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# Analysis of Key Mechanics for The Impact of Game Design on Player Experience

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**Abstract.** The development of the Internet and technology has transformed the gaming industry, leading to more immersive, evolving games, from 2D to 3D, independent to online, and from simple to highly interactive experiences. This paper explores the relationship between game design and player experience, specifically examining how different game elements influence player immersion, challenge, and emotional feedback. The study employs a combination of literature review and case studies, referencing key mechanics from various popular games and assessing their impact on player experience. The findings suggest that well-designed game mechanics enhance players' positive perceptions of the game and contribute to longer play sessions and sustained engagement. By analyzing the core components that drive player satisfaction, this research highlights the importance of game mechanics in fostering a deeper emotional connection and improving overall gameplay. The study provides valuable insights for game developers aiming to create more immersive and engaging gaming experiences. Future work will explore adaptive game mechanics powered by real-time player analytics, for dynamically tailor experiences to individual preferences.

**Keywords:** Game Design; Player Experience; Immersion; Emotional Feedback.

## 1. Introduction

The popularization of the Internet and the development of technology have contributed significantly to the game industry's change, leading to many players flocking to the game market [1]. To date, games have begun to evolve, with more and more independent games emerging from two-dimensional to three-dimensional, from independent to online games, and from simple interaction to high immersion. However, the current development of the game industry has been influenced by technology, market, culture, socialization, and other aspects, forming a huge and diversified sector [2]. However, even in such a vast market, games still end up with almost no one asking for them after release. Eventually, it will be discontinued, shut down, or even canceled. The core reasons for game shutdowns are, firstly, the loss of players, and secondly, the inability to maintain commercial operations. In game development, game mechanics are the core of constructing the game, directly affecting the player's sense of peace and satisfaction. This will arouse the players' interest, determining the game's playability and the number of core players, which is the most important group for the game development [3]. Therefore, reasonable game mechanics can attract players; then, game mechanics become an essential factor in game design and development.

Game mechanics also define how players interact with the game world, including rules, challenges, rewards, and so on [1]. Different mechanics bring different experiences to players. According to Nacke and Drachen's research, the key influences on player experience are game mechanics, emotional experience, and social interaction [4]. And according to Fernandez, a “fun experience" model in digital games emphasizes the importance of the player experience in understanding the game's fun [5]. This model extends existing usability methods. A tool is used to make the relationships between game components clearer. But users are testing it. Multiple relationships may arise between formations and assemblies, and these can then be a source of disruption to the enjoyment of the game. Therefore, developers need to understand what will attract and retain players before deeply understanding how the game's mechanics relate to the player experience. This requires deep thinking to fulfill the emotional and psychological needs of the player and enhance the player’s experience.

This paper reviews and summarizes the relationship between game mechanics and player experience. It is analyzed from multiple perspectives to conclude how consoles affect the player experience. The rest of the paper is organized as follows: The second part discusses the theoretical foundations of game mechanics and player experience, the third part presents the results and discussion.

## 2. Methodology

This paper explores the impact of various game mechanics on player experience. Game mechanics encompass the rules, processes, and data that form a game's core, dictating how the game is played, the sequence of events, and the conditions for victory or defeat. The study begins with a theoretical foundation on game mechanics and player experience, followed by an analysis of how different game mechanics influence player experience. The research also includes a comparative study to explain why player experiences differ within the same genre of games. Finally, the paper offers optimization strategies and suggestions for future game design. An overview of the framework is illustrated in Fig. 1.

