

CHAPTER 2

THEORETICAL FOUNDATION

2.1 Video Game

To develop a fun and good game, we have to consider several component of the game such as gameplay, graphic, AI, sound and many other things. These components must be well developed. But being well developed only is not enough; these components must be put together later. A good game is a game that worked well when these components are put together, not overlap with each other. In this chapter we will see what exactly these components are.

2.1.1 What is Video Game?

Game has existed for a very long time. The Royal Game of Ur is one of the oldest games known. It dated before 2600 BC [4]. What is exactly a game is? There are several definitions. Chris Crawford [5] defines game as an interaction between players to halt each other's goals. While Kevin Maroney [6] defines it as: "A game is a form of play with goals and structure". Other definition by Wolfgang Kramer [7] is:

Games are objects which consist of components and rules and have certain criteria: rules, a goal, always changing course; chance; competition; common experience; equality; freedom; activity; diving into the world of the game; and no impact on reality.

From these definitions, we can draw a conclusion that game is a competition between players to reach their own goals restricted by rules. As the name implies, video game is also a form of game.

Video game is a form of electronic game. It is a game that involves interaction with input device such as game controller to produce a feedback in the game world. In video game, the player still need to reach his/her goal in the game world while restricted by the defined rules stated above. As the name implies, video output is the most important component of video game. Another important component is the input device or the game controller in video game. Other components such as speaker or headphone and vibration or force feedback to help the player more immersed in the game world.

2.1.2 History of Video Game

In 2011, video game has evolved to the point that the player can play video game with no gamepad with Kinect for Xbox 360 and 3d video game without the need of 3d glasses with Nintendo 3DS. But how video game was born?

There are still several debates on who created the first video game. Some people such as D.S. Cohen [8] considered the cathode-ray tube amusement device as the first video game. Two physicists, Thomas T. Goldsmith Jr. and Estle Ray Mann submitted a patent for cathode-ray tube amusement device on 1947. The game is a missile simulator game. The player needs to navigate the reticule to the target with limited time. The device never released on the market due to various reasons such as high cost.

In 1972, Bushnell and Dabney founded Atari and release their game: Pong. Pong is the first arcade game to be successful [9]. This mark the beginning of the golden age of arcade game. Arcade game boomed, it's all over the place: restaurants, supermarkets, and other places. People would line up to play arcade game

The first generation of video game console is in 1972-1977. Ralph Baer has developed the Magnavox odyssey. Some people said this is the first video game. Home computers also began evolving, allowing the owners to develop simple games. This caused many computer games appeared.

The second generation of video game console is in 1977-1983. Because of the boom of video games, many people tried to create video game console and games. But this caused too many game console out there and poor developed game. This caused the many game developer went bankrupt because the consoles and games didn't sell. This mark the crash of video games industry.

In 1985, Nintendo release the Nintendo Entertainment System (NES) in North America. It turned out that the NES was a success, helping to revive the video game industry. With the release of NES, the third generation has begun. The third generation is in 1983-1995.

From 1989-1999 is the fourth generation of video game console. Sega released Sega Mega Drive in North America with more power than the NES. Nintendo responded with the release of Super Nintendo Entertainment System (SNES).

The fifth generation is in 1993-2006. Sony has entered the market with their console, the Playstation. Nintendo released the Nintendo 64 to compete with Sony. In this generation, most game console was using CD as the media for the game. Nintendo still using the cartridge system was lose because CD was more successful because it can hold more data than cartridge.

In sixth generation (1998-2004), Microsoft tried to enter the video game industry by releasing its game console: Xbox. But it was losing to Sony with their Playstation 2. Nintendo also released their next console, Gamecube. It was their first disc-based game. But Nintendo cannot compete with the success of Playstation 2.

Currently video game is in the seventh generation (2004-present). Sony and Microsoft released their high definition consoles, Playstation 3 and Xbox 360. Nintendo tried different approach the motion sensing console, Wii. Motion sensing was a hit, Sony and Microsoft also tried to join the market with Playstation's Move and Microsoft's Kinect. Cloud computing services also join the video game industry with Onlive and Gaikai.

