Tijmen Bult

THE IMPLICATIONS OF NON-FUNGIBLE TOKENS IN VIDEO GAMES FROM THE PERSPECTIVE OF THE STAKEHOLDER CAPITALISM THEORY

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Author
Tijmen Bult

Supervisor
Dr. Teck Ming Tan

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Abstract

Non-fungible tokens (NFTs) make it possible for companies to give consumers a unique piece of digital data that is represented on a blockchain. Where traditionally, an item in a game was just some code that could technically easily be copied, NFTs can make this game item truly unique and scarce. In this research, the impact of NFTs on stakeholders in a gaming ecosystem is explored.

The developments within the gaming sector regarding NFTs are looked at from the perspective of three principles of the stakeholder capitalism theory, which are the principles of cooperation, engagement, and responsibility. The impact of the implementation of NFTs in games on stakeholders is evaluated from the perspective of these three principles to better understand how NFTs impact the different stakeholder groups in a gaming ecosystem.

For this study, information was gathered by means of semi-structured interviews with five respondents. These respondents are all active in the NFT gaming industry, including CEOs of game development companies, researchers, and game designers.

The findings show several themes that currently play in the NFT gaming scene. Gamers can be engaged with NFTs while also investors and smaller game developers may be engaged more effectively. Also, the cooperation between stakeholders may be improved with NFTs. Though, there are concerns regarding the use of NFTs in games with regard to the responsibilities of the different stakeholder groups.

One of the contributions of this study is the identification of the different stakeholder groups that are part of an NFT gaming ecosystem and their relations with each other. Furthermore, several managerial implications are presented for game developers based on the conclusions.

Game developers should take into account the impact NFTs may have on their game design. For example, the fact that NFTs can have a monetary value means that the in-game economics may become more complex. Also, in certain situations, a game may be developed via a Decentralized Autonomous Organisation (DAO), meaning NFT and token holders can vote on development proposals. This may change the role a game developer has compared to traditional game development.

Expanding the knowledge of NFTs in games is necessary as, for some, Play-to-Earn has become a source of income. If this trend continues, the field of NFTs and Play-to-Earn may play an important role in the future economy.

Keywords
Gaming, Non-fungible tokens, NFT, cryptocurrency, blockchain, stakeholder, capitalism, engagement, cooperation, responsibility

Additional information

CONTENTS

FIGURES

TABLES

1 INTRODUCTION

In this chapter, the concepts of blockchain and non-fungible tokens (NFTs) are introduced. Furthermore, some use-cases are presented after which an introduction to the use of NFTs in marketing and gaming is given. Finally, the research questions, the importance of the research, and the research structure are introduced.

1.1 Blockchain technology

To understand the implications of non-fungible tokens (NFTs) in gaming and the marketing thereof, it is helpful to understand the basics of the underlying technology. Blockchain technology is often called a disruptive technology, especially for the finance sector. The reason for this is that the technology makes it possible for transactions to be send over the internet without any intermediary needed. The word "blockchain" consists of two words; "block" and "chain." The idea behind a blockchain is to have a complete ledger of the transaction history by chaining together blocks of transaction data. A block is added regularly and can be seen as the heartbeat of the network (Nofer et al., 2017). Figure 1 shows an example of a blockchain.

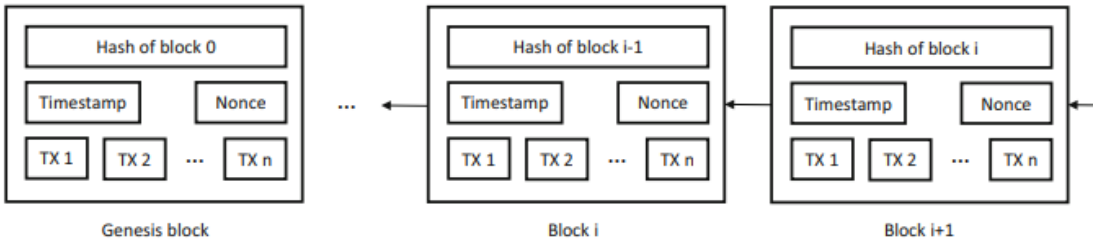

Figure 1: A blockchain (Nofer et al., 2017).

A block within a blockchain consists of multiple components. Firstly, there are the individual transactions ("TX 1, TX2, etc. in Figure 1). These transactions are accompanied by the timestamp, which is the exact time and date on which a block has been generated. The nonce is a random number that play a role in the generation of a block. Finally, the hash key of a block ("Hash of block n" in Figure 1) is the hash key that is generated by encrypting all the data in a block. The next block will contain this

same hash key to link both blocks together represented by the black arrow between the blocks in Figure 1.

A blockchain on its own does not have much value, however, without a network of peers. Nofer et al. (2017) explain how blocks of transaction data need to be accepted by a network of nodes. Once a majority has been reached after the distribution of a block, it can be added to the blockchain, settling the transactions made within the timeframe of a block (i.e. in between two heartbeats). The result is a set of transactions saved on a distributed ledger that cannot be changed anymore due to their linkage via hash keys. Changing even one bit of data in a previous block, changes the hash key of that block, breaking the link of the whole blockchain.

Blockchain offers a trust-layer on top of the internet, removing the need for trust between parties when transferring value. It not only enables transferring value without the need for middlemen, blockchain technology also makes it easier to prove who is the rightful owner of an asset (Ertemel, 2018). For example, when considering a public blockchain such as the Bitcoin blockchain, one can view every single transaction ever made in the history of Bitcoin through a blockchain explorer (Blockchain.com, 2022). All market and network participants, such as investors, miners and nodes, can verify that an address either owns the claimed amount of BTC or that a transaction indeed has been sent and/or received. Once a transaction is sent, it cannot be reverted anymore without both parties agreeing. This makes value transfer via a blockchain a use-case for internet payments.

1.2 Definition of non-fungible tokens (NFTs)

Based on blockchain technology one finds several use-cases, such as the already mentioned transferring of value via a currency. But blockchain is not limited to digital currencies (known as cryptocurrencies). Another emerging use-case are non-fungible tokens (NFTs), unique digital tokens that exist on a blockchain.

The difference between fungible and non-fungible items is described as follows: Fungible items can be exchanged with one another; one can trade 1 dollar with 1 dollar, they are of the same value. The same goes for euro’s, bitcoins or any other currency,

commodity, and common shares. Non-fungibility, however, concerns items that have unique attributes and can therefore not be traded one on one with other unique items (Chohan, 2021). A commonly known example of such items are collectable baseball cards; some are more rare than others and therefore have a higher or lower value than others.

Baseball cards are physical and live in the real world. Turning digital data into a comparable unique item was basically impossible for a long time as digital data can easily be copied. By implementing blockchain technology, people can verify ownership of data. An NFT is a "unit of digital information" stored on the blockchain. With the help of blockchain technology, people, companies, platforms etc. can verify the uniqueness and distinguishability. For example, artists can attach a digital artwork to an NFT which can then be sold on a marketplace (Chohan, 2021).

While one still can copy the digital piece of art, it is the proof of ownership that makes NFTs unique. People can no longer fake ownership of said data item. Kugler (2021) compares it to the document art collectors receive when acquiring an original painting, proving that the painting is real and in fact in the possession of the collector. With this document, everyone will agree on the fact that the collector owns the work. In the case of digital art connected to NFTs, the NFT and its transaction history take on the role of this verification document.

With smart contracts, creators can apply all kinds of extra conditions to an NFT. One such condition is to charge royalties every time an NFT is sold, for example, a percentage of the sales price. This royalty can even be charged when the person who bought the NFT from the original creator, sells it on to someone else. As will be explored more into detail in the next section, this is especially interesting to musicians selling songs and digital art creators (Trautman, 2021).

1.3 NFT use-cases

NFTs can be implemented in different sectors and in this section some existing implementations are presented. Beginning with digital art, then the metaverse, music, and finally some examples outside of these categories.

1.3.1 Digital art and collectibles

Chohan (2021) introduces NFTs by mentioning how much the market of these digital tokens has grown. While in December, 2020, $12 million worth of NFTs were sold, this number grew to $340 million two months thereafter. According to The Block (date of retrieval, May 9th, 2022), the weekly trade volume for art and collectibles comes in at about $190 million. This is, at the time of writing, the lion share of the NFT market.

Digital art is the digital version of art, which can take the shape of images as well as animations. Connecting this to NFTs adds a layer of uniqueness to digital art, which in essence exists out of data that could normally be easily copied. This gives digital art items value, as everyone can see that the collector indeed owns an original piece of digital art. Trautman (2021) states that the value of art is dependent on the value that other humans in communities see in a piece of art. Digital art connected to NFTs therefore is closely related to the interest from many online communities that exist nowadays, from which the art pieces derive their value.

Collectibles can be compared to the earlier mentioned baseball cards. Often, like their real-world versions, they are part of a bigger collection. For example, CryptoPunks is a collection of digital avatars, one rarer than the other (Larva Labs, 2022). An example of digital art, on the other hand, is the work by Beeple, called “Everydays: The First 5000 Days,” a collage of many of his earlier artworks combined in one digital art piece. This work marks the first NFT that was auctioned by auction house Christie’s and was sold for $69 million in 2021 (Trautman, 2021).

Figure 2: Some of the CryptoPunks NFTs (Larva Labs, 2022)

1.3.2 Metaverse

Another area where NFTs can be implemented is the metaverse. The metaverse is a digital world incorporating virtual reality technologies, bringing together people in a digital space. In this digital space, concerts can be held, stores can be opened, and games can be played. Within the metaverse, cryptocurrencies and NFTs can play an important role in transferring value between people via the internet. An example is Decentraland, a digital world where people can own digital pieces of land. Each digital piece of land is represented by an NFT, so that everyone in Decentraland can verify who owns what piece of land (Sparkes, 2021).

Investment bank Fidelity utilizes the Decentraland metaverse as part of its marketing strategy. Fidelity opened a digital building with multiple floors where customers can learn about the basics of investing (Fidelity, 2022).

Figure 3: Fidelity's real estate in Decentraland (Businesswire, 2022)

1.3.3 Music

NFTs have several use cases within the music industry as well. One of these use cases is that songs can be represented as NFTs (Trautman, 2021). One could argue this brings the musicians closer to their fans as the fans can own a piece of the musician this way. A recent example is Snoop Dogg and his new B.O.D.R. album. Fans can buy "Snoop Stash Boxes" containing one of the songs in NFT form (Rolling Stone, 2022).

Another use case for NFTs for musicians is the possibility to release NFT collections. The American heavy metal band Avenged Sevenfold released a collection of 10.000 NFTs called the "Deathbats Club." Holders of these NFTs can earn different perks, such as meet and greets and free tickets for life. These NFTs also give access to the metaverse land that the band owns. There it plans to organize virtual concerts only for members of the Deathbats Club (Forbes, 2022).

1.3.4 Other applications

The use of NFTs is not limited to the above mentioned use-cases. The technology can offer solutions in many other areas, such as the tokenization of software licenses, houses, educational certificates, etc. Regner, Schweizer and Urbach (2019) continue to dive deeper into the implementation of NFTs to tackle the issues event organisers

are facing in the light of the secondary ticket market. Ticket prices on the secondary markets can take extreme heights. Banning the resale of tickets could mean many problems for organisers as they would have to perform complicated checks to verify the person that owns the ticket before a visitor can enter the event. NFTs could offer a quick and easy solution in verifying the owner of a ticket. These are just some of the use-cases of NFTs. However, one must consider that at the time of writing, the actual real-world use of NFTs stays limited, hence not many literature exists about this topic.

1.4 NFTs in marketing

Now that the basics of blockchain technology and NFTs are introduced, the use of last-mentioned for marketing purposes will be looked at. Blockchain technology in general can offer solutions for marketeers as, according to Ertemel (2018), there is a lack of trust in marketeers. Only 20 percent of consumers have a considerable or high level of trust in brands. One of blockchain technology's characteristics is that it is trust enabling by taking away the need for trust. The technology can improve a brand's position by improving factors such as traceability and transparency.

