 15 million in Australia, 17 million in South Korea, 100 million in Europe and 200 million in China.

Back to when things were simple, the old masters had had their own freedom in creating their own gaming genres by mixing together clean pixel art and structured programming. After decades up until now, the world has familiarized with the concept of blockbuster games fueled by millions and millions of euros [2]. When the whole gaming scene embraced the existence of big funds and budgets, things started to get serious as well as supporters of the industry developed their standards for what they were going to spend money on. To satisfy the expectations, game projects started to show a need for a fluent workflow and management so that the workforce could navigate through the journey full of challenges to the achieve the highest form of quality.

## 2 The quest for a delicate workflow

In *Blood, Sweat And Pixels*, Jason gives a clear impression that producing video games is generally grueling and simply hard, given the same approach has been used in the start of any game making journey [3, p.15]. They first start with building up a team of artists, programmers and designers, then they count the number of the staff to make sure it fits the budget. A producer is present to push things following plans and schedule. Sound and music composers are brought in to create atmosphere for the game worlds.

Marketing masters blend in to wrap up the promotion work. If this is the common knowledge and has been passing around in the industry since 1970s, which are decades of learning and experiences, it is questionable that game developers still face the reality of bingeing and crunching. There were theories developed around the unpredictability of crafting commercial games which causes the whole development process difficult to be mastered.

Firstly, video games are interactive. How consumers experience video games are not anything like how they do with movies and animations. It's a planned realm of possibilities. In his research, Ted Friedman transformed his definition of computer games into "The New Hollywood", in comparison with "Old Hollywood" [4]. To them, games are interactive cinema. When participating in a game, the players are the protagonists, and they make the decisions for how the events in the storyline happen. Traditional Disney movies on another hand would render a series of computer-generated graphics along a timeline with a script controlling how the characters interacting with each other and how they cause the events happening on screen, which would engage the audience in as observers without influence.

The second challenge being mentioned is the unpredictable and fast-paced change of technology. The authors of "Disabling Barriers – Enabling Environments" emphasised this fact by discussing how this pace accelerated by the year [5]. What has been created today and engaged in work places and daily lives used to be the imagination of fictions just around half a century ago. Such technologies and information systems we've taken for granted changed the society we are living in. From an interview with Feargus Urquhart, the CEO of Obsidian Entertainment, the author of "Blood, Sweat and Pixels" realised how being on the edge of technology made the whole game development process more challenging [3]. If crafting games are like shooting movies, it will require a whole new custom camera to get started. The evolve of computers results in more powerful graphic processor which raises the bar of expectations for more dope-looking games. Trying to adapt to these expectations was described as monitoring a train towards a worker laying down the tracks as the train travels.

When Halo Wars was going through the final stages of quality assurance after years of producing features, Chris Rippy, producer of the project, talked about how difficult it was

to cut out features to make sure the product is complete to be able to launch [6]. By having gone through this tough choice he also provided the team with an appropriate concentration on the most fundamental features of the game so that the project can reach for the day light. While going through an interview with Jason, Chris recalled how challenging scheduling game projects can be despite his status as a veteran producer [3]. With normal software development, based on the previous experiences with producing features, one can draft up a rough schedule estimating how long the project is going to take to finish. In games, for example with the artists, it requires them to create a piece of art, which is rather intuition-based task than a fact-based task. Then, when the art piece is installed in the build, it would influence the game in a different way than the producer can imagine, which leads to an immediate pack of questions on how to forward from here, rather than seeing it in advance.

To continue, Chris also raised a tough challenge for the game development conquest: "Where is it fun?". Truthfully, with proper research, designers can make sure their plans turn into something interesting. However, one can only truly feel the excitement of playing games only when they get their hands to it [7]. Emilia Schatz, a designer at Naughty Dog, discussed about the uncertainties of knowing if their work felt good to play with when she started get her hands around the pre-production of The Last Of Us II. Her whole team had to go through building quite many prototypes to really define the nature of the game. They tried to come up with new traversals in the game environment including: prone crawling, squeezing through small gaps, and Emilia even made jokes about exploring double-jumping in a realistic environment. All of this work was the team's effort to search for the right amount of traversal in the game. Emilia shares with Jason how scary it can be for even experienced designers like her to go through of all of this planning in her head and it can turn out to be terrible when play-testing.

With all of the odds and the challenges of the game development process, it is useful to explore its definition to tackle the causes rather than dealing with the consequences.

### 3 The core components of game development

The question to begin the process of understanding what it takes to produce a commercial game is to take a step back to look at the big picture of game development. What are the elements of this artwork? Is it the people sitting in front of laptops typing in lines of code? Is it the pretty hands swinging on the screen trying to recreate the realistic world in a different approach? Is it the mighty brains figuring out what interactions are happening in their design? Is it the campaigners trying to bring the image of the product to the consumers? Or is it the investors and shareholders judging the potential of a proposed vision? It is important to acknowledge that game development leading to a commercial product involves individuals from various backgrounds and professions to work together as a team [8]. With this theory being laid out, in this section each of the core components will be examined roughly for the purpose of understanding the gist of what's necessary to produce a game.

#### 3.1 Game design and writing story

In their book, Jesse Schell shows the importance of grabbing the definition of game design [9]. They see the subject as an act of deciding what a game really is should not be based on a single decision, but a series of decisions that go through one's thinking. The author also addresses designers to write down their thinking to further help the team soon to be involved with the design to understand those decisions. Or according to Gary Austin, they see a game designer as a talent using the interaction of players and set them in boundaries of rules to emerge an experience out of them [10]. In Alejandro's article, they collect these elements and mention the importance of "fun" in game designs [11]. They dig deeper into the researches of the definition of games, and understand that game design requires the designer to invent a set of fun activities grounded by rules, in which player's interactions are necessary and they use this to go through challenges with their own decision-making power, eventually bring out an experience for themselves.

A minor part of game designing would involve writing a compelling narrative, which requires the worker to spend extra effort in figuring out the story arc and direction. They would need to combine the story with the missions or the interactivity in the game, or how characters would form dialogues in a believable and natural manner [12, p.41].

Achieving the whole storyline is quite direct but required two key things: a great deal of logical thinking and imagination. In writing a plot, it is important to keep generating events, as long as they make sense and have logical reasons. Fundamental questions like: "Why? What? How? And where?" needed to be asked very frequently while writing the story [13]. An instant example would be:

- Event A leads to Event B leads to Event C.
- Event C happens because of Event B because of Event A.
- Event B always needs to be a bridge between Event A and Event C.

An event always has a precedent and a follower. Logical thinking is applied in creating events to make sure what happens before connects to what happens now and builds up a platform for what happens next. When exploring the story and universe, players will start asking a great deal of questions about the world the characters are being in. Where is this? How is that place looking like? What are existing in that imaginary place? What kind of objects or creatures behaving in that environment? How are all of these interacting and relating to each other? Answer these questions a writer would forward the game better to the players by painting a detailed and lively world with careful choice of descriptive words so that players can live in and experience to their best senses.

Regardless, in reality, it is a quite difficult job to be able to craft an original game of one's original design and see it all the way through commercial release [12, p.63]. Each creation would have its own methods and approaches to how it was funded and created. The most common case in the industry is that a publisher or the studio head of an accomplished game development enterprise handle the business components to be rightly placed so that the game can have a safe platform to be properly produced.

## 3.2 Graphics

Back in the very beginning of the game industry it used to be a one single artist handling the character sprites and the world backgrounds for those pixel protagonists to execute their missions [12]. Around the mid-80s a game project started to recruit no more than three artists to work together in a team. In the early 90s, the boom for art standards and big budgets started showing. Classic examples would be Wing Commander 4 by Origin trying to adapt live-actions so that it behaves like a movie [14]. Or how Japanese' Final Fantasy 3 focused on blocky polygons and low-res textures to make sure the game holds it standards for 3D handheld game supported by Nintendo 3DS [15].

Scroll the timeline to present, creating art nowadays requires a vast area of skill sets. [12, p.47]. It may ask the artist to generate the visibility of the game world through sketches of specific imaginary locations and characters. It may require lots of painting backdrops, tiles and sprites for use in non-3D game engines, which further requires fluency in Photoshop and Illustrator. Or when jumping into 3D, artists should be familiar with shapes, planes, vertexes, knowing how to operate these packages in popular 3D software like Blender or 3DS Max. They would be interested in crafting up mechanical things like tanks, guns and buildings while the others concentrate on organics of characters. Then they would need to skin those 3D objects in their minds and paint them using their versatile 2D skill set. And then games would be lifeless if there are no animations in those characters, animals or monsters. There are two common methods to create game animations: key framing and motion capture. Key framing has been existing since the beginning of animation, a different skillset from 3D modeling or texturing. Motion capture is evolving and causing buzz in the industry, in which it requires a camera to record real human actor to take their motion data to be used. A very early example of the existence of motion capture is the work of Jordan Mechner capturing his brother David climbing up the wall to create animations for the game Prince of Persia [16]. When the game was a hit in 1989, it was praised for how the animation of the game stood ahead of time, laying the ground work for motion capture in 3D later on.

Regardless of how evolving or difficult it is, it all comes down to the quest of creating a look for the game product. That's how graphics works!

### 3.3 Music and sounds

The act of experiencing a video game engages three senses [17]. Most of the experience goes through the sight, how a player takes in the tremendous vivid-looking boss appearance they are fighting with. In the middle of the fight the player hard-rotates their thumb on the joystick and suddenly vibration from the controller announces they get critical damage. And then, how the player would be triggered to frustration along the intense music flow through the battle they are dealing with have every reason to do with every notes thumping into their ears provoking them to try and try again.

Indeed, it is undeniable that music is the oldest art form worldwide [12, p.50]. Emotions can be easily drawn out with the right kind of powerful music. A great example of good use of music would provoke the vulnerable side of players and invite them in deeper into reflection would be *Gris*, a narrative artistic adventure game. In an interview, Nomada Studio talked about how the music track slid in as the player went through solving the puzzle in a melancholic manner, called out different part of their minds to introspect and resonate with a question of deeper meaning [18].