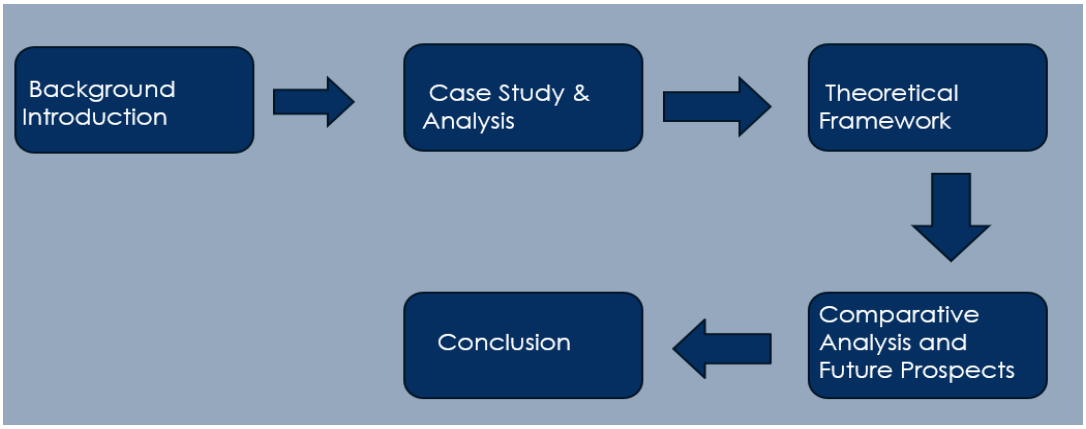


**Fig. 1** The pipeline of the study (Picture credit: Original).

### 2.1. Definition and Classification of Game Mechanics

Game mechanics are the core elements that make up the game experience is an integral part of the game design; he is the rules of the game and the way of interaction in the game. different game mechanics will affect the player's experience and behavior. Game mechanics is a macro statement. After all, on a smaller scale, in the game, movement, jumping, and attacking are the game's mechanics. There are four main types of gameplay trends: the core gameplay system, progression system, reward mechanics, and the interactive system [1]. First is the core gameplay; the core of the game mechanics is the basic gameplay, and the core gameplay determines the type and style of the game, which is extremely important. After all, different games have different core gameplay. For example, the same as the Mihayou company's original God and the collapse of the Star Dome Railroad are open games, but their combat mechanics are very different. This is its core gameplay. Then there is the progress system, which acts as a guide position in the game. The player will be guided through the game. A standard progression system is the quest system, and it is usually coupled with another mechanic, which is the reward mechanic. For example, if the player completes a quest in the game through the quest system, the player can usually receive rewards in the quest system, which can be in-game items, experience, currency, etc. This is the reward mechanism. Lastly, there is the interaction mechanism, which refers to player-to-player communication, or the mingling of players with the game world, such as in-game friends, guilds, multiplayer rivalries, etc. These four essential mechanics in the game, as shown in Table 1.

**Table 1**. Structural Framework of the Basic Mechanism

| | |
|---|---|
| Core gameplay | defines the basic gameplay, genre, and style of the game |
| Progression system | a guide to understanding the game |
| Reward Mechanism | In-Game Rewards |
| Interaction mechanisms | player-to-player communication or intermingling with the game world |

### 2.2. Main Game Mechanics of Different Types of Games

There are five classic game genres on the market today: action games, role-playing games, strategy games, shooting games, and simulation games. Starting from action games, its masterpieces include Dark Souls, Only Wolf, etc. Its core mechanism is the combat system, physical interaction. It usually begins with a short storyline as a newbie tutorial, then advances through the levels and the final boss station, and finally, the ending and repeated challenges—the second role-playing game. Final Fantasy represents it. The core mechanic is a growth system, with plot options to explore and quests that typical flow from the introduction of the worldview to character creation, newbie quests, main and side quests to grow the system, and finally the showdown and ending. The third is a strategy game. Representative works are Civilization 6, StarCraft, etc., and Sunday is resource management, tactical planning, and technology tree. The general process starts from the initial choice to developing resource management technology and Artificial Intelligence (AI) or other players' expansion and confrontation, the final strategy, and finally, the game settlement and replay. Lastly, there are shooters, represented by Call of Duty, CS go, etc., and Thursday is the design system, multiplayer battles, dynamic battlefield. Its process is divided into two kinds, one is a single-player game, such as Call of Duty usually starts with introducing the story background, followed by basic combat teaching, then completing the mission to the final mission, and finally the ending. The second is a multiplayer battle mode, similar to the "CS: GO" process for matching, combat, and settlement. The last is a simulation game, which is represented by the core mechanism of The Sims, for the real simulation of free creation and a long gameplay cycle. The process is usually the game's creation at the beginning of the construction of resource management and expansion of unexpected events, and long-term development. These five typical game types, mechanisms, and processes as shown in Table 2.

**Table 2**. Game genres, as well as their main mechanisms and main content structures

| Game Type | Core Mechanics | Typical Flow |
|---|---|---|
| Action game | Combat system, physical interaction | Over quest character development |
| Role-playing game | Growth system | Development Expansion Settlement. |
| Strategy games | Resource management Tactical planning | Development Expansion Settlement. |
| Shooting Game | Shooting system, multiplayer combat, dynamic battlefield | Multiplayer Versus Mode Match, Battle, Settlement. Single-player games Plot. quests, endings. |
| Simulation games | Realistic Simulation Freedom of Creation | Creation, management, long-term development |

### 2.3. Player Experience and Assessment

Player experience is key in measuring whether a game can be continued. A systematic evaluation framework can help developers understand the player's behavior, emotion, and cognition in the game. Game usability evaluation covers a variety of methods, including inspiration, such as assessing the player's thought process through interviews, etc. [6]. Before the review is completed first is the player experience, the player experience has five main dimensions: immersion, Challenge and Achievement,

Emotional Experience, Social Interaction, and Feedback and Control. Immersion is the degree to which the player is invested in the game world, which psychologically means an intrinsic motivation is required [7]. This means the game must be interesting enough to entice the player. Challenge and sense of accomplishment, is the player in the game to fight the game difficulty should be matched with the player cannot be too high, otherwise the player may give up cannot be too low otherwise the player will be bored and give up playing, moderate game difficulty can inspire the player's enthusiasm, and at the same time in the completion of the challenge will make the player have a sense of accomplishment, to continue to play the game. Emotional experience refers to the player's emotional changes in the game. For example, the game player will feel sad because of the death of a character, or because of the reunion of certain characters, and feel happy; this aspect is successful. Then comes socialization and interaction, he refers to the collaborative and competitive experience in multiplayer games. Lastly, there is feedback and a sense of control, which is the player's sense of predictability and mastery of the game system. This allows the player to have sufficient intentions for the subsequent game development. There are various ways to measure the gaming experience, such as physiological measurements, such as heart rate and brain waves, behavioral analyses, such as game duration and win rate, self-reporting, such as questionnaire interviews, and lastly, eye tracking, which is known as measuring focus of attention, as shown in Table 3.