1.4.1 Owning a piece of a brand or movement

There exists little literature of the implementation of NFTs for marketing purposes. But when looking at practical examples, it becomes clear that the tokens are gaining traction, with large brands embracing them. An example is McDonald's use of NFTs. The fast-food company launched a collection of McRib tokens that give customers the opportunity to own one of the few digital versions of the hamburger. Customers could win these by following McDonald's on Twitter and retweeting a certain tweet (McDonald's, 2021). The goal here seems to be generating engagement while also giving customers a part of the McDonald's brand.

Aside from commercial motives, also (political) movements can utilize NFTs. An example of such movement is the Ukrainian government selling the Ukrainian flag as an NFT for 2.173,6 ethereum, worth about $6,5 million at the time of the sale (UkraineDAO, 2022 – Date of retrieval 23-05-2022). The proceedings of this sale went

to the Come Back Alive organization, which donates supplies to Ukrainians that suffer due to the Russian invasion of the country (Jabotinsky & Lavi, 2022).

1.4.2 Adding functionality

NFTs could be a powerful tool in the arsenal of a marketeer. Where the mentioned example of McDonald's is a simple digital collectable, Nike goes a step further by aiming to add a function to its NFTs. The American sports fashion brand filed for a patent in 2019 that introduces "CryptoKicks." When a customer buys a pair of real-word Nike shoes, the customer would also receive the same pair of shoes in digital form. The physical and digital shoes are linked with an NFT token on the blockchain. This token contains information such as the transaction date, among other data. Reselling the physical pair of shoes becomes easier, considering brands like Nike are often faced with counterfeited products. Selling second-hand pairs of shoes on the secondary market offers buyers the possibility to verify the shoes by means of transaction data on the blockchain (Beedham, 2019).

Aside from verifying the shoes, Nike proposes that consumers can also "breed" digital shoes with one another. And if the offspring meets the manufacturability conditions, consumers can choose to have a new pair of tangible shoes made by design of the CryptoKick bred designs (Andon, et al., 2019).

1.4.3 Bridging physical with the metaverse

Another area where brands have shown interest in, in the context of NFTs, is the metaverse. As mentioned in section 1.3.2, the metaverse is a digital world based on virtual reality and blockchain technology. The metaverse offers opportunities for brands by transforming physical products into digital items that consumers can "wear" inside the digital metaverse. Brands open digital fashion houses and collaborate with famous artists to design new, unique NFTs, such as digital clothes, shoes, and bags.

As almost all digital data can be transformed into an NFT, brands may use NFTs to make digital versions of catalogues, for example. Also, digitalizing real-world

products could make it possible to embed these products in metaverse games, something that is already happing with the fashion industry (Ceviz & Sarikas, 2021).

1.4.4 Marketing for sports teams

Finally, NFTs offer sports clubs and teams a unique way of engaging with fans, while introducing a new revenue stream. Traditionally, fans collected physical cards of their favourite player, as mentioned in section 1.3.1. NFTs make it possible to tokenize almost everything. One example is the NBA Top Shot platform, launched by The National Basketball Association (NBA).

Top Shots are not just pictures of famous basketball players, like their old-school physical twins. Instead, with Top Shots, fans can own a game highlight, like a dunk. The value of these highlights are digitally tracked, just like their whereabouts. Athletes can utilize NFTs for their own marketing purposes, gaining exposure, while fans can experience more engagement with their favourite players (Rehman, et al., 2021).

Concluding this first chapter, blockchain technology is a way of storing data decentralized in an immutable ledger. The best-known implementation of blockchain is Bitcoin, a virtual currency. Blockchain, however, makes many more things possible such as smart contracts and NFT's, which are built upon this technology. With NFT's, creators, companies or anyone interested can create unique digital sets of data that exist as a digital token on a blockchain. This offers the possibility to proof ownership of digital items. This is offering many potentials, especially for marketing-related practices as well as digital artists, musicians, and game developers, as will be covered in the next chapter.

1.5 NFTs in gaming

Now that a basis has been laid down for blockchain, NFTs and the general implementation of NFTs and more specific in marketing, a more specific use-case of NFTs will be brought forward; the implementation of NFTs in video games. In this section, the core of this research thesis will be introduced. To understand the implications of this technology within the gaming industry in the light of existing

marketing theory, one must understand the current situation of how NFTs are currently implemented and what value they can offer within games.

As explained in chapter 1.2, NFTs are unique sets of data that are stored on the blockchain, giving people the possibility to verify the scarcity and ownership of data. NFTs could therefore also represent in-game items. A player could, for example, obtain a digital sword linked to an NFT. Due to the NFT, this sword can be scarce and other players can verify that a player indeed owns the item. Aside from the fact that players can generally own a digital in-game item, the implementation of the digital tokens could stimulate the in-game economy between players (Bawany, 2021).

In-game items such as swords, skins or outfits, so-called digital assets, have existed since most of gaming history. Some of these skins are valuable due to their perceived scarcity, although in traditional games such as Fortnite and Counterstrike, these assets are made up out of data that is part of the game software. In other words, the data is managed by a centralized party, in this case the game developers. They could, if they wanted to, pull the plug out of the game with all digital assets incorporated into the game gone. However, skins in traditional games can still be sold in certain ways. For example, in July, 2020, the StatTrak M4A4 skin in Counter-Strike: Global Offensive was sold for over $100.000 (Hawthorne, 2021).

NFTs could revolutionize how games handle in-game assets, giving players the ability to proof gaming asset ownership. Also, ‘Play-To-Earn’ can be made possible and become more efficient with the help of crypto and NFTs. Play-To-Earn is the concept of giving players the ability to earn money while playing a game (Choi, 2022). Play-to-earn became popular in the Philippines amidst high unemployment rates and the COVID-19 pandemic. Axie Infinity, a play-to-earn game with NFTs, became an important income source for people in the country (Li, 2022).

Making play-to-earn possible and more efficient by ways of NFTs is realized by linking conventional gaming design with unconventional game mechanisms, in this case the underlying blockchain technology. The assets that players earn can be earned in several ways. Breeding is the creation of new items by spending in-game currency

in combination with an already existing NFT, for example. Players could also obtain these items by completing in-game tasks (Osivand, 2022).

1.5.1 Example: Ubisoft Quartz

One such implementation of NFTs by a game developer is Ubisoft's Quartz platform. Quartz is based on Tezos, a Proof-of-Stake (PoS) blockchain network. On this network, Ubisoft launches so-called 'Digits,' which are "unique and in-game cosmetic playable items." The Digits are part of collections, called Editions. Once an Edition is launched, there will never be more Digits (or NFTs) added to the Edition. Initially, Quartz will only be incorporated with the Tom Clancy's Ghost Recon games, a game title that saw its first game launched in 1998 (GlobalNewswire, 2021).

On the official Ubisoft Quartz website, Ubisoft puts forth three advantages gamers will gain from Digits in their gaming experience. Firstly, uniqueness. When a player receives a Digit, their gamer name will be included in the metadata as well, meaning their gamer name will be part of the Digit forever. Secondly, exclusive experience. Ubisoft states that Quartz brings the opportunity to truly stand out with unique and scarce in-game items. Thirdly, in-game items will no longer be stuck inside a specific game title but can be traded outside of the game on authorized third-party marketplaces (Ubisoft, 2022).

1.5.2 Blockchain-based games

As the Ubisoft example above shows, NFTs can be implemented by centralized game developers where only a part of the game (game items represented by NFTs) interacts with the blockchain. Where NFTs play a more integral role, however, is in blockchain-based games. These are games which code exists in a smart contract on the blockchain that is executed automatically once certain conditions are met (Min, Wang, Guo and Cai, 2019). In the figure below, the architecture of a blockchain-based game is shown.

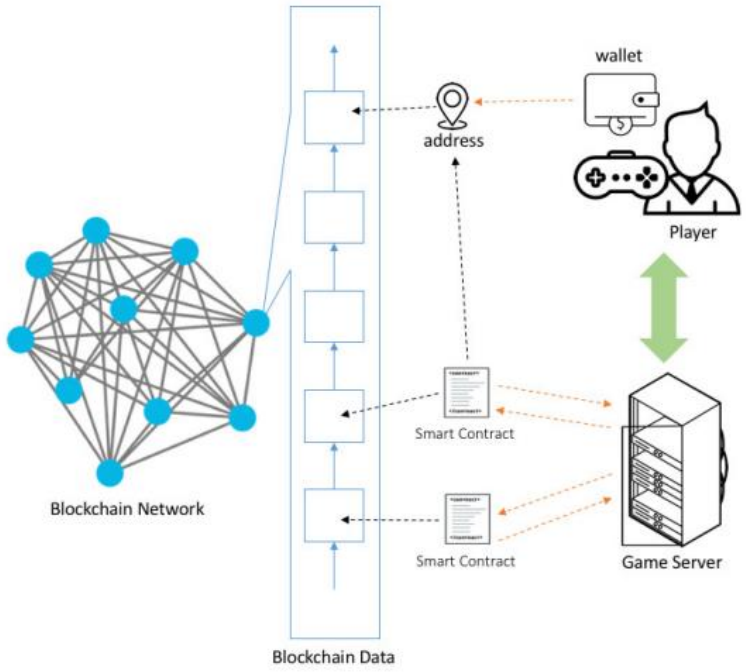

Figure 4: Architecture for blockchain-based games (Min, Wang, Guo & Cai, 2019)

For a player to be able to play a blockchain-based game, they need a wallet address for that specific blockchain. The game servers let functions within the game that alter the in-game assets represented by NFTs be done by the blockchain network through smart contracts, open source programs that are stored on, and executed by the blockchain (Min, Wang, Guo and Cai, 2019).

Giridharan (2021) mentions that the potential growth of this sector can attract venture capital This view is supported by Union Square Ventures partner Fred Wilson, who stated that digital collectibles and the games they enable could be one of the, if not the first, big consumer use cases for blockchain technology (Wilson, 2018). Furthermore, venture capital firm Andreessen Horowitz launched a $600 million gaming investment fund that will invest in gaming start-ups utilizing NFTs (Somerville, 2022).

1.5.3 Stakeholders in NFT gaming ecosystem

Based on the use cases of NFTs in general, in marketing, and more specifically gaming laid out in this chapter, several stakeholders of an NFT gaming ecosystem can be identified. Namely, the game developers, gamers, and brands currently implementing

NFTs and willing to include their NFTs in games. Also, platforms such as Decentraland form a stakeholder group. Finally, investors can be considered to be a stakeholder group within an NFT gaming ecosystem.

1.6 Research questions and objectives

The goal of this research is to explore the current state of NFTs in gaming. More precisely, to understand the current ideas persons with experience in the field of game developing have about the implementation of NFTs in video games with regards to the stakeholders. To fulfil these objectives, this research aims to answer the following research questions.

RQ1: How could NFTs improve the cooperation between stakeholders in an NFT gaming ecosystem?

RQ2: How can game developers engage stakeholders using NFTs?

RQ3: How do NFTs impact stakeholders' responsibilities?

By answering these three questions using collected data, a clearer idea of the current situation regarding NFTs in gaming can be obtained. RQ1 focusses on the relationships between stakeholders and what impact NFTs may have on their cooperation, RQ2 is aimed at the potential improvement of the engagement of stakeholders, and RQ3 considers the change of stakeholders' responsibilities in an NFT gaming ecosystem.

1.7 Importance of research

The blockchain sector is nascent with many different solutions now being build on top of different blockchain networks. One of the sectors that can leverage blockchain technology, is the gaming sector. By representing in-game items as NFTs, a new layer is added to games.

Exploring and researching this development is important as it is unclear yet how, where and why the technology can help gaming developers. This aim of this research

is to explore the developments in the context of the different stakeholder groups. They can be affected significantly by this development, both positively and negatively. Also, the relationships between these groups may change as a result.