Music is just that important to form up a game, same as sound effects or voice-overs. They help convey the environment and realize the interactions and actions happening in the game. Sound effect engineers would find magic in searching for that mysterious tune so that they can stretch and twist until they find it satisfying to represent the interaction happening in the game. Voice-over otherwise just simply is a reliable tool to bring a game to life. In *Strike Commander* by Origin released in 1993, every character was fully voiced as the game focused heavily on plots and conversations [19]. This work really helped defining the characters in the game as the player participated in commanding their team full of wingmen.

### 3.4 Project management

Management of a game project is stated to be one of the most crucial part of the process [12, p.73]. The individual who is responsible for handling the project affects the ability to perform of other members, like programmers or artists. Hence, the job can be shared

between a group of talents with different responsibilities. Nevertheless, this short list will captivate the gist of what needed to be done in the field [20].

- Game project managers engage and involve the team, lead them all the way through the end on time and within budget.
- They create schedules, assign tasks to members of the team, work on the communication to transfer tasks in between so that everyone works on something and nothing gets blocked.
- They calculate salaries, application tools and license fees.
- They are inspiring leaders.
- They interact with the press circle to promote the project.
- They notice and tackle problems with workflow and solve miscommunications/conflicts.

To sum up, like Kennedy confidently states in his book, that leadership and management's mission is about showing relentless commitment. Wherever they go they establish a strong urge and hunger for the project progress so that actions from people around them can be awakened. Then they articulate their vision and set goals so that the team can follow through until all achieve the destined victory. Without them and their will, it is impossible to hold the long-term focus on the established vision [21, p.154].

### 3.5 Business development

Software has made an unthinkable impact to economy through their values to individuals and businesses [22]. Game products belong to this movement. It is vital to incorporate business development into the very first designs of a game so that when it is completed, the game can work itself to generate financial values.

As mentioned above, the first foremost step to develop a business out of a project is to think about it [23, pp.53-55]. Contemplate on questions like:

- How does one sell this game?
- What differentiates this game with the others on the market?
- Which features of the game generating financial values?

The core thinking of the process would be involving around how to come up with features or strategies that would benefit the gameplay and also attract financial opportunities. With this fundamental theory being painted, let's study the example of how the game League of Legends designs their business strategies around the characters' skin production.

League of Legends is a game of MOBA genre (an online virtual battle with 5 members each team), with around up to 100 characters enriched with stories and universes they exist in [24]. Now imagine each character in the game has their own storyline and a visual to define them in the LOL's universe. Based on this visual, from time to time, the studio will create a new look for that character with a corporate theme to bring in an interesting concept or to simply celebrate an occasion.

Let's study the case better with a champion named "Ahri" in Table 1.

Table 1. Detailed study case of Ahri's skins

Skin name	Appearance	Quick description
Original		The first visual of Ahri: a nine-tailed fox mage using magics of orbs and victims' life essence.
Academy		Installed in "Academy" skin line. In this theme, Ahri plays as a female high school student, along with other "students" being roleplayed as other characters.
Arcade		Installed in "Arcade" universe, Ahri plays as a character from 80s arcade games having 8-bit music, pixel arts and objects.

Star Guardian		Installed in "Guardian" universe, along with other guardians (other characters as well), Ahri here plays as a protector of the universe with the ability to transform magically from an ordinary girl to a Magical Fighter.
K/DA		Ahri here is reimagined as a Popstar singer with her band named "K/DA". She dances a cool choreography and sings in Korean and has her own Music Video with the band on YouTube.

Table 1 shows that the new looks on a same champion will refresh the atmosphere, bring new angles and depths to the character. These creations will be charged at 2-3 euros, which is a natural buy towards the players who are frequent with this character.

To continue, in Table 1, the K/DA band was mentioned as a group of pop singers with other members, meaning, with this theme, not only Ahri carries this look, but the other champions in the same band share this concept with her.

Image 1 will present the rest of the band's members.



Image 1. K/DA Popstar band's members, from left to right: Kai'sa, Ahri, Akali and Evelynn

Image 1 shows that within the existing universe, other characters can share the concept and values can be generated from this fact. Meaning, in the future, if LOL wants to dig deeper into a specific skin line, they have a larger potential to approach their loyal

audience and get support from people who are already attached to the concept with their new creations so that they can collect more values.

Above is just a small aspect of the potential of the idea. Virtual music performers is an interesting territory to explore and discuss about.

While building up a game design, it is clever to also set up features that can open doors and lead to more values and profits [25]. Instant success can come from proper preparations but long-term success and values are more echoing and long-lasting with a long-prepared solid foundation.

## 4 LilyPop

The official name of the product is LilyPop, and this will be used throughout the whole documentation as a reference to the product itself. LilyPop has been developed since July 2017, part-time.

As a game, LilyPop contains 15 levels divided into 4 themes/chapters with graphics, music and a storyline to tie these elements together. Its gameplay is classic arcade: players shoot the bubbles existing in the level as they will split into two, four, and so on until they can't split anymore and then move on to the next level. LilyPop in general gives out a merely dark appearance but on the contrary the heart of the game is sweet and sentimental.

### 4.1 Timeline

This section will deliver the core milestones and events on the execution process of LilyPop so that readers can grab the simplest idea of the sequence of what happened and how they happened.

*In the earliest days*, after the team was roughly formed, members gathered around and started discussing on what game ideas they were having in mind.

Image 2 shows the result of the first few meetings that the team put effort in to draft out a potential game idea.

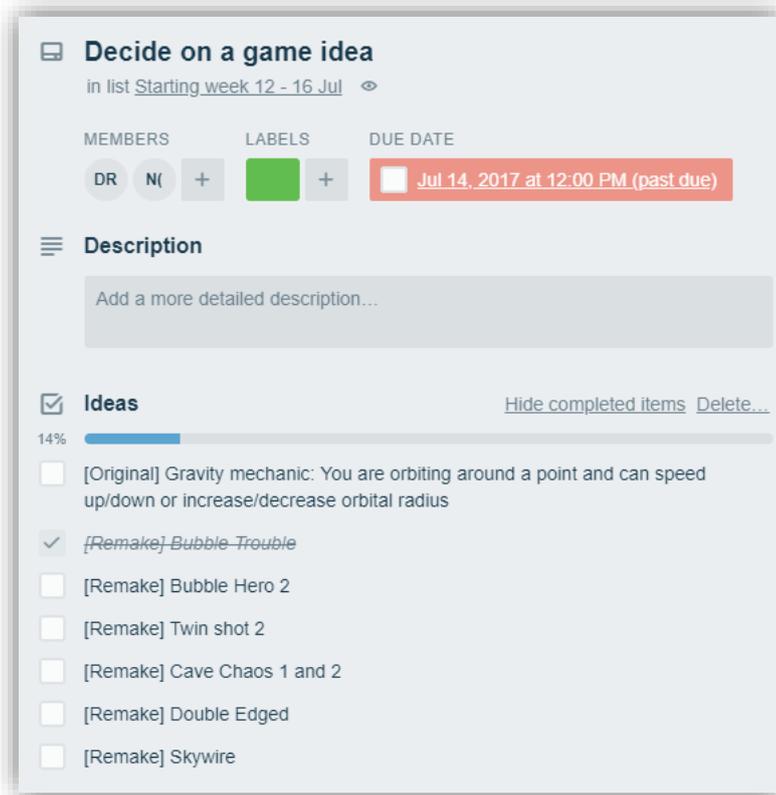


Image 2. Minute of first meeting on Game Design Trello Board.

As shown in Image 2, initially the mission assigned to the team was to complete a game project together. The team managed to draw out a couple of ideas so that members can do some research on before reaching for the final decision.

*To look for our initial game design*, in meetings mentioned in the previous sub-section, the team focused on researching for game ideas and references to select an appropriate one that could fit members' capability and executable in terms of project scope. The team browsed through many different game genres and decided to concentrate on flash games titles, which can be found mostly on famous flash game websites like Miniclip or

Kongregate. The team came down with a short list of these titles and started building up the project's earliest Trello boards.

After the given deadline, the team moved forward with the idea of remaking the old classic game: "Bubble Trouble" in a new and interesting direction.

Image 3 shows how Bubble Trouble looks like.

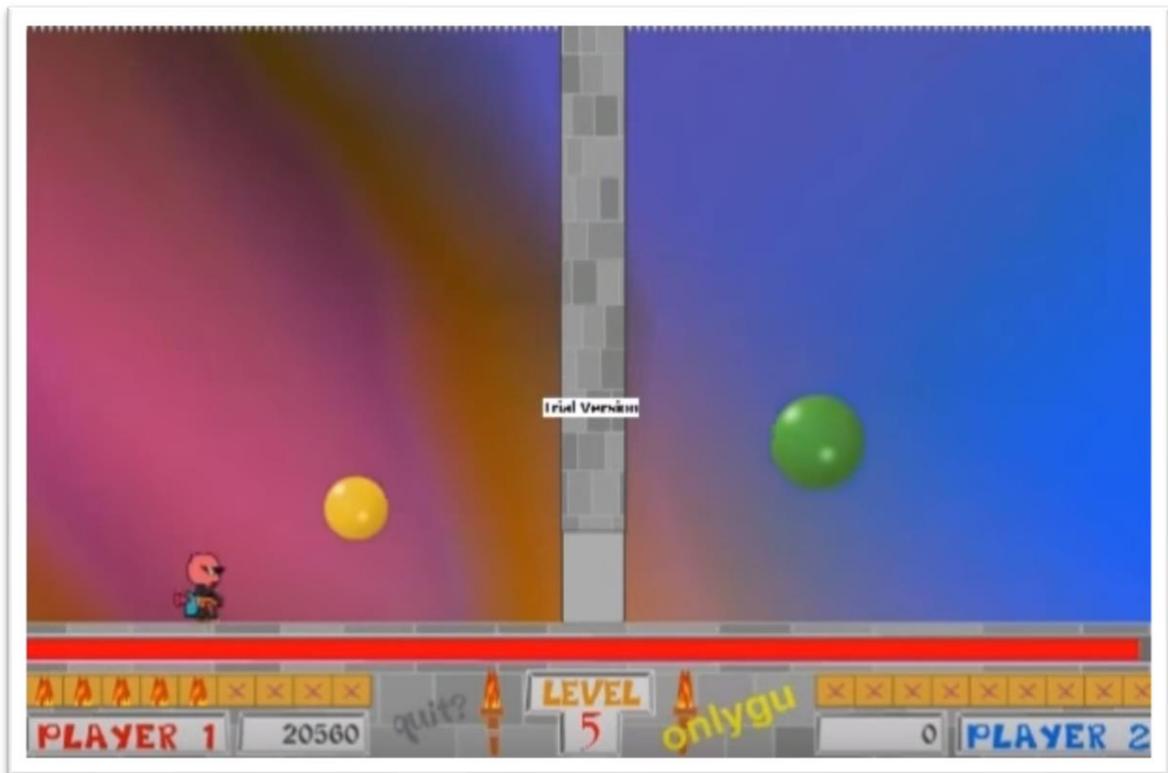


Image 3. Bubble Trouble gameplay.

