1 Abstract

- Summary of the whole report

2 Introduction

- Introduction to project

3 Literature Review

3.1 Review of Game History

Similarly, video games would be impossible to create without the television screen, which serves as an essential portal into their fictitious worlds. It was on this date, March 25th, 1925, that Scottish inventor John Logie Baird gave the first public demonstration of televised silhouette images in motion at Selfridge's Department Store in London. It is possible that this event marks the beginning of the gaming industry. Or possibly in the commercial endeavor that Konosuke Matsushita started in 1918 called the Matsushita Electric Housewares Manufacturing Works. This was the enterprise that eventually led to the development of Panasonic, which developed the screen technology that is essential to the existence of video games. Or, should we go back even deeper in time, to the year 1889, when Fusajiro Yamauchi first formed the Marufuku Company? This company would eventually develop into the Nintendo Playing Card Company, which would go on to become the most successful video game manufacturer in the world. The seeds for this business's future success were planted here. In point of fact, the history of video games may be traced back to each of these points, in addition to 10,000 others (Fish, 2021).

Over ninety percent of the 50,000 players' matches were won by the Nimatron, an innovative computer that played games using light bulbs and astonished guests at the New York World's Fair in 1940. At the Canadian National Exhibition ten years later, a towering noughts and crosses machine called Bertie the Brain made its first appearance. Bertie the Brain included varying degrees of difficulty. Real-time images were first employed in a room-sized computer at the University of Michigan in 1954 with a pool simulation. The first software-based video games were produced by British computer scientists in the year 1952. By 1958, "Tennis for Two" had been developed at Brookhaven National Laboratory, and by that time, entertainment had assumed the position of primary importance. The famous "Spacewar!" video game was designed by students at the Massachusetts Institute of Technology (MIT), and it was made feasible by the PDP-1 computer, which was introduced by Digital Equipment Corporation in 1959. Who knows whether he would have continued working at defense contractor Bolt Bernek and Newman, laying the foundations for the Internet by creating data transfer routines for ARPAnet, the United States military computer network, if it weren't for Will Crowther's Adventure, a game that was designed as a way for this father to stay connected to his daughters following a chaotic divorce. The game was designed as a way for this father to stay connected with his daughters after the divorce. The world's early arcade game producers were constantly striving to minimize the size of circuit boards in order to cut costs. As a result, technology shrunk even as its capacity increased (Fish, 2021).

The industry's embrace of the microprocessor in the late 1970s helped to haul the development of home computing along with it, contributing to the acceleration of the

adoption of the technology that supports so much of modern living. The 1970s were the decade in which video games advanced at a rate quicker than at any other point in history. During this decade, games began to incorporate simple animation, imbued their screens with color and particles, and multiplied their soundtracks from life monitor-esque bleeps and blips to striking melodic arpeggios. During this same decade, games also began to adopt the concept of "levels." From Pong's crude take on table tennis and Gran Trak 10's racing simulation all the way up to Adventure, a game based on spelunking, the discovery of a network of underground tunnels, the typical activities of life in the 20th century were slowly imitated in the form of video games. These games ranged from the simple to the complex. During these ten short years, video games were propelled from the basements of university laboratories, where they were available only to the lab-coated high priests of technology, onto the stage of the world. The release of Space Invaders attracted so much attention in Japan that the country's national bank launched an investigation into developer Taito following a national shortage of 100 Yen coins (Parkin, 2014).

The year 1972 marked the beginning of a period of seismic upheaval in the environment of arcades, which paved the way for video games to soon dominate the industry. Pong was the game that initiated these shifts.

Figure 1 Bertie the Brain (Fish, 2021)

The Atari Video Computer System (VCS), which was a top-selling second-generation system, had a significant decline in sales with the release of Space Invaders in the year 1980. The number of machines sold increased by a factor of four over the course of just two years. Space Invaders was the first video game to sell more than a million copies,