1.8 Methodology

As this research is exploratory, current and new insights will be gathered by means of semi-structured interviews, meaning a list of questions is made which are then asked to persons that have experience in the field of gaming and have at least a basic knowledge of NFTs. In a semi-structured interview, questions can be omitted, shuffled or added based on the context. Semi-structured interviews can be used to explore and explain phenomena and thus suits the goal of this qualitative research (Saunders, Lewis & Thornhill, 2015).

1.9 Research structure

The research is structured in such way that the concepts that it revolves around are introduced firstly. Then, the methodology is introduced, including the way the data is gathered and the sample of respondents that participated in this study. The findings will then be presented, showing patterns and themes based on the collected data. Finally, the research questions will be answered based on which managerial implications and future research topics are proposed.

2 THEORETICAL BACKGROUND

In this chapter, the theoretical framework will be laid out. Firstly, the three principles stakeholder capitalism theory chosen for this study are introduced. Then, available literature on blockchain, NFT ecosystems and the gaming sector are presented.

2.1 Stakeholder capitalism theory

This research will be based on the stakeholder capitalism theory. This theory offers an alternative to the many different views on capitalism and proposes several principles (Freeman et al., 2007). In this research, the implementation of NFTs in gaming will be researched in the context of three of these principles; the principle of stakeholder cooperation, stakeholder engagement, and responsibility.

These three principles were chosen as they are closely connected to each other; for there to be cooperation, stakeholders need to be engaged in a responsible way first. Therefore, studying the implications of NFTs in the context of these three principles can offer a relatively wide overview of this topic.

Firstly, the relevance of the three principles to NFT implementation in gaming will be explained, starting with the principle of stakeholder cooperation: ‘‘Value can be created, traded, and sustained because stakeholders can jointly satisfy their needs and desires by making voluntary agreements with each other that for the most part are kept.’’ (Freeman et al., 2007). This principle can be argued to be relevant as NFTs could potentially increase the general unity of a community. Introducing unique, scarce digital items together with an in-game economy means gamers will be dealing with each other much like someone buying bread from a local bakery. Agreements can be settled through a trustless blockchain platform, making sure agreements are kept. Chohan and Paschen (2021) propose the possibility to trade digital ‘originals’ to be one of the opportunities for marketing NFTs, adding to the opportunity of improved stakeholder cooperation via NFTs.

The next principle is that of stakeholder engagement: “To successfully create, trade and sustain value, a business must engage its stakeholders.” (Freeman et al., 2007).

This can be argued to be relevant to NFTs in games since NFTs could potentially increase the engagement of gamers with games or an ecosystem of games. Gamers may want to put extra effort and time into games knowing they could earn an in-game NFT item that has actual monetary value outside of the game as well. Chohan and Paschen (2021) describe how the scarcity of NFTs may motivate consumers to "gain a competitive advantage over others to derive pleasure from the achievement." Considering games often revolve around quests and achieving objectives, like Axie Infinity, one might consider NFTs as a motivating factor for gamers to further engage. NFTs may also be able to engage other stakeholders, like NFT marketplaces, brands that use NFTs for marketing purposes and investors.

The third stakeholder principle that will be looked at in the light of the NFT gaming ecosystem is that of responsibility: "Value can be created, traded, and sustained because parties to an agreement are willing to accept responsibility for the consequences of their actions" (Freeman et al., 2007). The question of morality and consequences of actions should be considered more seriously when looking at the NFT gaming ecosystem. Now that in-game items can be represented as unique tokens, that can have quite a significant monetary value, the question what the possible consequences of the actions of developers and other stakeholders are should be asked. It should also be considered how the implementation of blockchain can improve the position for stakeholders, especially in the light of the blockchain's transparency.

2.2 Blockchain technology in businesses

Blockchain technology may fulfil these and the other principles that are included in the stakeholder capitalism theory. Tan and Salo (2021) state that blockchain technology offers a new vision of this theory, helping the development of relationships between stakeholders in an ecosystem and improving rights of ownership. In Figure 5, the specific improvements and changes are shown that blockchain technology brings to the principles of stakeholder capitalism theory.

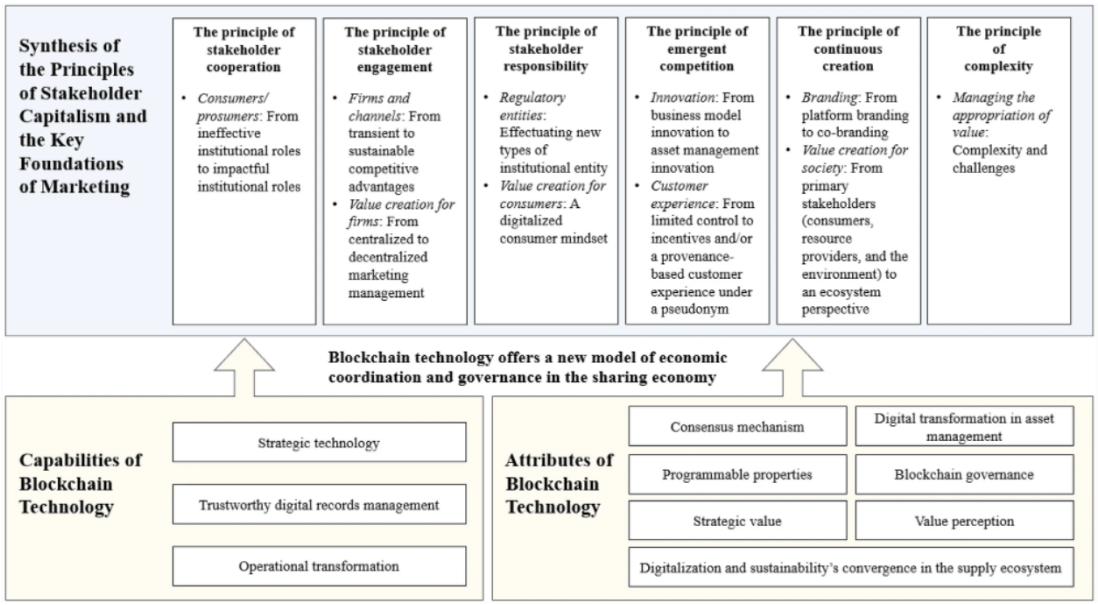

Figure 5: The ethical marketing in the blockchain-based sharing economy (Tan & Salo, 2021).

There are several capabilities that blockchain has as a 'strategic technology' that could be leveraged to improve business activities, such as financial inclusion, remittances, cybersecurity, privacy, intermediaries and the political influence of software engineers. As a ways of 'trustworthy digital records management,' blockchain-based records are deemed to be a solution for information integrity, such as user verification and access control. Though, one limitation here is that blockchains do not guarantee how data has originated and who has created it (Tan & Salo, 2021).

Blockchain technology has seven attributes as its core values for businesses to consider: consensus mechanism, asset management, programmable properties, blockchain governance, strategic values, digitalization and sustainability's convergence in the ecosystem, value perception (Tan & Salo, 2021). In the following section, attributes described by these researches most relevant to the gaming industry are introduced.

The consensus mechanism is the method a blockchain network implements to authenticate and validate transactions to be added to a blockchain. For a transaction to be processed, no intermediaries such as banks or payment providers are needed (Seibold & Samman, 2016, p. 1). There are many different consensus mechanisms, like Proof-of-Work (PoW) and Proof-of-Stake (PoS) (Swan, 2015, p. 84). Due to these

consensus mechanisms, transactions can be done peer-to-peer within a blockchain network, meaning game developers could implement an in-game economy that is no longer managed by a centralized system under the authority of the game developer.

The digital transformation in asset management suggests that businesses could implement blockchain to commercialize assets, both tangible and intangible (Nowiński & Kozma, 2017). While in-game items such as skins are already commercialized by game developers and publishers, blockchain offers a solution to commercialize other aspects of these games, with more sophisticated mechanisms tied to smart contracts, for example.

The definition of blockchain governance is "the means of achieving the direction, control, and coordination of stakeholders within the context of a given blockchain project to which they jointly contribute" (Pelt et al., 2021, p. 21). Stakeholders within a network or project can vote, and with that control the direction of a particular project, often by means of voting based on the number of tokens one has. Gaming communities could decide the direction of a game through these governance mechanisms.

The attribute of digitalization and sustainability's convergence in the ecosystem means that blockchain technology can offer businesses a more effective way to manage economic sustainability, for example by reducing transaction costs as a result of better information sharing and verifiability (Saberi et al., 2021). An example how this could be of use for game developers is that NFTs could be more easily migrated between different game titles.

2.3 NFT ecosystems

As the NFT gaming sector is nascent, literature specifically on stakeholders within a gaming NFT ecosystem is scarce. However, some literature exists on stakeholders within the general NFT ecosystem. Wilson, Karg and Ghader (2021) describe these stakeholders to be as follows.

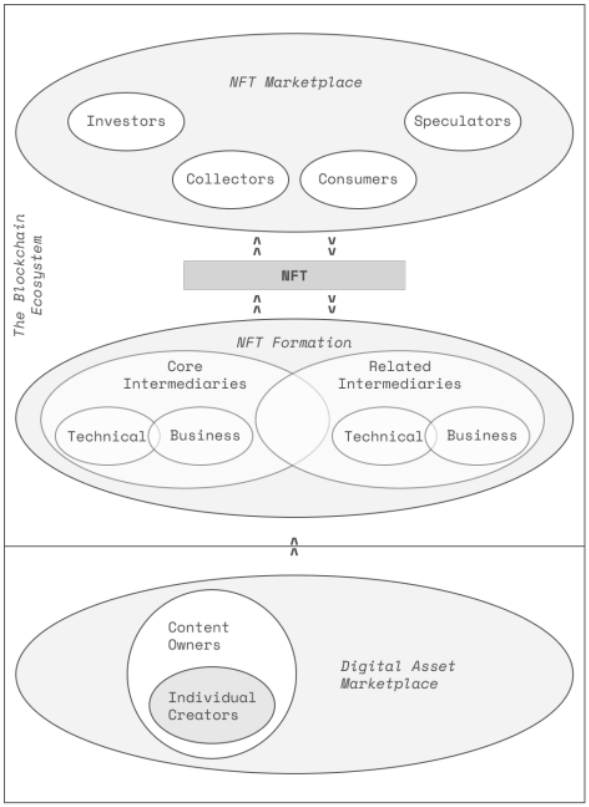

Figure 6: Stakeholders in the NFT ecosystem created by Baytaş (2022) based on Wilson et al. (2021).

Figure 6 shows the different stakeholders within the NFT ecosystem. Individual creators include businesses and people that are the originators of, and own the intellectual property, trademarks or copyrights on content that are part of an NFT.

Content owners are different from individual creators as they did not create the content themselves, but do own the content. Wilson et al. (2021) name the Japanese video game developer as an example, which announced the creation of NFTs based on their popular game character Sonic. It will include in these NFTs content like animations and music from game series. The content, like a picture of Sonic the hedgehog, were not initially created for the purpose of making NFTs, Sega simply uses its already existing IP to create NFTs.

To be able to create an NFT, there are core intermediaries and related intermediaries. Core intermediaries, such as the Ethereum Foundation, play an important role in developing and building the underlying infrastructure that is needed to create NFTs.

Also cryptocurrency exchanges are considered core intermediaries as they can form a bridge between the NFT ecosystem and the traditional financial world.

Related intermediaries are platforms that, for example, develop ecosystems in which users can use, enjoy and display NFTs. An example of this is Dapper Labs, which develops the platform for NBA Top Shots, introduced in section 1.4.4. In other words, related intermediaries are building on top of the infrastructure built by core intermediaries, like the developers of Axie Infinity that build their game on the Ethereum blockchain.