As illustrated in Image 3, the main character, a pig spy, is assigned to a mission of clearing all of the balls in the area. The property of the balls is that they will split into two if they get shot by player's gun. There will be power-ups and new obstacles along the journey.

*In the first few weeks*, the team allocated some time in the beginning on delegating tasks, responsibilities and drafting out a roadmap for the project.

For the roadmap, the original intention was to accomplish this game as a summer game project, so the team set the scale of the game around two and a half months work.

After this process, the team moved on to selecting necessary technologies, as well as communication tools, to start building the software, which will be mentioned in later sections. With these preparations, the team started working on the first playable level of the game.

*During this first stage which is when LilyPop was taking form, with initial enthusiasm, the team worked very effectively and smoothly, moving from one objective to another. In six weeks, the game started to form around the first level, shaping up the first world/chapter of the game.*

Image 4 presents the first complete appearance of the project.

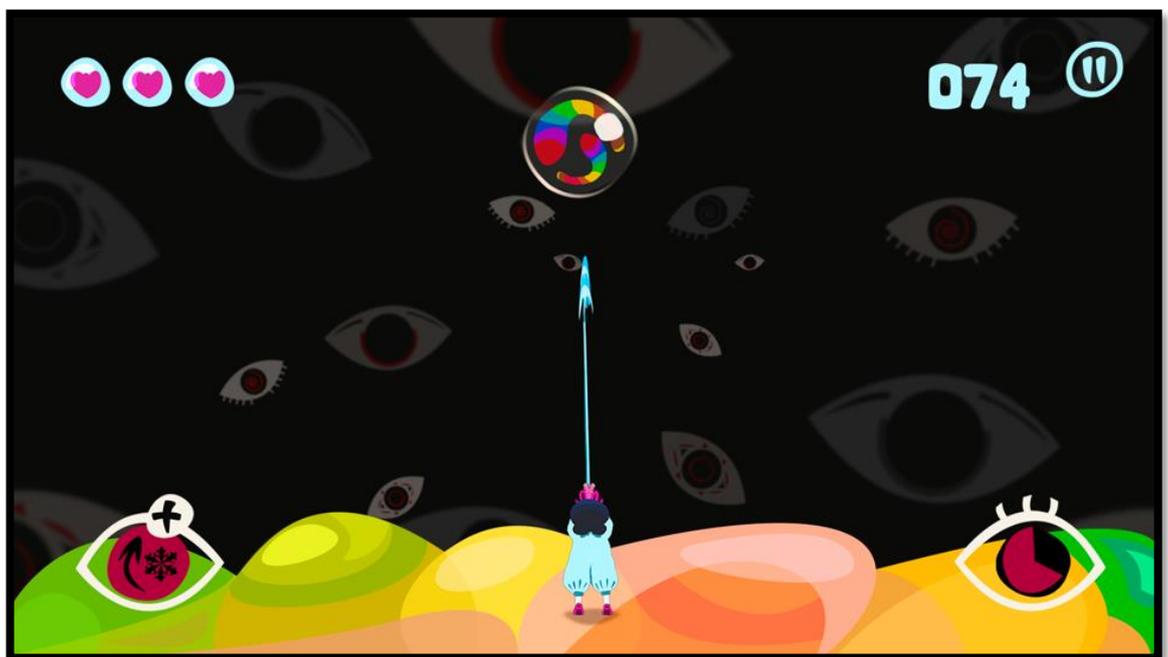


Image 4. The first complete graphic of the game

Illustrated in Image 4 in the complete graphic of the first playable level, containing all of the elements: UI components, player and gameplay components. This first production set a fundamental stepping stone for the future of the project.

With this momentum the next 6-7 weeks, LilyPop started to have levels 2,3,4, the first boss level, the first music track, the earliest animations for the character, the first sketches for the next worlds/chapters. The team kept the habit of having meetings every

10-14 days to communicate and lay out challenges so that those can be solved together. The team also made sure of being on the same page with ideas, timeline and workflow.

At the end of this stage, which was around November 2017, the team took a break and reevaluated the direction/vision of the project, as LilyPop was no longer a “Summer Game Project”.

*With the determination to make LilyPop into a complete game*, the team started to move back to developing around the beginning of 2018, with the attempt to implement the next 4-5 levels in the second world/chapter. Then, after many discussions, the team decided that LilyPop was going to have 15 levels in scale, and this was expected to be achieved in 4-5 months.

With this milestone established, the team kept moving forward with tasks and mini-achievements, ranged from designing level mechanics to shaping up the story for the main character.

In the middle of this stage, due to personal schedules and reasons, the team and Sofja Vanhanen decided to separate and let the team moving on to the next stage.

*During March, April and May, the game’s development took a peak* and the team had to handle a specific amount of pressure. This was due to two main reasons: the project started to transition from a prototype to a product and the project got exposed to business factors.

Firstly, with the transition, the 15 levels of the game are roughly implemented, each of them also carried a music track and part of the story. During this process, the project needed to adapt well with new features and constantly being challenged in consistency with what were implemented before.

Secondly, as the project started to see the public light of events, demos, contests and conferences, there was an external pressure on the project to match up with the quality of the projects being out there in the market. Moreover, the project had to adapt to features that could pave the way for commercializing the product.

At the end of this stage the project made constant progress and responded well to change. LilyPop then took the earliest shape as a game product and prepared itself for the pre-final stage.

Near the end of summer 2018, *the team geared up again to try to put a closure to the project*. The team's focus was on: implementing the minor but important features tying the project together, cutting out features seeming too ambitious and assuring the quality of the game. In addition to these above tasks, quite an effort was put into the game's story. This task focused on answering questions like: What is the message of the story? Will the story leave some marks in players' minds and hearts? Together with the coming end of the project, the team also put effort in generating marketing content and went through the registration formalities to set up an online store page for selling LilyPop.

## 4.2 Game Development Process

This major section will guide readers through the key methods the team used to produce LilyPop, based on the researched theories.

Assuming a 2D computer game in general carries a tight combination of these core elements:

- A game mechanic for players to interact with.
- 2D graphics to visualize what's being presented to the players.
- Codes and programming to build up this computer software.
- Music and sound to help convey the environment players interacting with.
- A storyline to tight these above elements together.

LilyPop chose to follow this structure and execute the idea on each of these aspects respectively with methods and strategies being precisely described in below sections.

#### 4.2.1 Arcade Game Design

There was quite an amount of discussions having been raised around the difficulty style of the game. The team tried to answer if players want the gameplay to be more hardcore or they want to have it easier to enjoy the feel of the game. After the project has progressed for a while, the team felt like the game should follow its own artistic direction and decided to tone down the difficulty of the levels.

As mentioned before, LilyPop took the direction of Bubble Trouble's game mechanic and worked on that platform. Below quote is a sum-up of the game's core mechanic:

“Players are given the option of moving on a 2D-rectangular platform and shooting a line-shaped bullet vertically from their weapon to split and clear all of the bubbles existing in that current level. “

The level system of LilyPop contains an amount of different worlds surrounding the designed core mechanic. Each world carries a different theme and the bubble type of that theme will influence the gameplay.

- In the first world (Rainbow), the Rainbow bubbles are split into two.
- In the second world (Aqua), the Aqua bubbles are split into four.
- In the third world (Clay), the Clay bubbles are split into two, but one of them is called 'Normal' while the other is 'Dark', which cannot be split and stay unbreakable until it is reversed back to 'Normal' automatically after 5 seconds.

The team decided to scale the amount of levels at 16, with 5 levels each world and the final level is a separate ending in an extra world. The detailed level design and their attributes are described in Table 2.

