**Exploring the Impact of an Economy on Player Decision-Making, Strategic Thinking, and Gameplay Experiences**



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## 1 Lay Summary:

This dissertation investigates the impact of economy-based games on players' decision-making, strategic thinking, and gameplay experiences. The research aims to develop an economy-based farming game using Unity and C#, simulating economic systems to determine the optimal difficulty level for player engagement and challenge.

The game features different crops with varying values, growth times, and yields. Players compete against AI (Artificial Intelligence) opponents to make £1000 in profit. Easy, Medium, and Hard modes provide different starting money and varying crop costs and profits. Playtesting and interviews with players will provide insights into perceived difficulty levels and gameplay experiences.

The findings have implications for game developers, enhancing their understanding of economic simulations' impact on player decision-making and strategic thinking. Players gain insights into how difficulty levels in economy-based games affect gameplay enjoyment and satisfaction.

## 2 Literature Review:

### 2.1 Introduction:

This literature review explores research on the influence of economy-based simulations in video games, focusing on player decision-making, strategic thinking, and overall gameplay experiences.

### 2.2 Project Objective:

The objective is to design and develop an economy-based farming game that accurately models economic systems. By analysing player experiences, the research aims to determine the optimal difficulty level for player engagement and challenge.

### 2.3 Economy-Based Simulations in Video Games:

Economy-based simulations are widely used in video games to provide players with virtual economic systems to navigate and control (Sierra & Rodriguez-Conde, 2023). These simulations include resource management, trade, production, and economic interactions, aiming to create realistic and engaging gameplay experiences that require strategic decision-making and efficient resource allocation.

Research has demonstrated that economy-based simulations in video games significantly impact player decision-making processes (Camerer, 2003). Players analyse market conditions, assess risks and rewards, and make choices to maximize their economic outcomes. The complexity of these simulations can vary, ranging from simplified models to more intricate representations of real-world economic systems.

Additionally, economy-based simulations in video games offer opportunities for players to enhance their strategic thinking abilities. Engaging in resource management requires problem-solving, decision-making, and analytical skills to optimize economic performance. These simulations foster adaptive decision-making by requiring players to adjust strategies in response to changing market conditions or unexpected events.

While this literature review focuses on economy-based simulations, it is worth noting that game features beyond economic systems also influence strategic thinking. For example, Penczynski (2016) examines the impact of differing objectives and move order in the "hide and seek" game on participants' strategic sophistication. Although Penczynski's study may not directly align with economy-based simulations, it emphasizes the significance of game features in shaping strategic thinking.

Future research could incorporate insights from studies like Penczynski's (2016) to further understand the impact of different game design elements on strategic thinking within economy-based simulations in video games. Exploring the relationship between game features, player decision-making, and strategic thinking can contribute to the development of more engaging and effective gameplay experiences.

However, further research is needed to explore the specific cognitive processes underlying strategic thinking in the context of economy-based simulations in video games. Understanding these processes can provide insights into players' decision-making approaches, risk evaluation, and strategy formulation within virtual economic environments. One approach that addresses the limitations of traditional game theory and offers a psychological perspective on strategic thinking is the cognitive hierarchy (CH) modeling proposed by Camerer, Ho, and Chong (2015).

Camerer et al. (2015) discuss the limitations of traditional game theory in psychology and introduce CH modeling as a psychological approach to strategic thinking in games. They highlight that traditional equilibrium analysis in game theory assumes unrealistic assumptions and does not adequately account for people's bounded and heterogeneous thinking. However, CH modeling considers levels of strategic thinking and has been applied in various experimental and field settings, providing a psychologically plausible framework for understanding strategic thinking.

By incorporating the insights from Camerer et al. (2015), future research can deepen our understanding of the cognitive processes involved in strategic thinking within economy-based simulations in video games. This knowledge can contribute to the design and development of more engaging and challenging gameplay experiences.

### 2.4 Research Gap and Contribution:

Although there is existing research on the influence of economy-based simulations in video games, there is a research gap regarding the specific impact of difficulty levels within economy-based simulations. This dissertation aims to bridge that gap by exploring the relationship between difficulty levels and player engagement in the context of an economy-based farming game.

### 2.5 Key Questions:

* How do economy-based games influence player decision-making processes, particularly in terms of resource allocation, investment strategies, and trade decisions?
* What factors shape players' choices within economy-based games, such as risk aversion, strategic goals, and perceived consequences of actions?
* How do economy-based simulations contribute to the development and enhancement of players' strategic thinking abilities, including problem-solving, decision-making, and analytical skills?
* How do different difficulty levels within economy-based games impact player enjoyment, engagement, and satisfaction?