Within the NFT marketplace, the stakeholders are investors, consumers, collectors and speculators. Wilson et al. (2021) state that consumers and collectors claim ownership of an NFT. Including the consumers group are investors and speculators who include NFTs in an investment portfolio. In Figure 6, investors, collectors and speculators could therefore also be drawn inside the consumer bubble.

The model presented by Wilson et al. (2021) does not seem to clearly represent the complex interplay between the different stakeholder groups. Baytaş (2022) proposes a model that includes this interplay and categorizes the stakeholder groups differently, for example by merging investors, collectors, consumers and speculators into one group called “Owners.” This recategorization was based on shared motivations and actions that these different groups have within an NFT ecosystem (Baytaş, 2022).

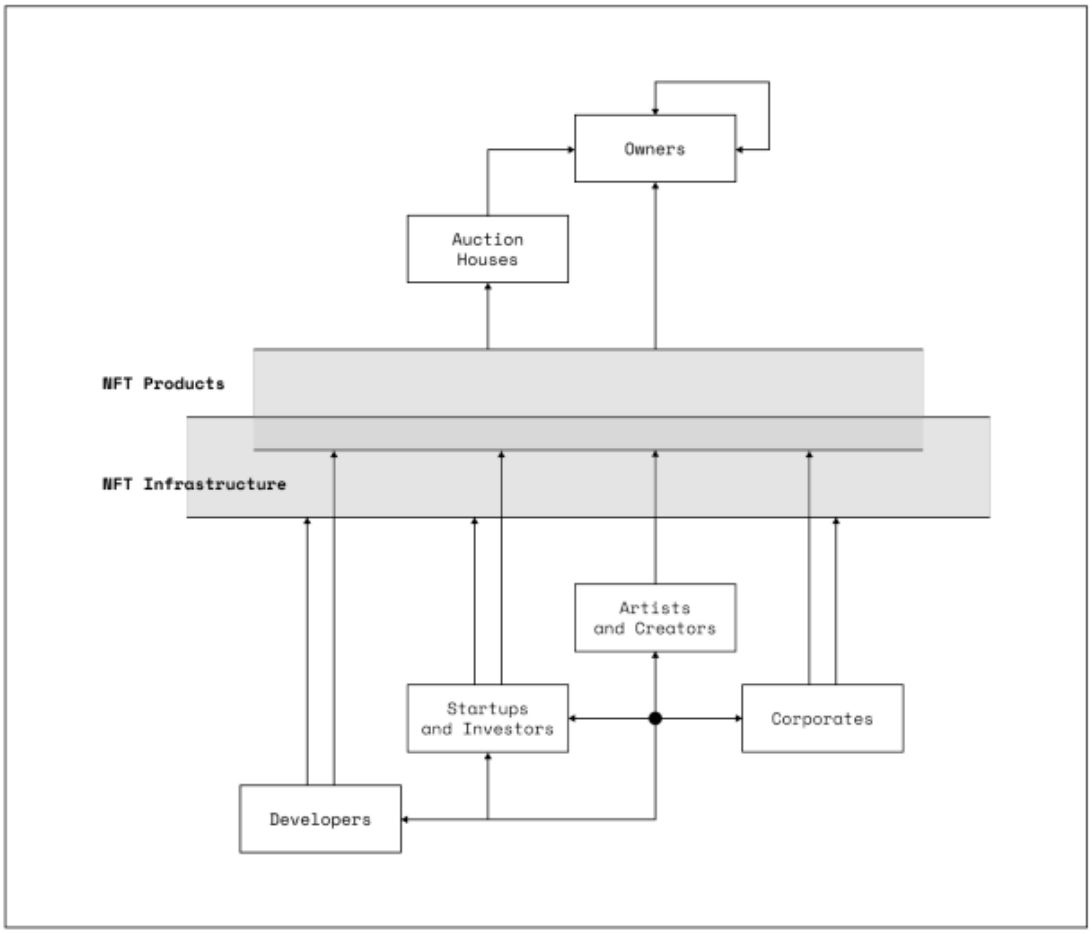

Figure 7: Stakeholders in the NFT ecosystem (Baytaş, 2022)

2.3.1 Other literature on NFTs

In their research, Sharma, Zhou, Huang and Wang (2022) explored the current sentiments that exists with regards to NFTs, creators and their communities. Within an NFT ecosystem, many intermediaries can be removed. In the case of artists marketing their artwork as NFTs, this would mean that intermediaries such as auction companies and artist agencies are no longer needed. NFTs could further support the collective and collaborative creation, and enhance the ties between NFT artists and create sustainable communities.

According to the same research by Sharma et al. (2022), respondents of that study expressed their concerns with regards to the lack of regulation. Although regulation could increase the entry barrier to the NFT ecosystem, they could also prevent the misuse of NFTs by bad actors.

Valeonti et al. (2021) state in their research on NFT collectibles that the technology is still in its infancy, therefore it should be approached with caution. One of the critical deficiencies of NFT collectibles are the possibility to lose an NFT forever if not handled carefully, while important unknowns were identified to be issues revolving around copyright policies.

Popescu (2021) concludes that blockchain-based fungible and non-fungible tokens can spark the emergence of new internet communities that have their own micro-economies. These economies are managed in a decentralized manner, and community members can own, collect and manage these tokens.

2.4 Gaming industry size

The video game industry is a growing sector. In 2021, the gaming industry generated $180,3 billion in revenue. An estimated 3 billion people played video games, which marks a growth of 5,3% compared to 2020. Mobile gaming revenues are the lion share of the global gaming market, accounting for 52% of the total revenue (Wijman, 2021).

In 2022, revenues from consumer spending are expected to generate $50,5 billion in the United States. For China, this figure is $50,5 billion. The amount of games that are released in China are likely to be limited due to government policies, which is why the United States is expected to overtake China when it comes to generated revenues (Wijman, 2022).

In the previous years, the industry has been growing steadily across the different continents. The country that accounted for most of the revenues in 2019 was China, generating 31,7% of the total revenue of that year. The United States of America accounted for 29%.

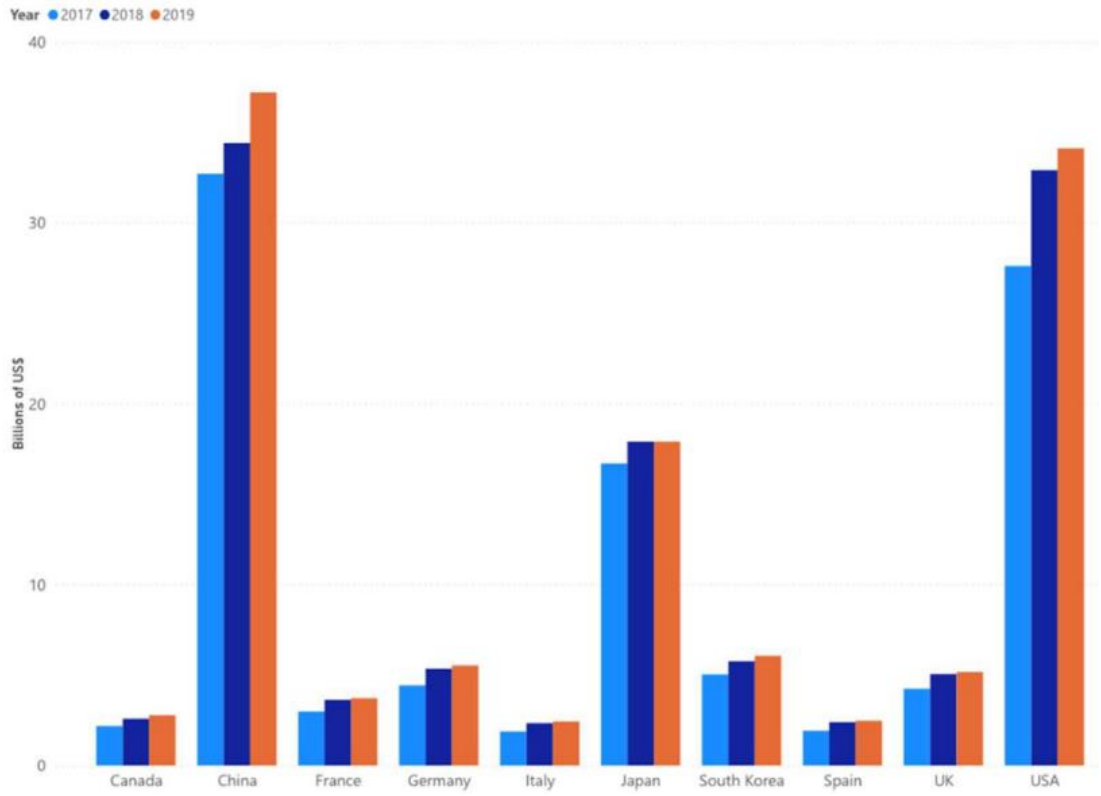

Figure 8: Games market revenues (billions of US$) by country and year (Palma-Ruiz et al., 2022 – p. 4).

The main trends moving the gaming market in 2022 are new developments in the business strategies such as Play-to-Earn (P2E), Esports and Streaming, cloud gaming and the metaverse. One such innovation within the business strategies is the use of gaming intellectual property (IP) in other media. For example, The Witcher game got a series on Netflix, and the League of Legends character Jinx was added to another game series called Fortnite (Newzoo, 2022). Both the transmedia use of gaming IP and P2E can be considered relevant trends in the light of the implementation of NFTs. For example, owners of Bored Ape Yacht Club NFTs can submit their NFT to star in three animated short films called “The Degen Trilogy” (Degen Trilogy, date of retrieval 23.04.2022). Regarding P2E, as gaming NFTs can be obtained in games implementing the technology and then freely traded on the market. Being able to earn money with playing games is a direct consequence of said development.

When determining the stakeholders in the ‘traditional’ gaming industry, there are several groups that are considered stakeholders. There are the gamers, both professional and consumers, hardware developers like Nvidia and Intel, videogame publishers like Konami and Ubisoft, and support software developers like Team Speak and Discord (Ramos, 2021).

A segment of the gaming industry is the blockchain-based games. This segment generated $2,32 billion in revenuews during the third quarter of 2021, which represented 22% of the total NFT trading volume. Axie Infinity was the biggest blockchain-based game with NFT sales worth $1 billion (Blockchain Game Alliance, 2022).

2.5 NFTs in gaming

To understand the roles that NFTs could potentially play in games, one must understand the current state of digital assets that exist in games. Among in-game digital assets are items such as skins for weapons or avatars, which change the appearance of the player in the game world. Due to the popularity of games such as Fortnite and Counterstrike, some players pay large amounts of money for some of these items. One such example was mentioned in chapter 1.5.

The problem with these digital in-game assets is that they consist of data which is regulated by the game developer’s central system. In traditional games, there is no trustless way of managing the data that make up these sometimes valuable in-game items. A game developer could simply copy the data of the most valuable skin. On top of that, the selling of these in-game assets often happens outside of legitimate marketplaces as the trading of these assets for money often violates the terms of service of the game developer.

NFTs can offer a solution by offering developers and gamers a way to proof ownership and retain full control over a digital asset, also offering them the opportunity to earn real-world money by selling unique digital assets. One popular game that uses NFTs in its core is Axie Infinity (Choi, 2022).

There are challenges with NFTs in gaming. Firstly, the lack of regulation may form a risk of people using NFTs to launder money or evade regulations. Also, taxing can be complicated due to the unclarity currently existing with regards to taxation and digital assets. Further, the power consumption of the underlying blockchain and security risks may pose challenges in the implementation of blockchain technology for gaming. There are also questions revolving around the intellectual property rights with regards to NFTs. This is especially true when the underlying NFT consists of content that is owned by multiple parties (Fowler & Pirker, 2021).