Table 2. Level design system of LilyPop

Level	Quick Description	Attributes
1 - Candyman	Introductory level, to familiarize the gameplay with the players and set the tone for the game.	<ul style="list-style-type: none"> <li>- The bubbles are shaped into two squares, moving in spiral-motion.</li> <li>- The terrain looks like candy being placed with each other, animated</li> </ul>

		<ul style="list-style-type: none"> <li>- The background eyes are animated opened and closed periodically.</li> </ul>
2 – Merry-Go-Round	In the same world with Level 1, represents a Merry-Go-Round/Carousel.	<ul style="list-style-type: none"> <li>- The bubbles bounce quite high and move at a higher speed, represent the horses on the Merry-Go-Round</li> <li>- The floor is animated.</li> <li>- The eyes peeking through the window holes animated.</li> </ul>
3 - Merry-Go-Square	A variation of Merry-Go-Round, with a pair of eyes centered in the middle, represents stalking.	<ul style="list-style-type: none"> <li>- The bubbles are generated one after another, every 5 seconds either from the left or the right eye hole.</li> <li>- The floor shaped of a colorful spiral swamp is animated.</li> </ul>
4 - Hemoglobin Lunar	A red eye looking down from the red round shapes representing red moon.	<ul style="list-style-type: none"> <li>- A large amount of bubbles in different sizes are floating very slowly in this level.</li> <li>- Strokes of gray curves animated representing the wind.</li> </ul>
5 – How Funny This Mortal Life Is	First world's Boss level	<ul style="list-style-type: none"> <li>- Boss moving from left to right and vice versa.</li> <li>- Boss summons two types of projectiles falling down to the floor every time it performs the attack animation.</li> <li>- The last bubbles contain the bullet to kill the boss</li> </ul>
6 – I Am Not A Poppy	First level of second world. Flora-geometric shapes in the background spilling out goose messing up the level's floor.	<ul style="list-style-type: none"> <li>- Introduction to Aqua bubbles</li> <li>- Two bubbles chasing in a circle at the beginning of the level.</li> </ul>
7 – Despicable Her	Early second world's Boss level	<ul style="list-style-type: none"> <li>- Second boss is portrayed as a stick woman shape with bizarre big head jumping around.</li> <li>- The boss can spawn a hair wall that can trap the player and the bubbles inside or a switch object that can turn off the light of the level.</li> </ul>
8 – The One That Gets Away	Introduce animated background components acting as timer	<ul style="list-style-type: none"> <li>- A giant bird flies from left to right with a time duration equals to the level's timer.</li> <li>- Bubbles group up to a wing shape flying around the level scene.</li> </ul>
9 – Going On A Picnic	A moderately casual level.	<ul style="list-style-type: none"> <li>- Two bubbles, one small, one big skipping from side to side on the scene.</li> </ul>
10 – Please Build A Better World For Me	Bubbles filling up the top of of the scene like stars filling in the night sky.	<ul style="list-style-type: none"> <li>- Bubbles of various sizes spin around themselves as players shoot them to scatter them all around</li> </ul>
11 – I Thought We Were The Same	Introductory level for third world: Clay and Clay Bubble.	<ul style="list-style-type: none"> <li>- Timer in integrated in the background</li> <li>- Floor elevates down as the time goes by</li> </ul>
12 – To The Sea And Beyond	The only level that is upside down	<ul style="list-style-type: none"> <li>- The level scene is reversed. The floor is on the top, and the controls are also reversed.</li> </ul>
13 – Reflection	A very toned-down level	<ul style="list-style-type: none"> <li>- The floor is reimagined into a cloud terrain attached with the player's movement.</li> </ul>

		<ul style="list-style-type: none"> <li>- Player's main duty in this level is to catch the bubble with the cloud terrain, not letting them touch the bottom edge of the screen because it will enlarge the bubbles.</li> </ul>
14 – Lily Who?	First level of the final bosses sequence	<ul style="list-style-type: none"> <li>- Boss shoots out waves of star bubbles that are unbreakable but can be shoot away.</li> <li>- Timer is integrated into the background, disappearing gradually ring by ring from outer to inner.</li> </ul>
15 – Who Is Lily?	The second boss of Clay World	<ul style="list-style-type: none"> <li>- Second boss summons thunder that becomes a barrier to the bubbles and kills player if it hits.</li> <li>- The level scene is split into two: saturated and desaturated zones. Bubbles get passed to desaturated zone will always get converted to Dark Clay.</li> </ul>
16 – Trapped In Neverland	The single level of a new world	<ul style="list-style-type: none"> <li>- Final boss continually generates bubbles at four points on the screen.</li> <li>- The only way to pass the final level is to lose 3 lives.</li> </ul>

Table 2 brings an insightful look into all of the levels of the game: how they are conducted, how they behave and how they are related to each other in a thorough sequence from the beginning of the game.

With this notion in mind, creating challenging but fun levels for LilyPop involved a great deal of arranging bubbles' position, setting up their motion, movement, speed and how they behave. On top of this principle, the team had to make sure the game design respond well with the flow of the story. Image 5 introduces Level 10 scene which is one the level best describes this theory.

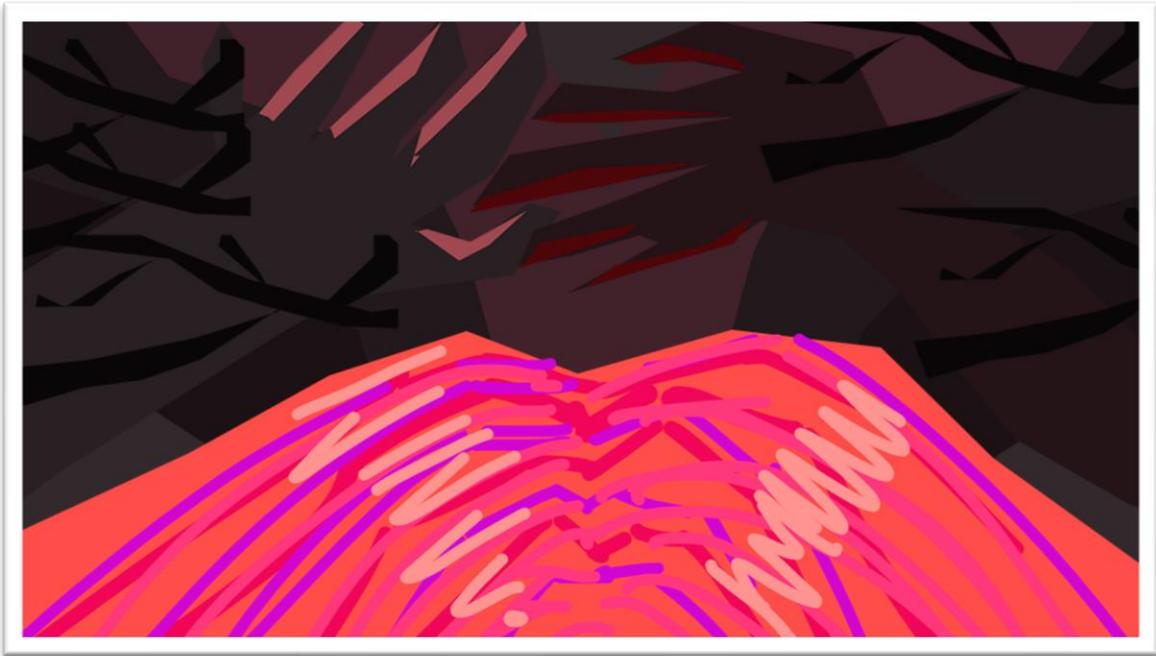


Image 5. Full screen capture of Level 10

Image 5 presents Level 10 of LilyPop, namely: "Please Build A Better World For Me". The level's job was to deliver the conversation about the main characters' aspirations for a brighter future in the storyline. With the graphics seeming like a girl with pink hair and trying to scratch her way out of the dark forest in the midst of the tangled branches, on top of this background was set up to be an amount of bubbles of attribute "Aqua" hanging and rotating around themselves. Now since the bubbles are of attribute "Aqua", they will split into four. As they split into four, they looked like shooting stars. This whole arrangement made the level play feel like these stars shoot and tear the dark sky apart as they kept splitting and spreading. A night full of wishing stars that the main characters looked up to was what the team tried to deliver in this level.

To cleverly place a difficulty curve in the bubbles' behaviors, the team has put a great deal of effort into designing and testing to finally came up with three mandatory types of bubbles that did not only satisfy the incremental difficulty curve but also shaped up the face of the three worlds in the game, respectively described below:

- **Rainbow:** the original bubble, with rainbow colors filling the palette. Its main behavior is split into two smaller ones if the bullet hits it. The children bubble always bounces on the ground in two different directions.

- Aqua: the bubble of the second world, with shades of cyan. Its main behavior is splitting into four smaller ones if the bullet hits it. The children bubble spreads into four diagonal directions.
- Clay: the bubble of the third world, with shades of brown and cream orange. Its main behavior is splitting into two, but the first children bubble is normal and can be split immediately, while the second children bubble is dark and cannot be split until 5 seconds later.

As an intention to deliver a special ending to the game, the final level was customized and designed in its own way. A fourth world was inclusively created for this purpose.

This world was called “Galaxy”, indicated that at the end of the game, the main character transitioned from the “realistic” world to another world. To specifically represent this world, Galaxy bubble was also created and its behavior resembles Rainbow bubble’.

#### 4.2.2 2D Artistic And Abstract Graphics

According to Daniel Prokisch, either it’s doping 3D graphics or VFX or simple 2D sprite assets, in general, the game has to look “good”, meaning, it has to be able to carry a distinctive aesthetic and a style on its own [26].

This section covers how LilyPop found its own skin, where this appearance came from, why this style was followed and how the team executed the visual for the project.

At the start, the team titled the project as “Soap Bubble” because there wasn’t any notion on what type of bubble design to be implemented in the game. With this “soap bubble” keyword, team’s artist started to find references in a music video with colorful and children-illustration-book style but intertwined with well-handled sarcasm.

Image 6 below is a capture from the music video.



Image 6. A scene from MIKA's music video: Lollipop

In the scene presented in Image 6, Red Riding Hood, a famous character is reimagined into this world full of bubbly lollipops and rainbow-like terrain, filled with lyrics of the song, skipping on her spectacular journey to the grandma and the wolf.

Sensing an interesting direction, team's artist pushed further for exploration to find a sweet spot between sugar and darkness boosting effectively his creativity. From this point, he began to get closer to the art direction he wanted to follow.

Images 7 and 8 present the next references the artist had his work based on.