### 2.6 Difficulty Levels and Player Engagement:

Difficulty levels are a crucial aspect of economy-based simulations in video games. They vary starting conditions, resource availability, and market dynamics to create different levels of challenge. Balancing player engagement is vital for maintaining interest and satisfaction.

Aponte et al. (2011) propose a measurable definition of difficulty based on player experience. Their experiment with a synthetic player and AI-driven player extracted objective difficulty measures. Considering players' past experience when defining difficulty is essential.

Studies have examined the impact of difficulty levels on enjoyment and engagement. Excessive difficulty leads to frustration, while oversimplification results in boredom. Striking the right balance keeps players invested.

Reynaldo et al. (2021) conducted a literature review on video games' effects on cognitive skills and decision-making. They found that video games improve perception, attentional control, and decision-making. Real-time strategy (RTS) players show enhanced cognitive flexibility, while First-person shooter (FPS) players exhibit lower switching costs in tasks. Serious simulation games improve decision-making skills in professionals. High school and undergraduate students who play video games exhibit better cognitive abilities.

Considering the research by Aponte et al. (2011) and Reynaldo et al. (2021), difficulty levels significantly impact player engagement and cognitive skill development in economy-based simulations. Balancing challenge enables game designers to create an optimal experience that promotes involvement and cognitive growth.

### 2.7 Overall Gameplay Experiences:

The simulation of economic systems in strategy games has a significant impact on players' overall gameplay experiences, contributing to increased engagement, immersion, and satisfaction. Well-designed economic systems provide meaningful challenges, goals, and a sense of achievement. The following studies shed light on the relationship between economic systems and overall gameplay experiences:

* Calvillo-Gámez et al. (2018) investigate the influence of economic and socio-demographic factors on immersion in video games, emphasizing the role of economic systems in creating a sense of realism and authenticity.
* Huotari and Hamari (2017) define gamification and discuss its impact on player engagement and satisfaction, highlighting the importance of well-designed economic simulations in providing meaningful challenges, rewards, and a sense of progression.
* Lee et al. (2020) examines the effects of economic systems on player motivation and enjoyment, emphasizing the correlation between player motivation and the complexity of economic systems in strategy games.

### 2.8 Enhancing Player Engagement through Game Balancing in Physical Games:

Altimira, Mueller, Clarke, Lee, Billinghurst, and Bartneck (2017) conducted a study on the effects of game adjustments on game balancing and player engagement in digitally augmented physical games. They explored the impact of altering the game equipment, such as the table size and bat-head size, both statically and dynamically in a digitally augmented table tennis game. The study found that these adjustments enhanced player engagement compared to the no-adjustment condition. The insights gained from their research contribute to the development of balancing strategies that facilitate engaging game experiences, particularly in physical games (Altimira et al., 2017).

Moving forward, it is suggested that future research could focus on resolving conflicts in game design strategies to optimize player engagement. Additionally, investigating the implementation of the derived game design strategies in non-parallel games such as basketball or soccer could provide further insights into adapting balancing adjustments based on different game dynamics.

In summary, Altimira et al. (2017) offer valuable insights into the effects of game adjustments on game balancing and player engagement in physically augmented games. Their research highlights the potential of digital technology as a resource for enhancing player engagement and provides design strategies for creating engaging balancing experiences in physical games.

### 2.9 Conclusion:

In conclusion, the literature review highlights the profound impact of economic systems in strategy games on player decision-making processes, strategic thinking abilities, and overall gameplay experiences. Economic simulations within these games provide players with immersive and engaging virtual economies, replicating real-world economic dynamics. The reviewed studies demonstrate that economic systems shape players' choices, encourage strategic thinking, and contribute to the enjoyment and satisfaction derived from strategy games.

## 3 Methodology:

### 3.1 Game Development:

The primary methodology employed in this dissertation is the design and development of an economy-based farming game using Unity and C#. The game will incorporate features such as crop selection, planting, growth cycles, harvesting, resource management, and trade interactions. Three difficulty levels (Easy, Medium, and Hard) will be implemented, each with varying starting conditions, crop costs, crop values, and AI opponent behaviours.

### 3.2 Playtesting and Interviews:

Following the development of the game, playtesting sessions will be conducted with a sample of participants. During these sessions, players will be asked to play the game across different difficulty levels. Their gameplay experiences, decision-making processes, strategies, and overall satisfaction will be observed and recorded.