**Table 3**. The Five Dimensions of Players and the Framework of Meaning

| Immersion | The level of player engagement with the game world. |
|---|---|
| Emotional experience | Player immersion |
| Challenge and fulfillment | Player Enthusiasm. |
| Socialization and Interaction | Collaborative and competitive experience |

## 3. Results and Discussion

### 3.1. Results

This paper will use a shooting game as an example to introduce the game mechanics and its gameplay experience. Counter-Strike (CS) is a first-person shooter game. The game features extremely tense and exciting combat, a wealth of weapons to choose from, and a depth of teamwork to attract many players. The game and the information are for the bullet walks, recoil control, and movement penalties. These mechanics determine the player's shooting accuracy. The most important aspect of a shooting game is shooting accuracy. As shown in Fig. 2.

**Fig. 2** Accuracy in Unsympathetic Situations (Picture credit: Original).

The bullet spread of the gun will increase when the player is moving, preventing the player from hitting the target. The recoil and ballistic control are mainly presented in the continuous firing of the firearm, which causes the bullets to spread out in a specific ballistic pattern, as shown in Fig. 3.

**Fig. 3** Recoil Demonstration (Picture credit: Original).

The advantage is that it has a high tactical depth, meaning that players need to do all very well between accuracy and maneuverability, unlike some Frames Per Second (FPS) games that can be designed while running, and at the same time have competitive and ornamental, and fair gameplay. The disadvantage is that newcomers need a lot of training to improve the gun colleagues, easy to hit rate is very low frustration, will also limit the ability of players to run while shooting recoil mechanism may also lead to gun balance problems, after all, different firearms ballistic differences make it difficult for novice players to adapt.

### 3.2. Future Prospects

There is still a long way to go in the future for gaming. So, where can the future of gaming go from here? Here are three ways. The first can become cloud gaming. Cloud gaming is an innovative way of game interaction. It offloads computationally intensive tasks to a cloud server, transmitting the offloaded game screen to a lightweight client device [8]. Cloud gaming adopts the implementation of cloud technology, without the need to download the complete game package can also be a key to open a low-latency, high-quality quality and high frame rate gaming experience. Although cloud gaming has great development space, it still faces many challenges, such as resource management and business model sustainability [8].

The challenges facing the future of gaming, including cloud gaming, AI-driven Non-Player Character (NPC) interactions, and immersive technologies, are not insurmountable. By further developing cloud gaming, optimizing resource management, and improving adaptive transmission technologies, smooth and accessible gaming experiences can be ensured. Additionally, improving NPC-player interaction through AI is crucial for enhancing immersion. NPCs capable of understanding player emotions and adapting their dialogues or plots based on choices could solve issues like low player retention, where players often stop after a few levels due to psychological or technical limitations. However, the high computational demands of intelligent AI and the associated high costs pose challenges [9]. Solutions such as cloud-based AI or optimizing local AI algorithms for limited hardware may help address these issues. Moreover, to enhance immersion, technologies like AR and VR can be leveraged, but Brain-Computer Interfaces (BCI), which allow direct control of the game via brainwaves, offer even greater potential for freedom of interaction. While BCIs are expensive and in the early stages of development, future innovations in lightweight, low-cost devices and non-invasive BCI technologies could make them more accessible, enhancing user experience and immersion [10].

The future of gaming is expected to evolve through advancements in cloud gaming, AI-driven NPC interactions, and immersive technologies. Cloud gaming, which offloads computational tasks to cloud servers, allows players to experience high-quality games without downloading large files [8]. While resource management and business model sustainability challenges exist, these can be addressed through further optimization and improved transmission technology. This will enable smooth and accessible gaming experiences for players across various platforms.

Another key direction is enhancing the interaction between NPCs and players through AI. AI-driven NPCs can adapt to player choices, generating dynamic dialogues and plots. However, the computational demands of highly intelligent AI and the associated high costs hinder widespread adoption [9]. Solutions such as cloud-based AI or optimized local algorithms could help address these issues. Furthermore, immersive gaming experiences can be significantly enhanced by AR, VR, and BCI, which offer greater freedom of interaction. BCIs, although still in early stages and costly, are already being applied in rehabilitation and could revolutionize gaming if low-cost, non-invasive devices are developed [10]. By overcoming these challenges, the gaming industry will likely achieve greater interactivity, immersion, and accessibility.

## 4. Conclusion

This paper explores the relationship between game design and player experience, emphasizing the importance of game mechanics in shaping player engagement and satisfaction. Through the analysis of various game mechanics and player feedback, it is concluded that well-designed game mechanics are crucial for maintaining player interest and vital for fostering emotional connections and enhancing overall satisfaction. Moving forward, further research will focus on integrating AI technology and human-computer interaction to enable more dynamic, real-time, and personalized player experiences, thereby advancing the development of human-computer interaction in gaming.

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