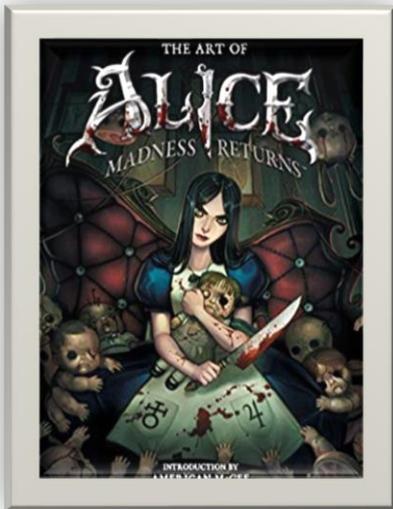


Image 7. Inspiration from Game: Alice Madness Returns poster (left)

Image 8. Inspiration from Red Eye Black Hair concept art (right)

The common concept of the characters presenting in Images 7 and 8 is that there are sweet and wonderful things in those worlds but while terror and darkness embrace them.

With the direction set in mind, the artist worked on early concepts and key graphics of the first level to set the tone for the game.

Image 9 shows the earliest concept and Image 10 shows the result of concept development. Then, Image 11 shows the first complete graphics of the game.

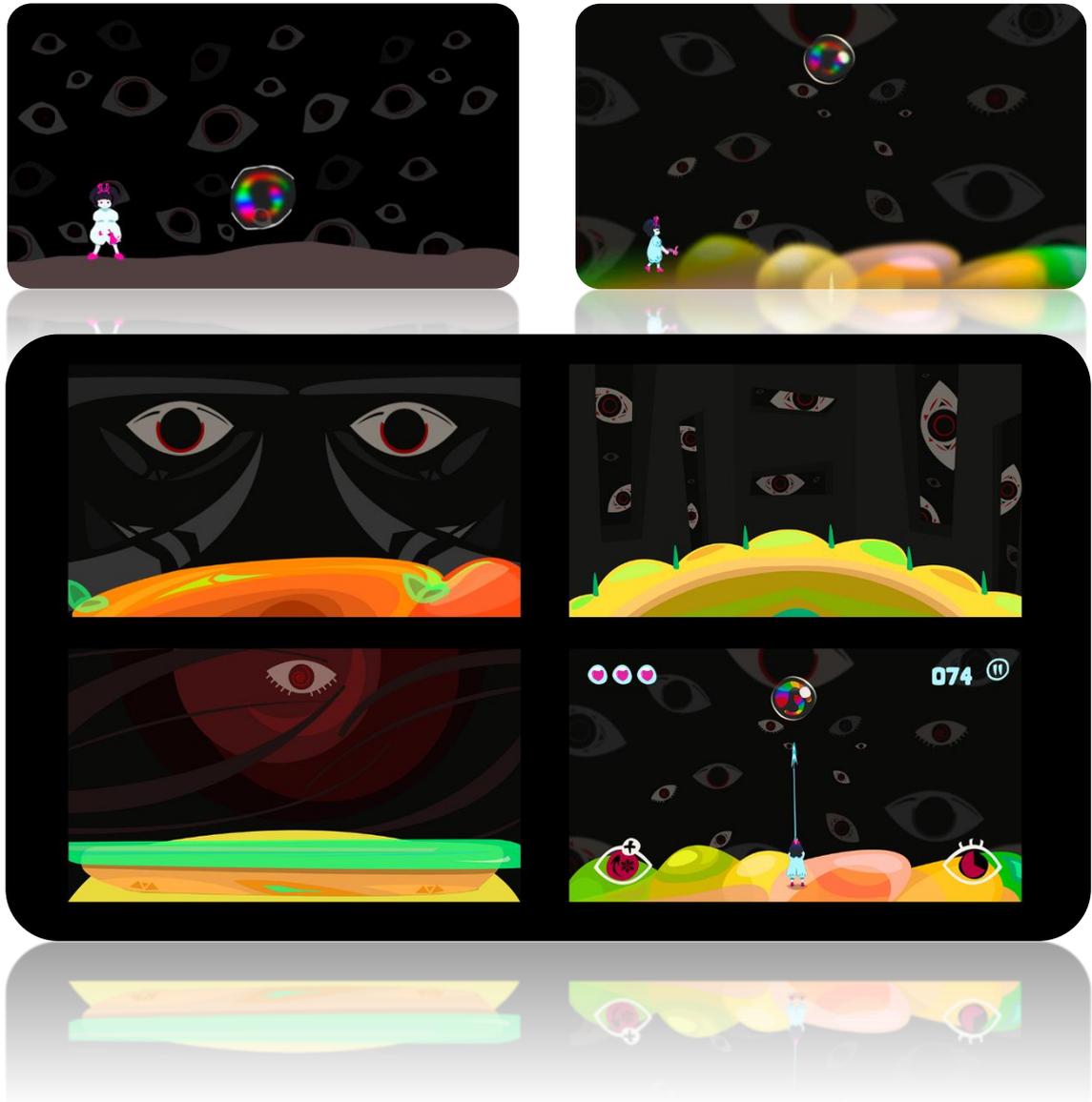


Image 9. First rough sketch (left)

Image 10. First concept developed from the sketch (right)

Image 11. First complete graphics from beginning levels (below)

Images 9, 10 and 11 shows how team's artist takes on the direction to transform it into this unique world with vibrant colors sweetening out the dark backgrounds and piercing eyes.

The definitive elements of the key graphics:

- Color palette: mostly red and shades of dark gray on the background to convey darkness and danger. On top of that is bright colorful shades of warm color in pantone-scale, ranging from pastel yellow, orange and a slight touch of green.
- The eyes and the vibrant colored floor: the purpose of bringing in this combination of scary hollow eyes and sweet-like-candy game terrain is to immerse the players in this dreamy world at the same time wrapped up around nightmares.

With a more defined path in mind, team's artist started producing necessary graphics for the rest of the game. The general production quota for each level included: background graphics and terrain/platform graphic, and at a later stage, animations are added to these two elements. After the first five levels of the game were technically done , when the time to produce the next five levels came, team's artist started to wrap his head around the idea of creating different worlds, then started the second world concepts from keyword: "Aqua". Since "Aqua" implicates water and the color palette of blue, the world for "Aqua" was painted in splashes of pinks and red velvet, as opposed to the definition.

Image 12 presents the first concepts of "Aqua" world.

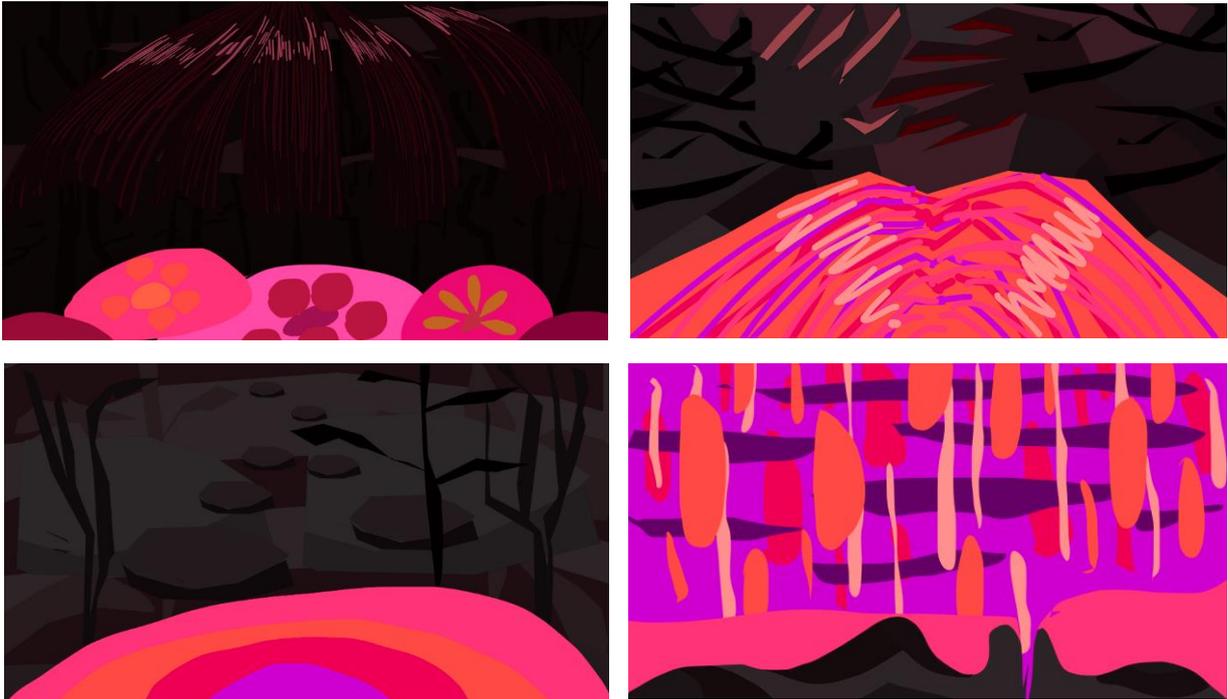


Image 12. Concepts of Aqua world

With these concepts the level graphics are produced after it. Same method was applied to bubble "Clay" and the "Clay" world.

To articulate the game's story, a set of 10-15 illustrations are meant to be put in between game levels as the player go through them one by one.



Image 14 is a sprite sheet containing the frames of main character's walking animation.



Image 14. 34 frames of Lily walking

From this sprite sheet, team's programmer used specific tools in game engine to extract and convert these layers into an object that plays this animation and can be manipulated further for programming.

The toughest setbacks for the team in graphic aspect was to test and decide on making the game's resolution to be 1920 pixels x 1080 pixels (full screen) or 800 pixels x 450 pixels (small screen). This was due to the team's consideration on which publishing platforms to work on. In the first place, the team was attached with Kongregate, but had no idea the platform required the game to be rendered in small resolution. With this lack of knowledge, at first LilyPop's graphics were produced for full screen gameplay. When

changed to smaller screen, the graphics needed to be adjusted and re-exported to fit the criteria. In the end, the game decided to move back to the full screen resolution, which was time and effort consuming. The second challenge during graphic production process was related to technical aspect. With the amount of graphics at the time, the loading of the game proved to be unnecessarily long, which sometimes damaged the game performance. The problem had to be solved on both technical side and graphic side.