Subsequently, semi-structured interviews will be conducted with the participants to gain deeper insights into their experiences. The interviews will focus on topics such as perceived difficulty, engagement, strategic thinking approaches, decision-making factors, and suggestions for improvement.

### 3.3 Data Analysis:

The data collected from the playtesting sessions and interviews will be analysed using qualitative research methods. Thematic analysis will be employed to identify key themes, patterns, and factors influencing player experiences within the economy-based farming game.

## 4 Expected Contributions:

### 4.1 Practical Contributions:

This research aims to provide practical contributions through the design and development of an economy-based farming game that incorporates varying difficulty levels. The resulting artifact will serve as an example for game developers, showcasing how different difficulty levels can be implemented effectively. Insights from playtesting sessions and interviews will inform game developers in designing engaging and balanced economy-based simulations.

Based on the findings, developers can refine difficulty levels in their games, striking a balance between player engagement and challenge. Adjustments to starting conditions, resource availability, market dynamics, and other factors can create gameplay experiences that are both challenging and enjoyable. This research will assist in creating more immersive and rewarding economy-based farming games, enhancing overall gameplay experiences.

### 4.2 Theoretical Contributions:

The theoretical contributions of this research focus on advancing the understanding of the impact of difficulty levels in economy-based simulations within video games. By investigating the influence of difficulty levels on player decision-making processes, strategic thinking abilities, and overall gameplay experiences, this research contributes to existing knowledge in the field.

The findings will shed light on the cognitive processes underlying player decision-making and strategic thinking in virtual economic environments. It will explore how different difficulty levels shape players' resource allocation, investment strategies, and trade decisions. Through participant experiences and feedback, this research will identify factors that influence players' choices, such as risk aversion, strategic goals, and perceived consequences of actions.

Additionally, this research will contribute to understanding how economy-based simulations in video games can develop and enhance players' strategic thinking abilities, including problem-solving, decision-making, and analytical skills. By examining the effects of different difficulty levels, it will provide insights into how gameplay challenges foster adaptive decision-making and strategic adjustments in response to changing market conditions.

By addressing the research gap on the specific impact of difficulty levels in economy-based games, this research expands existing knowledge on the influence of difficulty levels in economy-based simulations. It provides a deeper understanding of how different difficulty levels influence player enjoyment, engagement, and satisfaction within the context of economy-based farming games.

In summary, the practical contributions of this research provide insights and recommendations for game developers to create engaging and balanced economy-based simulations. The theoretical contributions involve advancing the understanding of player decision-making processes, strategic thinking abilities, and overall gameplay experiences within economy-based farming games.

## 5 Ethics:

### 5.1 Informed Consent

Participants will be provided with a detailed informed consent form, explaining the purpose of the study, procedures involved, potential risks and benefits, and voluntary nature of participation. They will have the opportunity to ask questions and clarify concerns before giving their informed consent.

### 5.2 Voluntary Participation

Participation in the study is entirely voluntary, and participants can withdraw at any point without negative consequences.

### 5.3 Data Protection and Privacy

The study will adhere to the University of Suffolk's data protection and privacy policies. All collected data will be treated with strict confidentiality, and measures will be implemented to ensure data security. Only the research team will have access to the data, and identifying information will be anonymized or pseudonymized to maintain participant privacy.

### 5.4 Potential Risks

While minimal risks such as fatigue or mild discomfort during data collection may occur, precautions will be taken to minimize these risks. Participants will be informed about these potential risks in the informed consent form, and their well-being and comfort will be prioritized throughout the study.

### 5.5 Ethical Approval

Ethical approval will be sought from the relevant ethical review board at the University of Suffolk before commencing the research study. The research proposal and necessary documents will be submitted for review to ensure compliance with ethical standards and guidelines.

### 5.6 Debriefing (if applicable)

As the study does not involve deception, debriefing is not necessary. However, participants will receive a summary of the study's findings upon completion as a gesture of gratitude for their participation.

In summary, ethical considerations will be addressed throughout the study, including informed consent, voluntary participation, data protection and privacy, minimizing potential risks, obtaining ethical approval, and providing participants with study findings.

## 6 Conclusion:

This dissertation aims to investigate the influence of difficulty levels on player decision-making processes, strategic thinking abilities, and overall gameplay experiences within an economy-based farming game. By conducting playtesting sessions and interviews, the research intends to provide insights into the effects of varying difficulty levels on player engagement and satisfaction.

The outcomes of this study can contribute to the development of more engaging and balanced economy-based simulations in video games and enhance the gameplay experiences of players. Furthermore, the research can advance the understanding of the cognitive processes underlying strategic thinking and decision-making within virtual economic systems.

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