2.1.3 Genre

Similar to movies, video games also have genre. In movies, genre is based on how the narrative delivered. Some examples of movies genre are: horror, comedy, and mystery. Those things will be elements in video game. There are several elements to make a fun video game.

We have to keep in mind that video game exist to entertain people. The entertainment of video game derived from several sources such as the gameplay, the story, the setting and so on [10]. Video game genre is based on how the gameplay interact. There are classifications of video game genre. Rolling and Adams [11] have made a classification of video game genre:

- Action Game

Action game genre covers the widest range of game styles. The key aspects of action game are reaction time and hand-eye coordination. Action games tend to

be simple because the player needs to react fast to the action in the game. Action games can be divided into two sub-genres: shooting and non-shooting.

Shooters don't always involve shooting despite its name. It focuses on violence as the major game mechanic. There are two classes of shooter game: a first person shooter such as Unreal Tournament, Quake III and 2D shooter such as R-Type, Space Invaders. Both classes have common attributes: avatar (player representation in game, ranged weapons, and enemies. The interface of action game also needs to be kept simple. The reason is that the player need to be effectively play the game, he/she needs react accurately and quickly to the game environment.

Non-shooter is an action game tried to appeal to children. Some examples of non-shooter are Mario, Sonic, and Donkey Kong. These games have common attribute which is non-violent games.

- Strategy Games

The origin of strategy games rooted from board games. It is the most pc-centric game because most of strategy released for PC. There are two forms of strategy games: turn based strategy games and real time strategy games.

Turn based strategy games are very similar to board games. Each player or AI takes turn to do action. Generally, pure strategy games tend to turn based because the player can take their time to maximize their action by doing strategic thinking. Strategy games especially turn based strategy games tends to be easier to generate a consistence and balanced rule-set. But that doesn't mean strategy games are easier to design.

Real time strategy games are derivative of turn based strategy games. The difference of real time strategy games from turn based strategy games are constant pressure. Because of the constant pressure, the players cannot take time to do their strategic thinking; they must react quickly to actions because there are no turns.

There are three main elements of strategy games: theme, presentation layer, perspective. Theme in strategy games means how the gameplay works. Usually there are three kinds of theme: conquest, exploration, and trade. The presentation layer or the user interface

- Role-Playing Games

Role-playing games (RPG) are originated from pen and paper games, similar to strategy games. RPG covers diverse genre, from simple arcade game to complex arcade game. All RPG have two things in common: configurable player-characters that improve with experience and strong storylines. These two things are the primary element of RPG. There are also other elements such as combat, or adventuring. But those things only serve as secondary element. These secondary elements exist to make the story progress and the characters to develop.

Almost all RPG have similar theme, which is only the player can save the world. There are some variations of theme such as rescue the kidnapped princess or destroy the dangerous object. The character will end up saving the world, but it only an accidental side effect.

In a glimpse, RPG's settings are between fantasy and science fiction this is because these settings are very popular genre. At one point, most people have

dreamt to live in a fantasy world or science fiction world. The reason these settings are so popular is because people tend to play video games because they want to enjoy a different situation from their everyday life. If a RPG using setting in modern world, the player won't really enjoy it because the setting is not different from their everyday life.

The interaction model in RPG consists of three segments: character management, navigation and control, and inventory.

- Sports Games

Sport games are different from most other games because it tries to emulate a world where the player knows a lot about. Many people know about professional soccer and how it played.

Sport games can be considered the only game that allows many kinds of modes: single player, cooperative, competitive, or in teams. Sports games are more successful in console machine because it's possible to have several players on a TV.

- Vehicle Simulations

Vehicle simulations try to create a feeling of control a vehicle whether it real or not. If the vehicle is real, the player expects that the vehicle have similar characteristics to the real vehicle, e.g. speed and maneuverability. If the vehicle is not real, you can create any experience without restricted to gravity, g-force and other things. What needs to keep in mind is the feeling of movement.

Players of vehicle simulations can be divided into two types: purists and casual players. Purist player demand the simulations to be accurate to the real vehicle.

They want to feel how the vehicle really works. On the other hand, casual player only pursue of driving a vehicle fast and have fun.