and it eventually went on to sell twice as many copies as it had originally sold. Because the introduction of Space Invaders attracted so much attention in Japan, the country's national bank began an investigation into creator Taito following a shortage of 100 yen coins across the country. The video game console adaptations of Asteroids and Missile Command were both made available in 1981 and went on to sell a combined total of 2.5 million and 3.8 million units, respectively. Pac-Man, on the other hand, was the most popular of all arcade adaptations when it was released in 1982 and has since gone on to sell more than seven million copies. During this same time period, Nintendo's Game & Watch series joined the portable gaming market, selling single-game devices that collectively sold over 43 million copies across 60 different titles. It is believed that 7 billion pennies had been poured into the 400,000 Pac-Man arcade machines across the world by the year 1982. Pac-Man's first year of operation in the United States brought in approximately $1 billion in revenue. This golden phase, however, was short-lived as the industry saw a disastrous decline in 1983. Revenues in the United States video game business fell from $3.2 billion in 1982 to less than $100 million by 1985, and estimates of the global market fell from $42 billion in 1982 to $14 billion in 1985. Both of these numbers are a significant drop from the previous golden time. The decline of the industry was hastened by several factors, including excessive spending on arcade machine purchases, the creation of illegal console variants, and the growing competition from personal computers in the home. Despite the fact that console games continued to dominate the industry, id Software was founded in 1991 and became a pioneer in the field of personal computer gaming with titles such as Commander Keen, Wolfenstein 3D, and Doom. In 1993, the total revenue generated by console games in the United States was $6 billion, while the total revenue generated by computer games was $430 million (Fish, 2021).

In the seventh generation of handheld video game consoles, gaming achieved its pinnacle, which was emphasized by Nintendo's bold move in 2004 to release the Nintendo DS, which had two screens simultaneously. The gamble paid off extraordinarily well, drawing interest from a wide range of people; as a result, 154 million copies of the Nintendo DS were finally sold. In spite of the fact that consoles had long had a dominant position in the video game industry, having supplanted arcades in 1997 and making a sizeable contribution to the total processing power of the world by 2007, the landscape began to shift in the 2010s.

Mobile game revenue surpassed that of console game revenue in 2011, and by 2013, the market share of the PC gaming industry had surpassed that of the console gaming industry. Recent technological trends that have inspired game developers include voice and facial recognition, gesture control, and augmented reality. The introduction of Pokémon Go in 2016 by Niantic, an example of the promise of augmented reality gaming, exemplifies this potential. Despite subsequent issues, CD Projekt RED's Cyberpunk 2077 was successful in its initial three weeks of release in 2020, selling approximately 13 million copies across a variety of platforms. Bandai Namco Entertainment published the action role-playing game Elden Ring, which was developed by FromSoftware and released in February 2022. The game received widespread acclaim and was recognized as a number of times as Game of the Year. After a little more than a year had passed, it was discovered that Elden Ring had sold more over 20

million copies (Fish, 2021).