To enhance the game performance, the game artist's duty was to cut off unnecessary textures and reduce the size of the assets. The most viable example was cutting off a considerable amount of game's animation frames: the bosses, the projectiles and the bullets. A 3-frame animation from Photoshop, with a duration of 0.1 second in between, normally would export into 6-9 frames of .png files. The solution was to export the 3 keyframes of this animation, then build a class to handle the duration of 0.1 second between each frame. Which this method being carried on, the mission was accomplished successfully.

#### 4.2.3 Programming

This section covers the general structure of the software, how to achieve the features building up this project and challenges team's programmer faced along the process.

Below are the main tools that the team used to program the game.

- Programming language: JAVA
- Programming interface: IntelliJ IDEA
- Game framework: LibGDX
- Version control: Git and GitHub

To visit Daniel Riissanen's programming work on this project, please submit a request at e-mail: [namdinhnguyen7496@gmail.com] and visit: [<https://github.com/doc97/LilyPop>]

To examine the structure of the project, Figure 1 brings in the earliest UML model created by team's lead programmer for when the project was still called a "Summer Game".

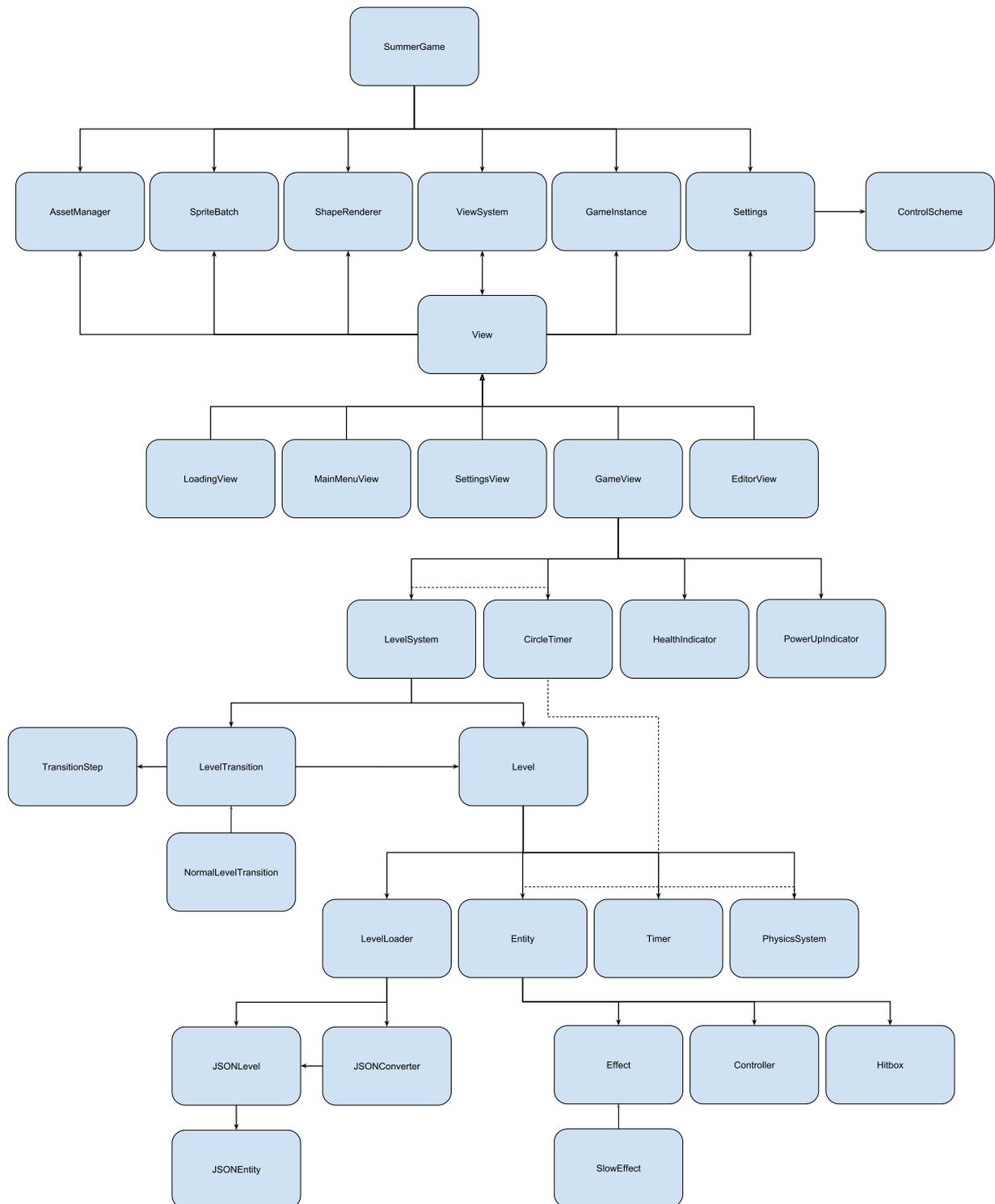


Figure 1. The earliest UML model defining the vision of the software

Figure 1 demonstrated the key classes to achieve the project. Later on the classes evolved with slightly different names but still held the same jobs. Examine the key classes of the current build of the project to understand more profoundly how they really shaped up the software.

- Class “LilyPop”: base class of the project, connecting the classes in the system together.
- Classes relating to “View” (GameView, PauseView, SettingsView, LevelSelectionView,..) Each class in this category produces a specific screen of the game. For example, “PauseView” would produce the Pause screen if the pause button is hit in the middle of the game.
- Class “EntitySystem”: Manages the objects, which are set on a total of 5 different layers, of a game world. For example in Rainbow game world, “player” will be set to a layer, placing on top of “bullet” layer, same method with “bubble”, “background” and “floor”.
- Class “Entity”: defines the properties of objects in the game: position, velocity, acceleration, rotation, hitbox, etc.
- Class “Hitbox”: contains the list of vertices to create a convex 2D shape representing the hitbox of objects. The frequently used shape is the rectangle and the circle.
- Class “Entities”: controls the class names of each object. For example: RainbowBubble, ClayBubble, Character, Background, Floor, ...
- Class “Controllers”: manages the controllers of objects’ behaviors. For example, Rainbow bubble can have a controller telling the bubble are to be split into two.
- Class “ViewUIBuilders”: almost every screens/views in the game have several elements of UI (timer, score, buttons, etc.). This class is responsible for generating them by utilizing LibGDX’s UI components.

The technical work that the team had to deal with required a lot of communication between the creative designer and the programmer, which surrounded mostly around the question of which feature needed to be done next. For instance, team’s producer wanted to have a feature for when the arrow hit the hitbox of the aqua bubble, four other bubbles are summoned, reduced in size and the starting position is the position of the parent bubble, to be achieved in 2 hours of work. So before the execution began, the programmer would evaluate the task, responded to producer’s deadline, raised opinions about what was required and what setbacks could be appear along the way and started examining and executing the work. If the execution was not as expected, the team would

consider alternatives. The first alternative the team attempted was how much time was available for the process. "Is this result acceptable?" If yes, the team would accept the current result and moved on to the next fundamental task. If not, the team would question what needed to be changed and how much time and effort would be delegated into this task, then acted accordingly. This core dynamic between the members of the team was they the key to move the project along the timeline feature by feature, from small to big.

With this strategy being followed, Table 3 shows the timeline of features the team moved along to achieve the full project.

Table 3. Detailed timeline of the software development

Time period	Milestone	Feature	Task and description
July – August 2017	First viable gameplay	Main game screen setup	<ul style="list-style-type: none"> <li>- Background graphics implementation</li> <li>- Floor and ceiling: graphics; set up gravity and hitbox so that player can stand and move on; hit detection</li> </ul>
		Player	<ul style="list-style-type: none"> <li>- Player movement</li> <li>- Player hit detection</li> <li>- Player attack: shoot a projectile moving upward.</li> </ul>
		Bubble	<ul style="list-style-type: none"> <li>- Bubble hit detection</li> <li>- Bubble first behaviors: affected by gravity; bounce when hit the floor; split when collide with arrow bullet.</li> </ul>
September – November 2017	First minimum viable product	First 5 levels	<ul style="list-style-type: none"> <li>- Graphics implementation and fixes.</li> <li>- Bubble's position and behaviors implementation.</li> <li>- First music track implementation.</li> </ul>
		Level 5 Boss	<ul style="list-style-type: none"> <li>- Boss movement and animation implementation.</li> <li>- Boss' projectiles.</li> <li>- Projectiles' behaviors and animations.</li> </ul>
		Level transition	<ul style="list-style-type: none"> <li>- Transition between the completion of the previous level to the next level.</li> <li>- Player transition animation implementation.</li> </ul>
		Main menu screen	<ul style="list-style-type: none"> <li>- Basic functionalities and position implementation.</li> </ul>
January – February 2018	Extend the scale of the game	Second world levels	<ul style="list-style-type: none"> <li>- Graphics implementation and fixes.</li> <li>- Bubble's position and new behaviors implementation.</li> </ul>
		Update main menu	<ul style="list-style-type: none"> <li>- New main menu graphics and animation.</li> <li>- Update functionalities.</li> </ul>
March – May 2018	Finish the whole gameplay	Third world levels	<ul style="list-style-type: none"> <li>- Graphics implementation and fixes.</li> <li>- Background animation and corresponding to timer implementation. Bug fixes.</li> <li>- New bubble's behaviors implementation.</li> </ul>
		The three bosses of the final levels	<ul style="list-style-type: none"> <li>- Graphics and animation implementation.</li> <li>- Bosses' behaviors implementation.</li> <li>- Projectiles' animation and behaviors implementation.</li> </ul>
July – September 2018	The surface features of the project	Level selection	<ul style="list-style-type: none"> <li>- Graphics implementation; UI.</li> <li>- Buttons' functionalities.</li> <li>- Level system implementation.</li> </ul>