2.5.1 Axie Infinity

Axie Infinity is a so-called blockchain game as it exists on the blockchain. It is one of the blockchain games that saw its popularity rise significantly in the past few years. The game revolves around Axies, little monsters, which are playable characters represented on the blockchain by NFTs. Players need a minimum amount of Axies by buying them as NFTs, and can then battle other players or complete in-game tasks to earn Smooth Love Potion, a cryptocurrency part of the Axie Infinity ecosystem. Axies look different and differ in quantities, making them scarce and unique, giving them a monetary value. On top of that, Smooth Love Potion also has a monetary value outside of the Axie Infinity, just like the Axies, thus giving players the opportunity to earn fiat money by playing the game (Aguila & Bartolata, 2022).

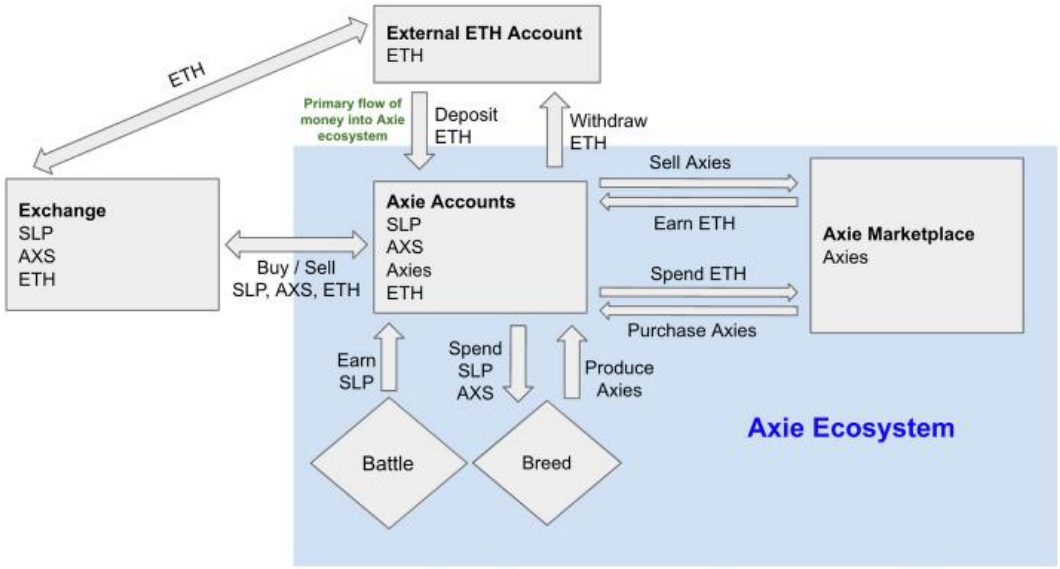

Figure 9: Axie Infinity Ecosystem (Axie Pulse, 2021)

As can be seen in Figure 9, the Axie Infinity ecosystem consists of an internal and external part. Within the ecosystem, players can battle other players, rewarding them with Smooth Love Potion (SLP). This SLP can be held in the account of the player or spent to breed new Axies. These Axies can then be used to either play more battles, or sold on the Axie Marketplace.

Selling and purchasing the Axies is done with Ethereum (ETH), the cryptocurrency of the Ethereum network on which Axie Infinity is built. AXS is a governance token giving players the opportunity to vote on development proposals of the game. SLP, ETH and AXS held in Axie Accounts can be withdrawn to be sold on the external market.

3 METHODOLOGY

In the methodology chapter, the research philosophy, approach and overall design are introduced. Furthermore, the data gathering method and sample will be described.

3.1 Research philosophy and approach

Research philosophy is a set of assumptions about human knowledge (epistemology), the realities encountered in research (ontology) and the researcher's own values and how they influence the study and its findings (axiology). The research philosophy shapes the methodology, approach and ways in which data is gathered (Saunders et al., 2015, p. 124). Understanding one's research philosophy is critical for the development of the overall research strategy.

Five major research philosophies currently dominate the business management research landscape, namely: Postmodernism, pragmatism, critical realism, positivism and interpretivism. Interpretivism, often associated with qualitative research, is a philosophy that argues that social worlds with humans, should be studied differently than physical phenomena (Saunders et al., 2015, p.140). Ontologically it is assumed in this philosophy that reality is rich and complex, and that people can have different realities depending on their surroundings, cultural backgrounds and overall circumstances. Epistemologically, in interpretivism it is believed that theories and universal laws are too simplistic and that insights into perspectives and ideas are lost when making such generalisations. Finally, axiologically it is assumed that the researcher and their interpretations of data play an important role in the research itself, of which the researcher should be aware and reflexive (Saunders et al., 2015, p. 136).

The goal of research following the interpretivist philosophy is to obtain a rich understanding of social worlds (Saunders et al., 2015, p. 140). Due to the fact that NFT gaming ecosystems can be considered highly social, where transactions and interactions are central, interpretivism is a suitable philosophy for this research topic. Therefore, the phenomenologist philosophy, a strand of interpretivism, will be followed to gain an insight into the first-hand experiences that the participants in their different positions and contexts have.

To gain understanding of the phenomenon of NFTs in games and their alignment to the stakeholder capitalism theory principles introduced in the previous chapter, an inductive research approach will be followed. Saunders et al., (2015, p. 145), state that categorized under the inductive approach is doing research by interviewing a sample of persons, in this research's case persons that have experience with gaming and NFTs. By analysing the data gathered, a broader understanding can be obtained of how the implementation of NFTs affect stakeholders in such ecosystems. Based on these analyses, a theory will be formulated by answering the three research questions that are central in this particular study.

3.2 Research design

Based on the research philosophy and approach, a research design is developed. A research design consists of a framework in which researchers decide the strategy, methodology and way of data gathering. The design of a research plan should fit the general goals of the research in question and are thus a critical starting point for the research as a whole (Saunders et al., 2015). The study that is presented here has the goal of understanding the nascent field of NFTs in video games. As it is nascent, the research could be considered exploratory with the aim of understanding the new phenomenon of NFTs in games and the effects the development has on the relationship between stakeholders in an NFT gaming environment.

Therefore, the most fitting type of research in this case is a qualitative research approach, a mono method qualitative approach to be more precise. This type of research tends to adopt a research design that is data-driven and flexible. The data that is part of qualitative research is often unstructured, gathered from a relatively small number of cases that are studied in detail.

In qualitative research, emphasis is put on developing a description or explanation of topics and phenomena. Instead of laying out a detailed plan at the start of a research, for example with surveys in quantitative research, a more flexible research design is applied. Data in qualitative research is gathered based on structured questionnaires or interviews to standardize the stimuli that are subject of the research. Responses from different respondents can therefore be compared to each other.

Cases in qualitative research are studied in detail, thus the number of cases that are subject in qualitative research are often small. As mentioned, by standardizing the stimuli, responses can be compared to ultimately recognize which factors, themes and patterns play a crucial role in the phenomenon that is being studied (Hammersley, 2013). In the case of this research, the implementation of NFTs in games in the light of the stakeholder theory is explored by doing semi-structured interviews.

3.3 Data collection

To gain an understanding of the effects of NFTs in games, research data will be collected. As Saunders et al. (2015) state, the data collection in mono method qualitative research can use a single data collection method. To be able to understand the effects of NFTs in games on stakeholders, this study aims to collect data from persons from the field of game development. To do this, interviews will be conducted with them. From the three types of interviews often used in qualitative research, those being unstructured interviews, semi-structured interviews and structured interviews, this research will apply the semi-structured interview method to gather information about NFTs in gaming. This type of interview gives the possibility to gather reliable datasets that can be interpreted with the aim is to answer the earlier introduced research questions.

3.3.1 Interviews

Research interviews are conversation between people with the goal of gathering valid and reliable data, relevant to the research questions. There are several types of interviews; structured, semi-structured and unstructured interviews. Structured interviews are often used to gather quantifiable data in quantitative studies, while semi-structured and unstructured interviews are non-standardised and often used in qualitative research (Saunders et al., 2015, p. 391).

During unstructured interviews, a respondent is able to freely talk about a certain topic. The conversation is informal without a list of prepared questions. That makes unstructured interviews suitable for research into a general field of interest. However, as the topic of this research is more specified, data for this research will be gathered

by means of semi-structured interviews. Semi-structured interviews consist of a list of themes or key-questions. The researcher can omit questions, change the order and additional questions can be asked depending on the context and flow of the conversation. A semi-structured interview is suitable to not only explore the 'what' and 'how,' but mainly the 'why' of a research topic. This way, semi-structured interviews provide the possibility to explore the context and backgrounds of the studied topic with relevant data. This type of interview is most advantageous in situations where the studied topic is complex or open ended (Saunders et al., 2015, p. 391).

There are concerns regarding biases when conducting semi-structured interviews, namely: the interviewer and interviewee bias. Interviewer bias can be caused by the way (verbal and non-verbal) the interviewer asks questions, causing a bias in the answers an interviewee gives, or when for example the researcher fails to gain the interviewees' trust. An interviewee bias can be caused by the perception of the interviewer. An interviewee may not be completely comfortable with a semi-structured interview leading to the interviewee possibly not telling all they know, limiting the ability of exploring the topic (Saunders et al., 2015, p. 397).

To limit the impact of these biases, participants are provided with the questions in advance of the interviews. Also, every interview will be held via Zoom at the time of choosing of interviewee. The interviewer will maintain a high degree of flexibility to make scheduling as easy as possible for the interviewee. Aside from that, due to the current position of researcher being editor-in-chief of a cryptocurrency news website, the interviewer has above average knowledge of NFTs and plays games, so is familiar with both topics, which could improve the credibility of the interviewer in the eyes of the interviewees (Saunders et al., 2015, p. 404).

The subjects in this study are people that have experience with gaming and have at least a basic knowledge of NFTs. Ultimately, the goal is to discover new insights and to understand the developments in this industry by answering the three research questions introduced in the introduction chapter.

For research purposes, the interviews will be recorded. As they are held in a video conference platform, mainly in Zoom, these recordings offer the possibility to easily store the video data and afterwards create a transcription of the complete interviews. During these interviews, researcher will try to have interviewees elaborate as much as possible on the asked questions.

The questions that are asked to the interviewees are categorized in different sections based on the introduced stakeholder capitalism principles. Below, the complete list of questions can be found including an introduction section, followed by questions aimed at the principles of cooperation, engagement and complexity.

3.3.2 Sample

The sample of interviewees consists of people from the researcher's own network. This network covers mainly crypto-related businesses and people as the researcher's current position is editor-in-chief of a large cryptocurrency news website. To approach potential candidate interviewees, the social media platform LinkedIn is utilized.

Several direct messages were sent to people on LinkedIn that included "NFT," "blockchain," and "gaming" in their account description. Several recipients responded out of which the most suitable were chosen. Below, a table can be found with all the interviewees that were a part of this research, including their gender, current position, country of residence and the duration of each interview.

Table 1: Respondents

Interviewee	Current position	Country of residence	Interview duration
Respondent 1	CEO of platform for game development	Sweden	41 minutes
Respondent 2 & Respondent 3	CEO of game studio & Studio director at game studio (respectively)	Puerto Rico	1 hour (total)
Respondent 4	Game Strategist at a DAO	Norway	1 hour 30 minutes
Respondent 5	Chief Research Officer at NFT gaming research company	Finland	50 minutes

Respondent 1 graduated to become a game designer from a university and then started his own mobile game development company. He is developing a game engine that aims to be the next generation game economy and virtual asset management platform for the games industry.

The interviews with respondent 2 and 3 were held at the same time, as they are both working at the same game studio. Both respondents answered all questions in turn, therefore the data gathering should not have been impacted too much by the fact that it differed from the other interviews. Respondent 2 is the CEO of a game studio that is developing a blockchain-based game. The experience of the studio mainly lies in casual and hyper casual gaming. Respondent 2 mainly focusses on the business side of game development.

Respondent 3 is the studio director of the same game studio. He has a background as a chemical engineer, but is passionate about games and art. He, therefore, soon left his chemical engineering position to start working as a digital content creation, making animations, commercials etc.