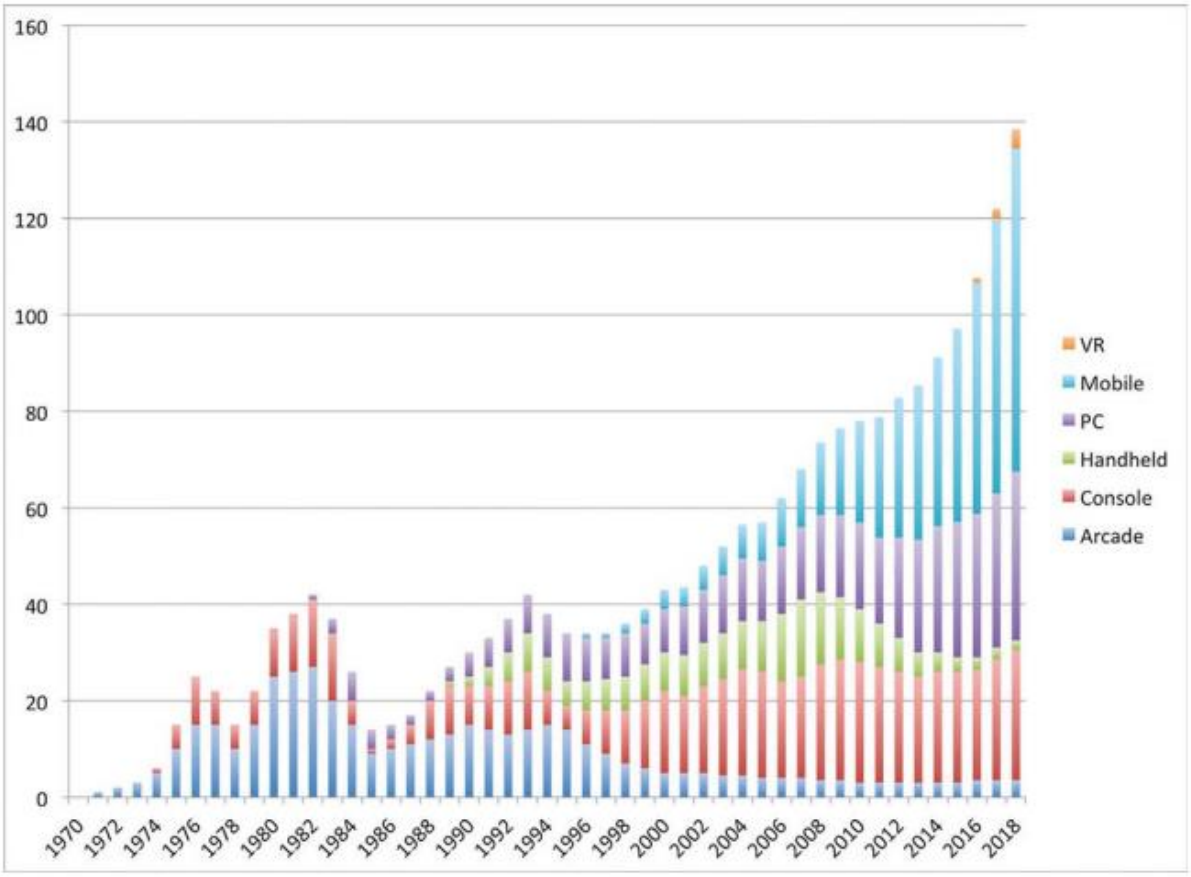

Figure 2 Video game industry global revenues by platform (1970 - 2018)

For decades, virtual reality (VR) has teased players with the promise of an experience that is completely immersive. However, the promise of such technology has been difficult to fully realize. When compared to the rest of the gaming business, it is still considered a niche area. In 2022, both sales and manufacturing in this sector had a 12 percent decline. However, over the course of the past few years, businesses like as Meta, Valve, PlayStation, and Samsung have all made moves to enter the virtual reality industry. The virtual reality (VR) gaming business is expected to increase at a rate of 30.5% by 2028 (Koss, 2023), which means that this trend of investment is likely to continue.

2016 was the year that augmented reality, a type of gaming technology that superimposes digital images onto the actual world, generally through smartphones or special glasses, made its significant debut on the gaming landscape. Augmented reality is a form of gaming technology that superimposes digital images onto the physical world. During that time period, parks and plazas were overrun with people playing Pokémon Go on their smartphones. Since its initial release, the video game has consistently been one of the most commercially successful pieces of software ever created, with annual sales of roughly one billion dollars. The use of augmented reality (AR) gaming is most commonly associated with mobile phones; however, tech companies such as Meta, Snap, and Magic Leap are beginning to expand into AR eyewear. As a result of the fact that Meta is planning to produce its own augmented reality glasses in 2024, there will most likely be significant developments in the field of augmented reality for gamers in the years to come (Koss, 2023).

However, AI is not only included in the game's gameplay experience. It's a normal aspect of the process of producing a game. AI has been used by game designers to assist them in the generation of game elements for a number of years now. They can delegate such task to computers by employing a method known as procedural generation, which is a common practice in the sector. Even if AI might not be able to make whole games just now, AI-generated art might revolutionize the graphics business in the near future (Koss, 2023).

It's possible that in the future, gamers will interact with one another on other people's computers or in the cloud. Cloud gaming is a form of internet gaming that gives players the ability to stream video games straight to their gaming device by connecting to remote servers hosting the games. In recent years, both Sony and Microsoft have launched their very own cloud gaming services for their respective platforms. A cloud gaming service under the name Luna was introduced by Amazon in the year 2020. Even Netflix has made moves toward entering the cloud gaming industry, including hiring its first vice president of gaming in 2021. According to Microsoft's estimates, there are currently 20 million customers using Xbox cloud gaming services. GeForce NOW, Nvidia's cloud gaming service, has also experienced growth in recent years, increasing from 14 million customers in 2021 to 20 million subscribers in 2022. It is likely that cloud gaming will continue to be popular in the future given that its value is projected to reach around $3 billion by 2024 (Koss, 2023).

In essence, Web3 is an expansion of cryptocurrency that leverages blockchain technology in novel ways to achieve fresh objectives. A blockchain has the capability to store several types of data, such as the quantity of tokens held in a wallet, the conditions of a contract that can execute itself, or the programming code for a decentralized application (dApp). Blockchains exhibit variations in their operational mechanisms, although, as a general rule, cryptocurrencies serve as incentives for miners to carry out transaction processing.