Rules in vehicle simulations are very diverse. Some game such as flight simulator doesn't have goals to defeat an enemy. The purpose of this game is to let the player experience flying an aircraft. There are also a competitive vehicle simulations games such as gran turismo or ace combat. In gran turismo, the player drives a race car and race with other racers. The player can make modification to the car in very detail manner. For example, the player can change the gearbox and set the gear ratio or change the balance of the tires.

- Construction and Management Simulations

Construction and management simulations (CMS) are about process. The goal of this genre is different from other game where you usually defeat an enemy or other players. The goal of this game is to build something within the context of an ongoing process. The better the player at understanding and control the process, more success will be achieved.

Common elements of CMS are resources, sources, drains, converters, deadlocks, static and dynamic equilibrium, and disasters. These elements are closely related to each other. Resources are the most essential in CMS. It is the economy of the game, it will be produced, consumed and exchange. Sources are where resources come from. Sources are important for the player because he/she need steady resources at hand. Drains are activity that consumes resources. Two common drains in CMS are constructions and maintenance. Converters are activity that turns one or more resources into other type of resources. Deadlocks happened when the player need resource to construct mechanism that will produce the

same resource. It is important to have method that will break deadlock. Static and dynamic equilibrium are condition where if the system left alone, it returns to the state of equilibrium. Disasters are a way to force the player to act. It will happen randomly and the player needs to react to it to stabilize the economy.

- Adventure Games

Adventure games are an interactive story where the character is controlled by the player. Characteristics of adventure games are: exploration, collection or manipulations of object, puzzle solving and little emphasis on combat and action element. This genre has transformed greatly over the years. In the beginning, an adventure game was only a text-only game. As time progress, computer has gained graphic ability. Point and click adventures such as the monkey island series became a boom.

- Artificial Life, Puzzle Games, and Other Genre

Artificial life games are about maintaining and growing a manageable population of organism. The Sims is an example of a success artificial life games. The player can give order the characters such as sleep, talk to other sims and many other things.

Puzzle games are about puzzle solving. Most puzzle games tend to be casual games such as Zuma or Bejeweled. According to Scott Kim, there are eight steps to designing puzzle game:

1. Find inspiration
2. Simplify
3. Create a construction set
4. Define the rules

5. Construct the puzzle
6. Test
7. Devise a sequence
8. Pay attention to presentation

There are also several other game genre that cover small market.

- Online Games

Online games have become a trend these years. There are advantages and disadvantages of online games. Some advantages of online games are players socializing and human intelligence instead artificial intelligence.

The disadvantages of online games are technical issues, communication models, transmission delay times, dropped and garbled packets, misbehavior, need to produce content, and customer service.

Table 2.1 video game genre

Video game genre	Characteristic	Example
Action games	Reaction time and hand eye coordination	Counter strike, street fighter
Strategy games	Time consuming, strategic thinking	Age of Empires
Role playing games	Configurable character,	Final Fantasy

	strong storylines	
Sports games	Emulate a real life experience of sports	Pro Evolution Soccer
Vehicle simulation	Emulate the feeling of controlling a vehicle	Gran Turismo
Construction and management simulations	Process of construction and management	SimCity
Adventure games	Exploration, puzzle solving	Tales of Monkey Island
Artificial Life, Puzzle Games, and Other Genre	Maintain a manageable population Puzzle solving	The Sims Zuma
Online games	Socializing, manage content	World of Warcraft

2.1.4 Game Design

Game design is process of designing the content and rules of the game. Game design is very important stage in game development. When the content and rules of the game have become clear, the gameplay of the game become visible.

Gameplay is the heart of a video game. It is the interactivity of the player with the game world [5]. Without it, there won't be a game. From the researcher's view, video game is very similar to movie. The main difference is in the gameplay, i.e., the interactivity between the user and the world. The researcher believe that if a video game with

minimum or no gameplay at all, there are no differences with movie. Crawford [12] mentioned that *Dragon's Lair* (1983) was a success because of it was the first game that has animated cartoon instead of the primitive jagged blocks. But the problem lies in the gameplay. The player only needs to press the correct button within the limited time.