Respondent 4 is a game strategist at a decentralized autonomous organization (DAO), where he researches NFT games. He writes unbiased, balanced research reports about games, and also playtests them. Based on his findings, he develops strategies for the scholars (gamers using NFT items that are owned by the DAO), with the goal of generating revenue with these NFTs.

Respondent 5 is the chief research officer at a NFT gaming research and investment company. There he focusses on crypto gaming, NFTs and social metaverses. For these projects, he and his company developed a rating system as a part of the risk assessments of these games.

3.4 Data analysis

The approach that is used in this research to analyse the gathered information is Thematic Analysis. With this approach, researchers can identify patterns and themes that exist in the data after which it can be analysed further, focussing in on the research

questions presented in this research. All in all, it is a systematic but flexible way to analyse large quantities of qualitative data (Braun & Clarke, 2006).

The process of Thematic Analyses consists of several stages. In the first stage, the researcher should get themselves familiar with the data that was gathered during, in this case, several interviews. This already starts during the transcribing process of the interviews (Saunders et al., 2015, p. 580). As mentioned, the researcher utilized Zoom to conduct the interviews. The interviews were recorded and then transcribed using Otter.ai, an artificial intelligence-based solution that automatically turns speech into text. Then, the data was anonymized by replacing the names of respondents by "Respondent 1, Respondent 2, etc." The familiarization process should not have been impacted significantly by implementing this automated solution. The reason for this is that the researcher will have to go through all the recordings and text anyway to verify the correctness.

The next stage is coding the data. Codes are labels under which data can be categorized, that represent the meaning of a unit of data. This can be a word, a sentence, a couple of sentences or a whole paragraph. By coding the data, the full meaning of it can be extracted in a comprehensible and efficient manner (Saunders et al., 2015, p. 581). For the coding process, NVivo was used. This program allows the easy gathering and analysis of qualitative data.

Based on these codes, patterns, themes and interesting details can be identified. In the Findings chapter, these topics will be discussed further, after which the research questions will be answered in the Conclusion chapter.

4 FINDINGS

In this chapter, the findings based on the gathered data are presented. The chapter is divided in four sections, starting with the identification of the stakeholders in an NFT ecosystem. Then, the findings based on the three stakeholder capitalism theory are presented, consisting of the identified themes that emerged from the interviews with the respondents.

4.1 Stakeholders in a NFT gaming ecosystem

Based on the gathered information during the interviews with the five respondents, several stakeholders can be identified that can be considered stakeholders in a NFT gaming ecosystem. In this section, the stakeholders in such ecosystem will be described as well as their relevance to each other.

4.1.1 Developers

Developers are one of the stakeholders groups that were identified. This group can be further subdivided into the game developers, developers of supporting infrastructure and third-party developers. Respondent 1 explains the latter group as follows:

> *"And then also, you could have third party developers that are making items for games, they are making NFTs only. The game developer could basically just make a game world or game rules, and then the gamers could actually buy some item from a third-party and import that into the game," (Respondent 1).*

Developers of supporting infrastructure help the technological advancement by developing new solutions that can be implemented within other games as well, while game developers develop the game-specific assets, storylines and so on.

4.1.2 Players

The players, or gamers, hold a stake in the ecosystem as they own the game-specific NFTs or tokens. Also the players can be subdivided into subgroups, namely retail players and scholars. Retail players are considered to be players that simply buy an NFT to play the game. Scholars "do not own an NFT but they rent one, or use one that they have loaned and they share the profit (Respondent 4)." They rent these assets from organisations like guilds.

4.1.3 Guilds

Gaming guilds, yield guilds, or simply guilds, are organisations that invest in an NFT game by buying the NFTs and then lending them out to scholars. These scholars will play the game with these NFTs, giving them the opportunity to earn a return, which will then be shared with the guild, without having to buy NFTs for themselves to be able to play the game. Also on the side of the game developers, guilds offer opportunities. Respondent 4 explains these opportunities as follows:

> *"Many guilds provide player liquidity to a game, like you get a lot of players or scholars into the game. In return, the guilds get a good deal on a pack of NFTs (Respondent 4)."*

Guilds can fall under private companies, but can also be made up out of a decentralized autonomous organization (DAO), which is a decentralized governance structure where token holders can vote for or against decisions.

4.1.4 Investors

Investors hold a stake in the ecosystem by investing in the project, either by participating in seed rounds or private rounds. They help the game developers raise the funding that is required to develop a game. Part of the investor group are retail investors and venture capitalists. Also a part of the guild stakeholder group overlaps with the investors group, as mentioned in the previous section, section 4.1.3.

4.1.5 Artists and brands

Artists and creators can potentially submit contributions for a game, if the game platform in question allows to do so. This group of stakeholders partly overlaps with the third-party developers, that are not directly related to the game itself but can develop on top of the platform the game developers have created.

Brands cooperate with games by creating NFTs that can be used in a game. This can established mainstream brands such as Coca-Cola, but also celebrities like the already mentioned Snoop Dogg. NFT games and brands could potentially cooperate with each other by adding hard and soft utility to NFTs, as Respondent 3 explains:

> *"So for example, you give something hard utility. It's like, hey, we make a partnership with the Bored Apes [a collection of NFT collectibles], and suddenly you have a Bored Ape skin within the game, it's present directly. Something softer would give you brand positioning, or open up some bonuses for that something that doesn't require any content creation (Respondent 3)."*

4.1.6 NFT marketplaces

NFT marketplaces are central or decentralized platforms where users can sell and buy NFTs from all existing projects. They have a stake in the web 3 gaming ecosystem as they facilitate the exchange of the digital items between players and offer the game developers to be discovered to a wider audience.

4.2 Cooperation between stakeholders

In this section, the opinions of the respondents regarding the cooperation between stakeholders are laid out. Starting with the problems that the respondents experience in traditional games.

4.2.1 Problems in traditional gaming

One of the issues that was brought forward by Respondent 2 considering traditional games, is that the game developers and gamers are not in direct contact:

> *"The developers will never hear my cries, it's always some person behind their computer in the customer relations department or whatever. Web 3 opens up the door for you to build live with your community (Respondent 2)"*

Furthermore, multiple respondents state that gamers not being able to trade in-game items of traditional games is an issue. For example, Respondent 2 states that "in today's games, you own the rights to use the item in the game." Respondent 4 explains that the items in traditional games are stuck in the game:

> *"I've been in League of Legends since the beginning. And the things I've collected over time, such as skins, I don't own any of them. They're in my account, but I can't do anything with them. I can't sell them, I can't give them away if I decide to quit League, and I have a large amount of both time and money sunk into that game which is stuck there (Respondent 4)."*

This also means that it can be difficult to help other players inside the game. Respondent 2 explains how he spent money on a traditional MMO game to obtain in-game items:

> *"I quickly realized the amount of value that is locked away in my inventory system, I would constantly run into issues and situations where I wanted to help my friends use my gear, which was way better than theirs (Respondent 2)."*

In that context, ownership of digital in-game items was an often mentioned topic. Respondent 1, 3 and 4 stated that ownership is one of the advantages of implementing NFTs in games, also improving the position of the game developers themselves. Where

these in-game items traditionally can not be traded at all outside of the game, players were resorted to black market platforms. By including NFTs in the game, there could be a ‘win-win-win’ situation, as Respondent 4 explains:

> *“For example, Epic Games [the developer of Fortnite] could take a transaction fee of the sale and you [the player] can be happy you get something for your early skin, which you barely use, and your friends or anybody who wants the skin would be happy because they can now flaunt their new skin. Giving the ownership to the players is which I'm really interested in (Respondent 4).”*

4.2.2 Discoverability and interoperability

According to most respondents, the implementation of NFT technology can facilitate in the cooperation of the different stakeholders. Firstly, the NFT marketplaces can offer game developers exposure as NFTs can be freely traded outside of the game. Meaning, when an NFT is sold on a trading platform like OpenSea, people can find this NFT and discover the game that the NFT originated from. Respondent 2 mentions with regards to discoverability that interoperability of the different blockchains is essential:

> *“Let's say that you're playing on Guild of Guardians [a game with NFTs], and you go to their marketplace, and you're scrolling around. Then you run into an NFT from another game, and it just so happens to be our game Cosmic Isles. And you really like that one. So it's also, you know, the more interoperability you see between the chains themselves, and even things like games share order books within marketplaces, that will start answering the question of discoverability and visibility, (Respondent 2).”*

Adding to this interoperability, also the games themselves could cooperate with each other. Respondent 1 gives an example of a scenario in which two game developers work together by implementing each other’s in-game assets:

> *"Say you have two game developers. And one of them makes a game where you can breed horses. And then the other game has a horse racing game. And so these two can then cooperate; in one game you breed the horses, you try to make them as good as possible. And then you can sell them to the users of the other game. And then you could do races in the other game (Respondent 1)."*

The cooperation with external brands and giving them exposure can also be facilitated with NFTs. One way of doing this is by partnerships with these brands, but brands can also initiate the cooperation themselves without needing direct contact with the game developers, for example. A name that was mentioned by several respondents was that of Snoop Dogg, a musician who is very active in the crypto scene. Respondent 3 states in this context: "We can give benefits to Snoop Dogg NFT holders, without having to talk to Snoop Dogg. It's like, hey, if you hold this in your wallet, you'll get this in our game."

4.3 Engagement of stakeholders

The next theme of the questions that were asked during interviews was the engagement of stakeholders. In this section, the findings with regards to the engagement of the different stakeholder groups will be presented. Starting with the engagement of stakeholders in the decision-making process through the means of a decentralized autonomous organization (DAO).

4.3.1 Engagement in decision-making

A DAO is "A blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralised (i.e., independent from central control)" (Hassan & De Filippi, 2021, p. 2). It lets a group of people that owns a stake in the DAO vote on developments and thus engages them in the decision-making process.

Respondent 1 and 5 state that through a DAO, gamers can have a more direct say in what happens with the development of the game. Respondent 4 sees this as an

interesting aspect of NFT gaming as well, but does raise concerns regarding the motivation of a game developer to keep working on a game as the role of the developer "turns into more of a community servant."

4.3.2 Engaging players with NFTs

Furthermore, NFTs may be able to help engage gamers with the product itself as well. The respondents give various reasons for how NFTs can do this, one of them being the representation of in-game items as a token, whose history is stored on the blockchain. Respondent 1 explains how this would look like in practice:

> *"Let's say Word of Warcraft implements blockchain into their games and you have a sword in the form of an NFT you use to kill goblins. The more goblins you killed with the sword, the better that sword could become at killing goblins, for example (Respondent 1)."*

This idea of progression in combination with NFTs having a value due to the fact that they can be freely traded between people, means that it can "intrinsically engage the player," as Respondent 2 explains:

> *"The value proposition itself is strong, it intrinsically engages the player to the point where the idea of progression is now stickier than ever. Because if that means that you are building on top of the already attributable value of your NFT to make it even worth more, that's yet more engagement (Respondent 2)."*

All respondents stated their opinions that the ability to earn while playing is the most engaging factor. Respondent 1 states that it could result in a higher retention rate among players as well, "because they can actually make money in the game." Respondent 4 does mention, however, the importance of the context how the NFT is being implemented in the game:

> *"Say, I bought some NFT for $1,000. That would engage me to keep playing the game, at least to recoup my initial investment. Of course, this would engage gameplay in game time within the game, and maybe also onboard other gamers. But would it be more fun for me as a player if the game is badly designed? I don't think so. If I would have to do that, it would feel like a chore and work, and not as playing a game (Respondent 4)."*

4.3.3 High entry barrier

Another worry that was mentioned multiple times is that of a high entry barrier. When a game rises in popularity, its NFTs rise in value. An example that was named is Axie Infinity, that requires players to have a certain amount of NFTs to be able to start playing the game:

> *"So that is driving like, price of items in the games, which could be both positive and negative. Yeah, it gets more expensive for the players as well, but at the same time, you have the possibility to actually make more money when you find a good item in the game (Respondent 1)."*

> *"Many of these games I see and have played tested, I would never touch them. Like, on a personal basis, because the main focus is earning, only the earning. It's not an entertaining game, you would expect. There might be some gambling aspect of it that might be fun for someone, but it looks like something you could've played 10 years ago or 15 years ago in a web browser. But now you have to pay like $1,000 to get an NFT to play it as well (Respondent 4)."*

4.3.4 Engaging investors of all sizes

The stakeholder group of investors can benefit from the implementation of NFT technology in gaming as it offers a way to invest in these projects, also benefiting the game developers. Respondent 1 states: "It's easier to sort of crowdfund games with

crypto, in a sense. So that's another way that investors, both small and big, could be beneficial to the system."