		Story illustrations between game play	<ul style="list-style-type: none"> <li>- Moving between frames functionality.</li> <li>- Set up the transition between the illustrations and the gameplay.</li> </ul>
		Unlockable Room	<ul style="list-style-type: none"> <li>- Set up the main lobby. Graphics implementation.</li> <li>- Buttons' graphics and functionalities.</li> </ul>
		Unlockable Room: Story illustrations room	<ul style="list-style-type: none"> <li>- Set up the timeline and the buttons.</li> <li>- Buttons' positions, graphics and functionalities (connecting them to the right sets of illustrations).</li> </ul>
		Unlockable Room: Music room	<ul style="list-style-type: none"> <li>- Set up the UI; list scroller of the music tracks.</li> <li>- Buttons' functionalities (play the right music track of the right button level)</li> </ul>
		Unlockable Room: Reading room	<ul style="list-style-type: none"> <li>- Set up the UI and buttons.</li> <li>- Set up the reading container and it's functionality (contain text of a specific color)</li> <li>- Moving between pages functionality.</li> <li>- Lock/Unlocking chapters of the story implementation.</li> </ul>
<b>October 2018 – January 2019</b>	Wrapping up the project and polishing.	Final features: Level Completion Screen	<ul style="list-style-type: none"> <li>- Converting the screen to black and white when a player finishes the level.</li> <li>- Graphics and UI for Level Completion Screen implementation.</li> </ul>
		Final features: Pause in game	<ul style="list-style-type: none"> <li>- Graphics and UI implementation</li> <li>- Save the current state of the game play when paused, then return to that state when players resume.</li> </ul>
		Polish specific levels	<ul style="list-style-type: none"> <li>- Adjustments and fixes on projectiles, gameplay, bubbles' positions.</li> </ul>
		Level background Animation	<ul style="list-style-type: none"> <li>- Implementation the new animation for Level Backgrounds.</li> </ul>
		Music and sound effects	<ul style="list-style-type: none"> <li>- Implement sound effects for bubbles collision with bullets; death and resurrect.</li> <li>- Implement the music for all of the levels, make sure the right level plays the right track.</li> </ul>

In table 3, the content of the features was listed out, as well as their purposes serving levels of milestones while gliding through the timeline.

Developing software is attached with bugs and bug fixing. There was a handful of times when bugs significantly set the team back from implementing features. Bugs can vary from small errors like:

“The bullet layer is behind the player layer in LevelSystem”

to bigger performance issues like:

“Loading into the game was taking too long due to the amount of graphics loading at that same time was too heavy”.

Team's methods to handle bugs change from time to time, but the core stuck around repeated play-testing, putting the bug into written form and bringing it to the "bug" timeline. Image 15 taken from Trello Code board showing the game's bugs waiting to be handled at stage Jan – Feb 2018.

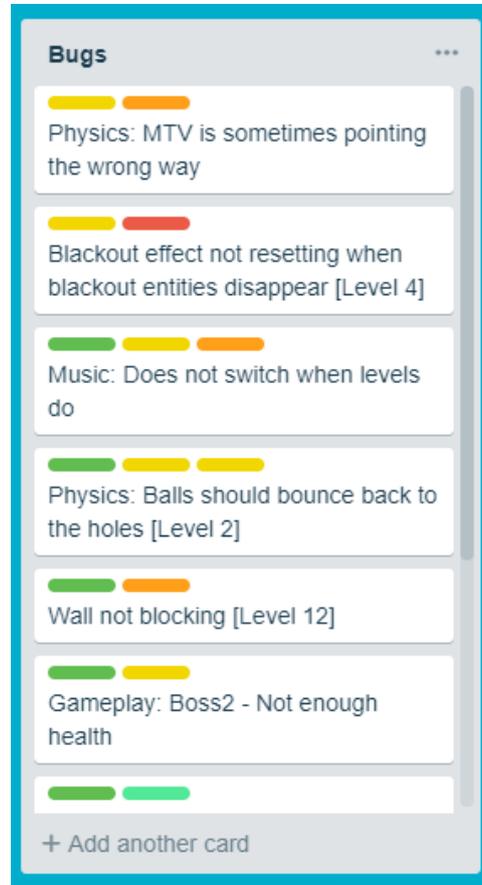


Image 15. A list of bugs stored on Trello board's card

Image 15 was just a mini presentation of bugs that the team had to go through. Solving bugs can be challenging and tiring sometimes for the programmer, since it may feel like the list keeps growing and there's no end. So if there's a possibility, when taking care of

bugs the team should stick together and give each other proper support to battle bugs with grace.

#### 4.2.4 A Full Album Of Music And Sounds.

Music is one of the key characteristic defining LilyPop. The whole storyline of the game is indeed translated into a sequence of 15 music tracks with titles corresponding to the key events in the story, forming up an instrumental and electronic music album. This section will transfer the gist of the journey that the team produced the music for LilyPop.

The first two theme tracks were produced at the early stage when the team was trying to draft up the first playable build of the game. When team's producer discussed the direction of music with external music artist Phan Hong Duong, they talked about an "Alice In Wonderland" inspiration but covered up nightmares. Hence, the first two productions from the artist carried a delicate, dreamy, beautiful, ringing but echoing and painfully touching at the same time.

Follow this [link](#) to the first theme track of LilyPop

The rest of the music quota was attached to 15 levels of the game. Each level carried its own music track, telling a piece of story along with the gameplay of that level. Team's internal music composer first experienced the concepts of what he wanted to work on with piano notes. He generated one or two lines of quick melodies, recorded them to the phone and figured out the direction with the chords and the notes already been recorded.

After having a foundation, the composer took the main melody and brought it into the music software being presented in Image 16.

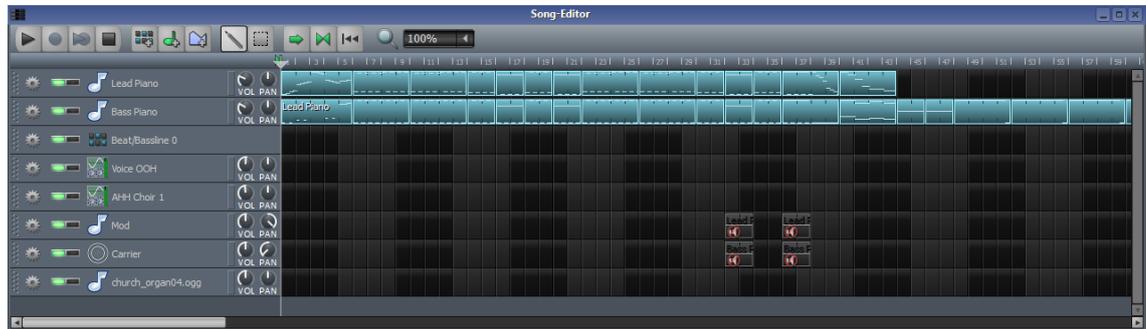


Image 16. Main board of creating a music track in LMMS

Image 16 shows that he wrote down the chord and the key notes defining that melody, and developed and scaled up from that base. For example, in "I Am Not A Poppy" track, using the base melody generated by the piano, after being brought into the LMMS software, the artist selected an instrument or sound he wanted that melody to be played on, then continued filling the timeline with more notes based on that initial melody. Along the way, more instruments are taken to support the first instrument (casually 2 or 3 more instrument/sounds) with either jobs: hightening or lowering the octave of the main melody, or playing the chords to make a base for the melody. The composer repeated this process to fill the rest of the track with notes from instruments until they reach a duration of, preferably, 150 – 180 seconds.

#### 4.2.5 A Bittersweet Story

When the project began the team did not expect to develop a thorough storyline for the game. The project was meant to be an arcade game with a series of passable levels. As it escalated, the project developed its own skin, look and feel, hence called out a universe requiring a soul for it. It was necessary to give the game characters, events and details to fill up that world, so that for the players it's easier to relate and connect with that imaginary universe.

Inspirations for the story came from various sources: short films and short stories, but the direction for the story was instantly clear from the beginning: a dark story but cuddled with sentimental feelings. Taking real-life image of team's programmer twin sister, game writer decided the protagonists of the story would be a pair of twins.

With the draft being sketched out using these initial techniques, the next thing to be considered was to ensure the story is engaging and interesting. To achieve this the most basic strategy is to set up dramas, ups and downs, twists and turns. LilyPop's story contained a fair amount of dramas, roughly said 3 key events corresponding to the three worlds created in the game design. It is also noticeable to balance between the easy sessions of events with the intense moments. There should be breaks so that readers can have time and emotional capacity to comprehend the complexed twists implemented in the plot.

Image 17 presents LilyPop's written story took around 30 hours of work and quite many edits and polishing before it came to the final version with 33 pages, 17 chapters and around 6500 words.

TABLE OF CONTENTS	
<b>TABLE OF CONTENTS</b>	<b>1</b>
<b>PROLOGUE</b>	<b>2</b>
<b>CHAPTER: RAINBOW</b>	<b>3</b>
One. Candy Man	3
Two. Merry-Go-Round	5
Three. Merry-Go-Square	8
Four. How Funny This Mortal Life Is	10
Five. Hemoglobin Lunar	12
<b>CHAPTER: AQUA</b>	<b>14</b>
Six. I Am Not A Poppy	14
Seven. Despicable Her	17
Eight. The One That Gets Away	19
Nine. Going On A Picnic	21
Ten. Please Build A Better World For Me	23
<b>CHAPTER: CLAY</b>	<b>25</b>
Eleven. I Thought We Were The Same	25
Twelve. To The Sea And Beyond	27
Thirteen. Reflection	30
Fourteen? Fifteen? Lily Who? Who Is Lily?	32
<b>CHAPTER: GALAXY</b>	<b>33</b>
Sixteen. Trapped In Neverland	33

#### Five. Hemoglobin Lunar

The window is open. Not wide. Partly open. The wind is stinging salty but it attempts to delicately travels around the room to give us some comfort then silently goes out. I am thankful for the breeze. It is the only thing helping the air pleasant to breathe.