The hybrid activity that combines gaming with finance, known as GameFi, is rapidly gaining in popularity. Play-to-earn, or P2E, gaming models are becoming increasingly popular within the blockchain sector, which has sparked a lot of excitement among gamers and Web3 developers alike. As a result, it shouldn't come as a surprise that there has been an increase in questions on how to make a GameFi game.
The play-to-earn concept, sometimes known as P2E, is one of the components that make up GameFi. Players in player-to-environment (P2E) games have the option of earning fungible tokens or non-fungible tokens (NFTs), depending on the game's design. After that, you'll have the option of storing or exchanging these assets for stable coins, further cryptocurrencies, or even fiat currency. As a consequence of this, the benefits gained from playing a game can be applied to one's everyday life. It is also important to note that decentralized finance comes with numerous perks, which also become the benefits of Web3 gaming. This is something that should be pointed out. On-chain games thus incorporate aspects such as decentralization, transparency, and immutability into their play. Because of this, shifting from a "pay-to-play" model to a "play-to-earn" model is no longer a matter of "if" it will happen because it has positive factors on its side. It is very clear what will emerge victorious, and current patterns provide evidence of this prediction (Moralis, 2022).

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The retention of players over time is the most important factor in determining a game's level of success. The retention of users is one of the most significant advantages of Web3 gaming, which is certainly a cause for celebration. The term "user-generated content" (UGC) is quite relevant in this context. As a result, players aren't only consuming the game; they're also taking part in it by making use of their own creativity (Moralis, 2022).

3.2 Review of Technologies

3.2.1 Overview

Unity	Being a flexible cross-platform game engine, Unity distinguishes itself by enabling developers to produce a wide variety of games, from 2D and 3D to VR and AR experiences. Its huge asset catalog makes game development more efficient, and its drag-and-drop system, visual scripting, and user-friendly interface cater to creators with different levels of experience. The

	attractiveness of Unity is derived from its advanced visuals, audio tools, and cross-platform interoperability, which are enhanced by features like networking and analytics. Unity is a popular choice for creators due to its versatility and large community support, even with its potential resource demands, especially for sophisticated games.

Unreal Engine	Unreal Engine is widely recognized as a dominant force in the game industry, renowned for its exceptional visual quality and extensive capabilities designed specifically for intricate projects. The rendering engine and comprehensive collection of tools of this software appeal to developers who aim to build visually impressive gaming experiences. Nevertheless, despite its remarkable qualities, Unreal Engine encounters obstacles that restrict its wider acceptance.

3.2.2 Performance

Unity	Unity achieves a difficult equilibrium between efficiency and constraints in terms of its performance. The lightweight editor, efficient memory management, and optimized rendering pipelines of this software are frequently praised by developers. Nevertheless, as games become more intricate, especially in scenarios with a multitude of objects and complicated shaders, performance issues become a significant problem, particularly on mobile devices and older technology. While C# provides a strong scripting option, its dependence as the main language may present resource difficulties. Therefore, developers must meticulously evaluate hardware limitations, particularly when working on extensive 3D projects.	
	Evaluation	4/5

Unreal Engine	The Unreal Engine is renowned for its remarkable performance capabilities, consistently delivering smooth gaming experiences with average frame rates above 60fps on high-end machines in demanding titles like Fortnite and Red Dead Redemption 2. Fortnite exhibits outstanding performance on mobile devices and VR/AR headsets, consistently sustaining a frame rate of 30fps on the Nintendo Switch. Moreover, Unreal Engine dominates the VR/AR projects market on SteamVR with an impressive 58% market share. However, employing this skill comes with a cost. The resource requirements of Unreal Engine may impede performance on less capable devices, and its extensive dependence on C++ programming presents a more difficult learning curve for beginners compared to script-based engines like Unity. In addition, it is important for developers to be aware that while focusing on the mobile platform, Unreal Engine has a smaller market share of 3.1%, while Unity is the dominant player with a market share of 50.9%. Undoubtedly powerful, Unreal Engine requires careful evaluation of project needs and target platforms to properly utilize its capabilities and ensure compliance with the project's vision and technical feasibility.	
	Evaluation	4/5