Investing in NFTs may generate a return on investment for investors. Respondent 3 does raise the point that the question remains if investors will use the NFTs, or if they sell them to someone who will use them. In a situation that this is not the case, Respondent 5 says:

> *"Say if everyone pockets every single NFT that is meant to be used in the game, then there's no way to gain access to those items, if they treat them as collectible art, for example. And then all of those NFT are missing from the game, (Respondent 5)."*

4.4 Responsibilities and consequences

The third focus of this research is the topic of responsibility within an NFT gaming ecosystem. During the interviews, the responsibilities of the different stakeholder groups were mentioned. Also, the consequences of actions were elaborated, with suggestions on how developers and other stakeholders should approach this, in the light of these possible consequences.

4.4.1 Complex in-game economy

An issue that was mentioned extensively was that of the in-game economy. Respondents explained their concerns about how complex these in-game economies have gotten by the implementation of crypto and NFTs. Also, legal concerns with regards to security laws and the likes were raised. Respondent 3 states that, therefore, game developers need to "up their game" due to the new layer of real-world economics which means developers will have to take things into account they did not need to before.

Respondent 4 explained how there should be a proper balance between entertainment value and the ability to earn while playing. He gives the example of Pegaxy, an NFT game where players can breed horses and race with them. The problem with this game

was that the amount of NFTs eventually inflated too much, which had negative effects as the interest in the game decreased after players started to realize that the chance to win a race was random.

> *"Over a period of like a month maybe, it was for the early investors a really good way of getting their value back. But suddenly, people are starting to realize that, oh, this game is just a game of chance. And of course, the developers have plans to implement a better game and make this into something sustainable. But, if it's not that to begin with, it's really hard to build a plane when you're already flying, it's easier to crash. And then that's what it did when enough people and enough guilds had scaled into this game. And the earnings go down, because now everybody's making new horses, and less people want to buy them and there's even more people providing them. So like these horses start to lose their value. The other horses, which are already in the game, start to lose their value. And everybody who rushed in, starts to sell these horses, and they start to undercut each other. So the price of the NFT goes down further and the price of the tokens go down because nobody needs to use the token anymore, or wants to buy the tokens to create more horses. Eventually the whole thing falls apart (Respondent 4)."*

Keeping the lid on this type of inflationary explosions is a matter of game mechanics, and thus is a responsibility game developers should understand. Respondent 4 names several examples of ways to do this, for example by giving NFTs a finite time in which it exists inside the game loop, which would be beneficial to newcomers in the game. Respondent 1 give a comparable solution where items do not last forever:

> *"Of course, it depends a little bit on the item, but items can't last forever. They have to go away in some form […] If you don't have a limited supply of items, and they don't go away in some form, the economy will stagnate eventually, because everyone will have the same gun. And then the economy of the game doesn't move. So that what Entropia [a traditional game] did was that they implemented*

> *that each time you use the weapon, it deteriorated a bit. Of course, you could repair it, but you couldn't repair it indefinitely. So say you couldn't repair it like 10 times. After that, you would have to scrap it and buy a new one. And that's when the economy actually started to work again. [Players] got really pissed. But at the same time, they did understand why it was necessary. Because they had noticed themselves that it was impossible to sell certain guns because everyone had them (Respondent 1).”*

4.4.2 Transparency

The transparency of blockchain technology was another theme in most of the interviews. Transparency may have an effect on the responsibilities within an NFT gaming ecosystem as anyone can view the balances of wallets within a public blockchain network. Anyone can know which wallet has what NFT. Respondent 2 raises an interesting issue with regards to this transparency:

> *“Imagine if the Bored Ape Yacht Club [a popular collectible NFT collection] founders started promoting the eating of baby cows and cancel culture really picks up on that. And so they now start cancelling Bored Ape NFT holders because of baby cow eating […] so you can totally see the actions of a few in an ecosystem, completely flip the perceived value of a particular collection or brands. And so it really goes back to this point of how transparent are the internal processes of how this thing are being built and put together and managed (Respondent 2).”*

On the side of investors, gamers and other stakeholders, the transparency adds an extra opportunity to do their due diligence before investing in a project. Something that happens every now and then is that founders of a game keep rare NFTs for themselves, as Respondent 3 notes. Keeping this information can cause an exodus once it is discovered, harming stakeholders in the process. Due to the transparency, the discovery of this information is often only a matter of time.

Respondent 2 explains that, also for this reason, game studios in essence go through a metamorphosis to become a digital content company, “because you now have this huge customer facing window that needs to show the story inside the studio, it needs to show the progress on the platform.”

4.4.3 Lack of regulation and empty promises

The crypto sector is relatively new, and thus, regulation of the industry is still in development. The lack of regulation can cause problems for stakeholders, by for example the loss of assets by accident. Due to the immutability of data on a blockchain, these lost assets cannot be retrieved. Aside from this, Respondent 5 notes that developers often reserve the right to change their policy at any time. He notes that gamers therefore need to stay up to date constantly to understand which party can do what to the existing NFT supply and other topics.

When it comes to investing in a project, Respondent 4 notes that the risk seems to shift from the developer to the investors/players who put money into the project in an early stage. Where in traditional gaming development, often the developer backed by investors put up the money to develop a game, after which it will only generate revenue once it is launched (if successful), in NFT gaming, also the end-users can invest their money to get in as early as possible. This can have an effect on the outcome of a project:

> *“I think maybe most teams overestimate themselves and how hard it is to make something good and how long time it takes. And also, when you get thrown millions of dollars at you by super hungry investors, it gets real, really fast. Can you handle the pressure? And if you deliver something bad, I think it flips the table, that the gamers and the investors are taking a lot of risk. Whereas the developer team, sure, they can just give the project back to the community when they decide that this is over their heads, and they’re underwater. There is less risk for the team (Respondent 4).”*

The same respondent mentions that with NFT gaming projects that fail, it is common that the developers seem to point at the fact that the project is actually a DAO. Therefore, they claim, part of the responsibility of the successful development of the game lies with the tokens holders:

> *"[The developers of these bad projects say] 'Oh, unfortunately, we're not able to do it, we're going to give this to the community. And we're, of course, a DAO, so the community needs to participate.' It's owned by the community and they're dropping their responsibility that way. While they're the ones pocketing the million dollars, (Respondent 4)."*

4.4.4 Possible negative factors

Respondent 4 also raises the point of the backlash Ubisoft received from players for implementing NFTs in its games. They see it as a new way for the developer to generate more profits, and compare it to micro transactions within games. This ties back to section 4.3.3 where it was mentioned that NFTs can also negatively impact the engagement as they can create an entry barrier for players.

It also ties back to the utility game developers give to the NFTs, also mentioned in section 4.1.5. A game item that is represented as an NFT can have all kinds of abilities, it either being a simple outfit that the player character can wear, or an item that gives the player a significant advantage over other players without that particular NFT.

4.4.5 Conclusion of findings

Based on the gathered information, a diagram can be created including all the identified stakeholder groups in an NFT gaming ecosystem. In Figure 10 below, these stakeholders are visualized, including the value streams between them.

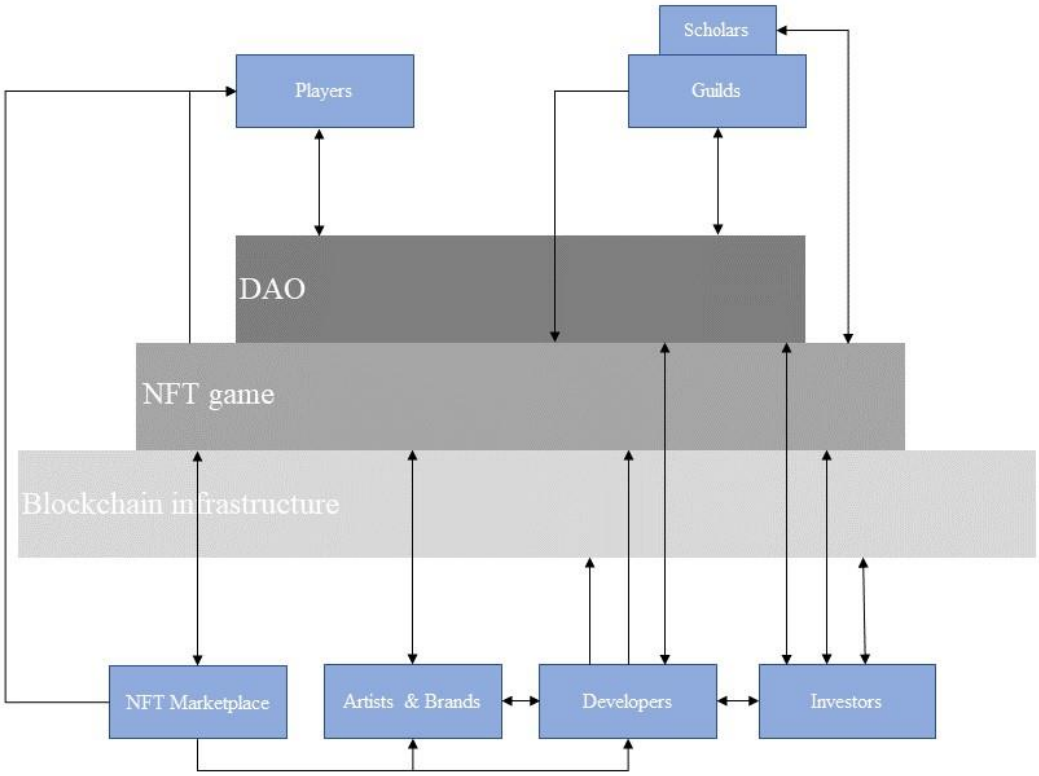

Figure 10: NFT gaming ecosystem stakeholders

Central to the model is the blockchain infrastructure, on which the NFT game is built. On top of that, the NFT game is based, which can include a DAO structure. NFT marketplaces offer players value by giving them a platform to trade NFTs on. These marketplaces also offer artists, brands and developers value by offering them exposure. The final point regarding NFT marketplaces is that they offer the game value by listing its in-game items.

Artists and brands offer and receive value from the NFT game by means of exposure. This way, they can cooperate with the developers of a game as well. More specifically on artists, they could offer value to the game by creating in-game items that make the game more valuable.

The developers consist of developers working on the blockchain infrastructure and the NFT game itself. In case of a DAO structure, developers play a core role in executing proposals that the DAO voted on. While developers offer value by participating in the decision-making process, they also receive value as they can work closer together with

the community (represented by the DAO). Investors, in this case of all shapes and sizes, can invest in all layers of the ecosystem and participate in the DAO by owning an NFT of governance token.

The stakeholder group of players play the NFT game and offer and receive value from participating in the DAO structure. They will also be able to trade NFT assets with each other through NFT marketplaces. Finally, the guilds offer value to the game by adding player liquidity (scholars).

Based on the information gathered during the interviews, several themes were identified that currently play within the NFT gaming ecosystem. These themes were categorized based on the three stakeholder principles. The most prevalent themes are presented in table 2.