I lay my back on the right bed, Big Sister's bed is on the other side. It takes four steps from mine to hers. Our bed heads are against the window's transparent glass guiding the moonlight towards the floor area between our beds. May the moonlight help me see through the inexplicable burden of my lovely sister.

I reach for Big Sister's right hand with my left hand. It feels lifeless. Her eyes are lost in the moonlight. No, they stuck there. She is looking down to us. She has seen things from which she can no longer escape.

As I punch into my scattering thoughts, I address Big Sister.

- You are absolutely quiet after that night and it gets on my nerves. Your silence cripples me. I don't know how to feel or how to act towards you anymore.
- Hush.
- Talk to me, Big Sister. I need to understand what happened. Your gaze is freezing.
- Hush hush.
- Wait a minute, on that night I also met the man who's been having business with Nun. He owns the Ra Pe Amusement Park. Did he have anything ...
- SHUT UP!

She yelled at me. Not how loud, but how brutal she did it took me aback.

Image 17. The written story of LilyPop in reading format

Image 17 presents the reading version of the story, planned to be sold with the Downloadable Content (DLC) packages when the game is released. This was meant for the audience who would enjoy literature and reading in general.

#### 4.2.6 Project Management

To execute effectively all of the above tasks, methods and workload, team's producer had to work hard to match up to the challenges of balancing the project and the team. His job most of the time was involved around the concern of time management,

prioritization, drafting out schedules and communication. This section will go through how the project's management aspect was handled to move the project along the stages and milestones while achieving features after features.

Firstly, to manage the roadmap and timeline for the project, the team utilized the aid of Trello board. In the beginning, the team created a card for each week they were following, then added tasks and features needed to be done that week before working on them during the week. At the end of the week, new tasks will be added to new week and the remaining tasks (not recommended) will also be moved to the new week.

Image 18 presents a section of Trello board on the executing.

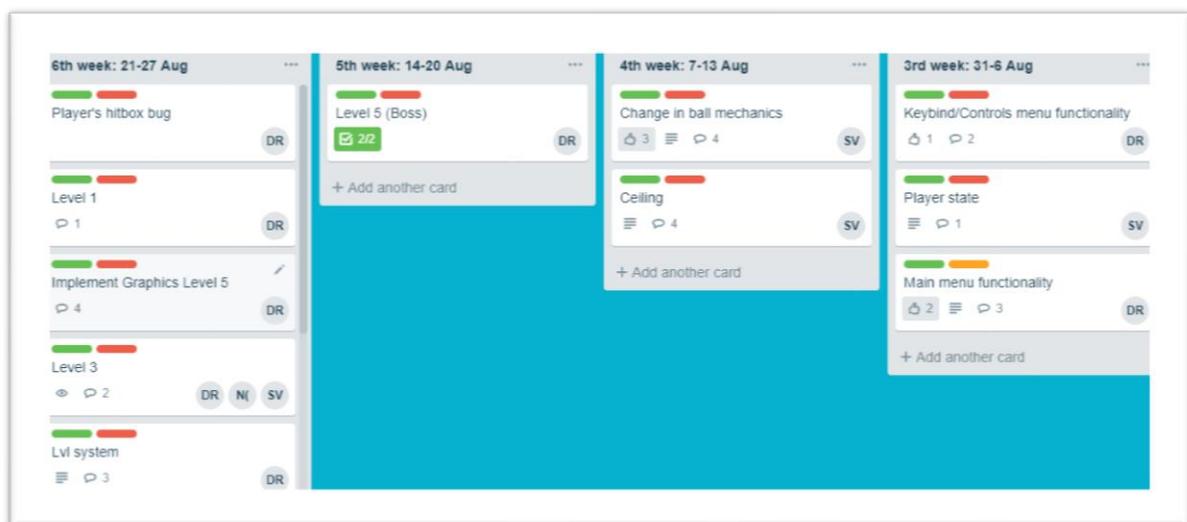


Image 18. A corner of LilyPop's Code Board on Trello

As seen from Image 18, tasks are put into cards under different columns of weeks. Unfinished tasks will be labeled red and when done the team will label them with an extra green.

The second tool getting mentioned is for pure communication and discussions: WhatsApp and Telegram. The team created a group and started having conversations since the beginning. While these applications did the mandatory job on helping the team exchange communication, quite many discussions were also handled directly on Trello

Board, under the comment section, for the convenience of easy-to-follow-through the task being discussed.

With the tools' aid and well-described tasks written out, the team kept on achieving task by task towards bigger goals. The team also noticed to start small so that when a sense of achievement came in, it built up a momentum. Identify what's needed to be done next was a strength of the team, but sometimes keeping up and follow through all of the tasks seemed challenging. As a reminder for the conflicts had happened and for the future projects, the thesis would bring in Trevor Young [27, p.125] for addressing the importance of communication and attitude towards this subject. The author states that poor communication is a fundamental source of conflicts. While doing communication a producer should know who to communicate with, which matters to communicate, the degree of information being communicated and how frequently this communication should happen. With the assumption of a basic knowledge of team members knowing what to do, team's producer should move on to follow up with the execution with questions untangling members' problems like:

- What is the current progress of the task?
- Are you having troubles? What are they? How do we solve these?
- How can I help?
- How do you feel?

In an ideal case if all of these matters and questions were answered thoroughly, any team would rocket through objectives and milestones with ease.

As in professional teamwork, strong opinions are always raised and be challenged by other members. While most of the communication on what to do and how to do this task happened smoothly, at times when the two parties trying to unpack a more complicated issue, tension can always arise. Driving the discussion all the way to the end was sometimes tough, but the result would always be as miraculous as art masterpieces.

When opening a discussion on the table, it is important to approach with an honest and open-minded manner so that all members can have the freedom to deliver the brightest ideas to the matter. Team's leader has to always know how to ask the right question,

because without the right topic, the discussion can wander and deliver no results. [28] It is also taken to consideration the amount of time allocating to a topic, and have to be cut out at a specific given time point to make sure the presence of pressure will push for an outcome out of the discussion. If the matter after discussing can't be solved, it is required for a decision to be called out or just simply move on to other matters. If too many extremes of opinions exist on the table, ask the ultimate question of trying to bring everyone on the same page. Hence, a compromise is often necessary.

As mentioned before, with opinions piling up on top of each other, at times when rationality be of fault, this leads to tension. During the journey of making LilyPop, countless of conflicts occurred and while most of them were healthy for the true meaning of arguments, some did cause damage. Now it is realistic to be aware and open to the risk of conflicts occurring in any project execution, and the most effective answer to a question that would avoid the most extreme case of the conflict could be:

“Is this worth fighting for over the long-term goal of the project?”

Harmony between team members are crucial to the survival and long-term growth of the project. Harmony creates a graceful path for the project to fly along with their owners. With trust and belief in each other, no matter team big or small they can drive through any obstacles.

Now the fundamental key of working with people is to use a heart controlled by a mind. LilyPop's producer had to constantly follow up and ask not only for members' performance on given tasks but also on their well-being and how they were feeling. With proper attention to the conversations with the members, any slight hint of anything that can go wrong should be addressed and solved as soon as possible, before misunderstanding and damage could happen.

#### 4.2.7 Business Development

LilyPop studied this and attempted to adapt the theories in a way that it accomodated the different themes within the game. To remind, the four themes defining the game was:

- Rainbow

- Aqua
- Clay
- Galaxy

The themes basically defined the appearance of the bubbles and attached them with with the visuals and the emotions being conveyed in that chapter of the game. After that the themes would create more materials to influence the direction of the music tracks. Hence, different music mini-albums were generated.

Image 20 presents the mini-album LilyPop: Rainbow, containing the first 5 music tracks of the game, telling the story of chapter Rainbow and carry the atmosphere of this chapter of the game.



Image 19. Album cover of LilyPop: Rainbow

With these above creations, it's worthy to see that the themes of the game are playing the part of the "doors" here. With these themes, the game becomes more interesting and more than that, they lay out a setting that can further turn into extra values, like in this case, music albums. Another vision that was generated from this is merchandies designed following the themes.

Image 22 presents the initial sketches for the merchandise that can be generated from these themes' lines.



Image 20. Pillow and bedding sheet covers selling as merchandise using the themes of the game

These above were just practices in thinking in terms of business, of trying to think in terms of further future, attempting to create more opportunities so that they can bring in more values that multiplying into values. Nevertheless, the music albums will be on sale in packages with the game.

## 5 Results

In January 2019, the product is technically waiting on the table for the right settings to be released. LilyPop's team went through several attempts of bringing the product to the local market and making it visible to a certain amount of audience in the industry, with the presence in the events below:

- Digitalent Gamedev Lab Pitch Competition
- BIT1 Competition
- Games First Helsinki 2018
- IGDA Demo Corner

In IGDA Demo Corner, the team brought a build to the tables so that event attendees can drop by and play the game. The team also prepared some marketing materials and a registration list of early admirers who later want to earn a free copy of the project when

it is release. Beside that, the most worthy-mentioned event must be Games First Helsinki hosted by SuperCell. Team's leader got 3 minutes to impress the attendees of the event at the Pitching section, and after the pitch LilyPop got a small amount of attention. People had their own feelings and perception on the project, and the general vibe is quite positive. Some of the common feedback from all these events are:

- LilyPop is quite psychedelic and artsy.
- LilyPop's graphics is beautiful and lovely.
- The story is surprisingly interesting and sweet.

In addition to that, the team is also communicating with a publisher to examine the possibilities of putting the project in their pipeline to see how the project is fitting in. Else, LilyPop will go back to self-publishing on different online game stores.

## 6 Conclusion

It is already a success that the team finished the project together. Upon the journey, there were ups and downs, and emotions. There were conflicts and difficulties, and enjoyable moments. The most important thing is that LilyPop was born and achieved its destiny: be a complete product. The team will work hard on establishing a business and publish the project to learn about customers and market, and we are exhilarated to see how the game audience will response to the launch of the game and hopefully to bring more light to games that stand for artistry and beauty.

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