3.2.3 Code efficiency

Unity	Unity is known for its code efficiency, which is achieved by predominantly using C# as its scripting language. This approach ensures a balance between ease of use and performance optimization. C# provides a scripting environment that is both user-friendly and versatile, enabling developers to generate code for their games that is both efficient and scalable. The efficiency of the engine is enhanced by Unity's lightweight editor, efficient memory management, and optimized rendering pipelines. The platform additionally offers tools for performance profiling and optimization, assisting developers in detecting and resolving bottlenecks in their code. The Asset Store of Unity greatly improves productivity by providing an extensive collection of pre-made components and plugins that can be easily incorporated into projects, resulting in time and resource savings during development. Despite the complexities of elaborate projects, Unity's focus on community support and easily accessible tools empowers creators to employ effective coding techniques and create top-notch, performance-optimized games for multiple platforms.	
	Evaluation	4/5

Unreal Engine	The coding capabilities of Unreal Engine are widely recognized for their strength and efficiency, primarily due to the utilization of C++ as the main programming language. C++ offers developers a robust and versatile set of tools to enhance performance in Unreal Engine projects. The engine's architecture facilitates low-level programming, empowering developers to meticulously adjust and enhance crucial elements of their code. Moreover, Unreal Engine integrates numerous optimization functionalities, including an advanced rendering pipeline, effective memory allocation, and integrated profiling tools, all of which enhance the overall efficiency of the code. Although beginners may find the learning process for C++ to be more challenging, skilled programmers can utilize its features to implement efficient algorithms and achieve optimal utilization of resources. This ensures that Unreal Engine continues to be recognized for its ability to deliver visually impressive and smoothly running games on various platforms.	
	Evaluation	4/5

3.2.4 Pros and Cons

	Unity	Unreal
Pros	User-friendly interface Suitable for varying levels of experience Efficient for 2D games	Exceptional performance, providing high frame rates in demanding games Remarkable graphics and advanced features
Cons	Not suitable for resource-intensive projects Lower performance in 3D than 2D	Steep learning curve Heavy resource demands

		Not suitable for mobile game development

3.3 Review of Methodologies

3.3.1 Aspects

Aspect	Waterfall	Agile	Scrum
Development Approach	Sequential and linear	Iterative and incremental	Iterative and incremental with specific roles
Project Flexibility	Low flexibility, costly changes	High flexibility	Moderate flexibility
Client Involvement	Limited client involvement	Continuous client involvement	Regular client involvement during each sprint
Risk Management	Risks addressed at the end of the project	Risks are identified and addressed continuously	Risks managed each sprint
Testing	Separate phase following development	Continuous testing through the development process	Testing within each sprint
Documentation	Extensive documentation created before development	Documentation changes through the project	Lightweight documentation
Changes Adaptability	Low adaptability	High adaptability	High adaptability
Delivery Time	Product delivered at the end of the project, long delivery time	Regular delivery after short interentation	Regular and fixed-length delivery

3.3.2 Pros and Cons

	Waterfall	Agile	Scrum
Pros	Clear and well-defined phases Easy to manage Detailed documentation before development	High flexibility Continuous client involvement Faster delivery of small changes	Iterative approach allows for continuous improvement Efficient use of resources Regular client feedback
Cons	Low adaptability to changes Limited client involvement	Dependent on communications Less predictable timelines	Relies on specific set of roles Require additional training for

	Long delivery time		development method

3.4 Choosing solutions

As a project developed with a limited budget and time, as well as little proficiency in the field, It is a wise choice to choose a language that is easy to pick up. However, the quality of the appliaction should also be valued. Therefore, using a game engine instead of graphic API would be more suitable. In summary, the technology choice should be easy to learn and use, as well as suitable for scripting in game engine. Considering the review of technologies above, It is evident that C# is the most appropriate option for developing the game.

As the project is developed in short time and can go through multiple phases of changing design, therefore, agile is the suitable method for developing the game.

4 Requirement Analysis

4.1 Similar application 1

4.2 Similar application 2

4.3 Conclusion

- Confirm your application features
- What is your improvements / modification / localization / …?

5 Software design

5.1 Architecture (optional)

5.2 GUI (optional)

5.3 DB (optional)

5.4 UML (optional)

6 Software implementation

6.1 Development environment

6.2 Important technical problems & solutions

6.3 Test (optional)

6.4 Results

7 Evaluation and conclusion

7.1 Evaluation of results

- Pros / Cons of your application

7.2 Conclusion

- Lessons learnt
- Problems / difficulties
- Future improvements
- Conclusion

8 Appendix

- Final plan

- Screenshots (optional)