According to Rollings and Adams [13], Game Design has three areas: Core mechanic, interactivity, and storytelling and narrative. Each area is distinct from each other but they are complementary.

Core mechanic are the rules for the game and the foundation of the gameplay. It is the heart and soul of the game, if the core mechanic isn't good, the game tend to poor. Storytelling and narrative is what interest people in video game. All video games has story. Story doesn't have to be the story of the game. It can come from the player who played the game. In Tetris, the story is created by the player as he/she plays. Narrative is the story told by the author or designer. It is only a presentational and noninteractive part. A game must have story but that means it has narrative. Tetris for example, have no narrative. The player doesn't know what the background story is, i.e. the narrative of the game, but it has story. Interactivity is the way player interact with the game world. The player interacts with the game world via graphics, sounds, and user interface. Interactivity is what makes the game playable. When you have bad interactivity, the game will be hard to play, in this case is not a good sign.

2.1.6 Level Design

In designing level, it is a good idea to create a map from top-down view [10]. After the map is created, next step is to list what are the things needed in the level. When we are done with that, the next step is to develop the level.

There are several types of level. First of all is outdoor level. In outdoor level, terrain plays a big role to make it more interesting and fun. There are several techniques to create terrain: heightmap, modeled, autogenerated, mixed, and tile.

The next type of level is indoor level. In indoor level we have to keep in mind the architecture of the building. The architecture must be accessible and makes sense. There are several ways to create structures in games: brushes, modeled, and tile.

2.1.7 User Interface

As stated in 2.4, the interface of a first person shooter game needs to be simple. If there are too many information, the player will need time to assess the information; thus he/she cannot move effectively.

According to Fox [14], there are several things that need to be attended in user interface. First of all, is to plan the menu flow. The flow of the menu must be simple and make sense. With good planning, the development of the game can be sped up because it can be perfect on the first try.

When the planning is done, next is to create the mock-up. With mock-up, the general feel of the interface can be seen. And it is easier to make changes in the mock-up rather in the game.

HUD stands for head-up display. It means that the player doesn't need to change focus of the sight. In developing HUD, it won't need to develop the flow because it can change rapidly. The main important is to keep the HUD simple. If there is too much information, the player can be distracted from the game world.

2.2 Bentengan

Bentengan is one of traditional games in Indonesia. The gameplay of this game are similar to capture the flag. There are several differences especially on how to defeat the enemy team.

2.2.1 Rules

The rules of bentengan are simple. First is to divide the players into two teams. The numbers of player are vary, usually 4-6 players per team. Then decide each team's fort, usually a pole or tree. In this game, you cannot permanently kill/defeat the enemy players. But enemy player can be captured. To capture enemy simply touch the enemy. Captured enemy will be held captive in the other team's fort. The captured player can be freed by their allies by touching him. The freed player is invincible until he/she returns to their fort.

2.2.2 How to Play

The objective of this game is to capture the enemy fort. To capture it, simply touch their fort. One thing to be noted is when capturing enemy's player. If the player touch their own fort after the enemy is out, he/she capture the enemy. But if the enemy is out after the player, the player cannot capture the enemy.

2.3 Game Development Pipeline

Video games are software. Because of this, software life cycle method can be applied but it's not always successful. One method that is good for game development is agile development. Agile development is focuses on communication between project members and based on iterative and incremental development [15]. The reason why agile development suitable is because the iterative and incremental development factor. In game development process, it is usually divided into several phase: preproduction, production, milestones, and post-production.

Preproduction is the design phase of the game. Preproduction result is the game design document. From there, the prototype of the game is developed. This works as proof of concept for the game. If the prototype is successful, it will be iterated into the video game

In production, each project member works on their assigned jobs such as develop the source code, create the 3d models, and more. After all the assets and source code finished, to game needs to be tested to find bugs and glitches. Testing the game is very important to ensure that the game can satisfy the player.

Milestone is usually used by AAA title games. Some phases of milestone in video game are: first playable, alpha, beta, and gold master which is the master for the released product.

Post production is important to keep the game alive. Even after tested, some bugs and glitches can be missed. Players of the game will reported these bugs and glitches to the

developer. After the developer received the news, they will begin developing the patch to fix the bugs and glitches.