The three main themes are cooperation, engagement, and responsibility, as those where the main topics of the questions. In the following paragraphs, some of the sub-themes are explained to clarify the meaning of table 2. One of the sub-themes of cooperation is “issues in traditional games,” which originates from the respondents’ comments regarding traditional game design. Some of the respondents mentioned how they spend a lot of time in some games, but that they are never able to take the items outside of the game to trade with other (new) players. The “win-win-win” situation originates from comments regarding traditional games implementing NFTs, as they could “win” by charging a small transaction fee, the gamer can win due to the ability of selling their in-game items, and finally a (new) gamer can win as they can buy the item that they want. Interoperability is the possible cooperation between game developers where game items can be used in multiple games as a result of the implementation of NFTs.

Secondly, the sub-themes of engagement. The decision-making theme is based on the comments regarding DAOs where stakeholders can actively participate in the decision-making process. Then, gameplay is a theme that consists of the comments about how NFTs could potentially be implemented within the gameplay. They make the concept of play-to-earn possible and can also add extra functions to in-game items. A negative impact that NFTs can have within an NFT gaming ecosystem, however, is

that it can create a high entry-barrier if the NFT prices are high while the game requires you to own a certain amount of NFTs before you can start playing.

Thirdly, the theme of responsibility. Here, lack of regulation is a sub-theme as NFTs may cause challenges on a legal level, and thus could cause challenges for stakeholders. The backlash of gamers is based on comments regarding the reception of NFTs by the gaming community, which has been negative as some see it as just another way for a game studio to make more profits.

Table 2: Themes

Cooperation	Issues in traditional games	Can not freely trade in-game assets
		Much time put in a game
		"Win-win-win"
	Exposure	NFT marketplaces
		Cooperating with external brands
	Interoperability	Improves cooperation between developers
Engagement	Decision-making	Engaging stakeholders through DAO
	Gameplay	Play-to-earn
		Extra functions to game items
		Balancing entertainment and Play-to-earn
	Entry barrier	Expensive NFTs may cause entry barrier
	Investing	Easier investment option
		Engaging smaller game developers
Responsibility	Complex game economy	Real-world economics
		Inflation of in-game NFTs
		Game design is critical
	Lack of regulation	Possibility of permanent loss game items
		Shift of early risk from developers to investors
	Backlash gamers	"Just another way to make profit for developers"
		Balancing entertainment and play-to-earn

5 CONCLUSION

5.1 Discussion

In this section, the three research questions that this thesis revolves around are answered based on the findings. Beginning with research question 1; How could NFTs improve the cooperation between stakeholders in an NFT gaming ecosystem?

5.1.1 How could NFTs improve the cooperation between stakeholders in an NFT gaming ecosystem?

Firstly, the possibility to trade in-game assets outside of the game could mean that gamers will be able to more easily exchange these assets. Sometimes it takes a gamer a lot of time, effort, and money to obtain certain items. Therefore, being able to trade these valuable items, means gamers can help each other. Of course, this was already possible in traditional gaming via the in-game economy. NFTs could, however, add another channel to trade without being dependent on the central system managed by the game developer moving the ownership of these items to the gamer.

Furthermore, the respondents mention how the implementation of NFTs brings gamers and developers closer together. This is due to the possibility to give gamers voting rights based on the governance tokens or NFTs they own through a DAO. Gamers, investors, and developers can decide together on the direction of a game. In the next sections, more will be discussed about the implementation of DAOs and possible caveats of such project designs.

Next, NFT marketplaces can help game developers gain more exposure to potential new gamers. By listing NFTs on these marketplaces, new gamers can discover game items of games they are not playing yet. This could potentially lead to more new gamers in a game.

This same exposure principle applies to external brands of companies not directly affiliated with the gaming industry. Partnerships between developers and external brands are more easily created. These external brands can gain exposure inside games

by, for example, developing an item that can be used in the game. Also, game developers could give benefits to brands that already are implementing their own non-gaming-related NFTs by offering owners of these NFTs benefits in their game, in which case contact with this brand is not necessary at all.

Also, game developers can more easily cooperate with each other using NFTs. For example, by developing in-game items that are represented by an NFT, other game developers can incorporate this same NFT in their own games. This could lead to a wider game economy where items can move between different games, something that was not possible in traditional games.

5.1.2 How can game developers engage stakeholders using NFTs?

As mentioned in the previous section, the possibility to implement a DAO gives developers the possibility to engage gamers and any other token and NFT holder in the decision-making aspect of the game. This can lead the different stakeholders to work closer together and can give gamers the feeling that they have a say in a game that they sometimes spend hours in. However, a negative effect could be that stakeholders feel less responsible for their duties, leading to the development of a project not proceeding as planned.

The technical possibilities of NFTs may engage gamers more effectively in the gameplay of a game. As the history of what happens with an NFT is stored on a blockchain, an item like a sword can contain a history of events. If developers decide to connect certain benefits to these activities (the more goblins you kill, the more powerful a sword becomes, for example), it could engage gamers and retain them more effectively. This principle of progression was mentioned as one of the engaging factors of NFTs.

The principle of play-to-earn may have the strongest effect on the engagement of gamers. As mentioned, some players put hours of their time into a game. Being able to convert this time into value outside of the game can have a positive effect on engagement. However, as NFTs have a monetary value, they could create an entry

barrier for new players, depending on the design of the game. For example, if a game requires the gamer to have a minimum amount of items to start playing.

Aside from gamers, also investors can be more easily engaged in an NFT gaming ecosystem. An important aspect of this is that this applies to investors of all sizes as buying a gaming token or NFT is a pretty straightforward process. This means it becomes easier for also smaller game developers to crowdfund games, possibly leading to a more diverse offering of games in the industry. Also here a negative effect can emerge, namely that of investors losing money by either scams, bad actors, or just a failing gaming project. More about this matter will be discussed in the next section.

5.1.3 How do NFTs impact stakeholders' responsibilities?

By answering this question, a clearer idea of the responsibilities of different stakeholders can be obtained. In the context of NFTs and cryptocurrency in general, this topic is sensitive as investors and players could potentially lose money when developers (or other stakeholders) do not fully understand the responsibility they have. Firstly, the complex game economy that emerges forms a new challenge for game developers.

The decisions of the game developers, how the economy is constructed, and the function of NFTs can have significant consequences for token and NFT holders. For example, when the in-game economy is too inflationary, it can eventually stagnate with the result that the items become less valuable, leading to a further downward spiral for the project. This shows the possible scope of the consequences that originate from the actions of the game developers.

Furthermore, the decision for game developers to implement can be interpreted as simply another way to generate more revenues. Also here the decision-making about what role NFTs play in a game can have significant consequences for stakeholders in the ecosystem.

Finally on the point of game developers, deciding to manage a project through a DAO means all stakeholders that hold an NFT or governance token have the responsibility

to move the project further. For gamers this means that their vote can have consequences in the future. For developers it means they let go part of their responsibilities and their actions could potentially have less impact.

As mentioned by Freeman (2007), transparency is needed for a business to flourish. In that sense, NFTs can offer a way for gamers and investors to get an insight into the inner workings of a game project. It becomes visible how many NFTs were created, where they are moved and who owns them. This transparency, however, can also lead to situations such as described by Respondent 2 in section 4.4.2. If, for example, a brand collaborating with a game does something that causes an outrage, NFT holders of this game could potentially be associated with this brand more easily.

For gamers, investors and other stakeholders that are custodians of NFTs, actions can have significant consequences in the form of a complete loss of the NFTs in the case of improper handling. It can be unclear what the loss of an NFT truly means for an owner, but typically once it is lost, it is lost forever due to the immutability of blockchain technology. This differs significantly from traditional games where items could technically be replaced if it was proven that the item was lost due to a scam, for example.

The balance in risk between developers and investors seems to shift more to the side of investors, as they can now more easily invest in an early stage where it can be that there is no game at all yet. The consequence here is that there is a risk for investors to lose their investments.

Based on the findings in this thesis, a framework was created which can be found in Figure 11. In this framework, the opportunities and risks that NFTs offer are included. Responsible game design, which in this figure includes the game itself as well as the complete project surrounding the game, could support the responsible engagement of stakeholders. NFTs may also stimulate the cooperation of stakeholders in a healthy NFT gaming ecosystem. This could be considered a continuous process, where stakeholders are engaged to cooperate, improving the gaming ecosystem as time proceeds, possibly engaging more stakeholders.

However, the irresponsible implementation of NFTs in a video game, as shown in Figure 11 to include a disbalance between gameplay and play-to-earn, too high inflation, giving in-game NFTs functions that give owners an unfair advantage, and the stagnation of development as the responsibility for the decision-making process is decentralized through a DAO, may prevent the realization of a healty gaming ecosystem.

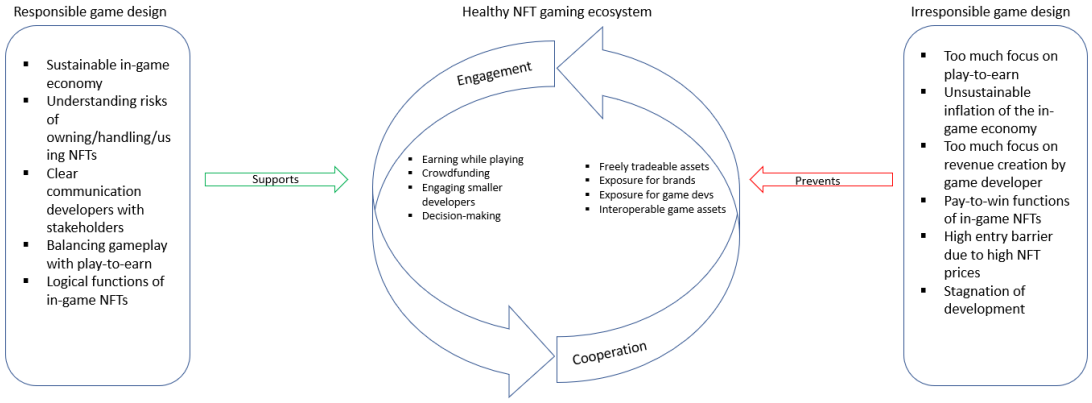

Figure 11: Framework for stakeholder cooperation, engagement, and responsibility in the non-fungible token video game ecosystem

5.2 Theoretical contribution

This thesis attempts to explore the implications for gaming ecosystems when implementing NFTs, and did this by interviewing five respondents. Based on their opinions and the earlier conclusions on the stakeholders in an NFT ecosystem by Wilson et al. (2021), several major stakeholder groups in the NFT gaming ecosystem were identified. With this information, a diagram was created that visualizes these different stakeholder groups (Figure 10).

The findings further support the theory that blockchain has several core values that offer opportunities for businesses. Firstly, the possibility to conduct peer-to-peer transactions in a trustless network (Tan & Salo, 2021), digital assets can become scarce and unique. For video games this means that digital assets can have a monetary value, and that they can be traded between gamers, offering game developers new opportunities for their businesses.

Furthermore, this also supports the findings of Tan and Salo (2021) that blockchains can commercialize intangible assets. This was mentioned as one of the promising possibilities of NFTs in games by the respondents of this study, improving the cooperation and commercial opportunities between stakeholders such as brands and game developers.

According to Tan and Salo (2021), blockchain offers a new model of economic coordination and governance in the sharing economy. Based on the findings of the present study, this seems to also be applicable in the gaming industry. DAOs can improve the cooperation between stakeholders by deciding the direction of the development of a game.

In combination with the point on commercializing intangible assets, using blockchain as a way to offer NFTs or other tokens, developers can more easily raise capital from investors and gamers, supporting the findings of Tan and Salo (2021) that blockchain offers a way to manage the economic sustainability more effectively. Though, in the case of games, the game design brings an extra factor to take into account when it comes to this sustainability.

Furthermore, this study supports the conclusions of Sharma, Zhou, Huang and Wang (2022), that one of the advantages of an NFT ecosystem are that intermediaries can be removed. In a gaming NFT ecosystem, this means that developers and players can get into closer contact without, also stimulating collaborative creation between them.

Sharma et al. (2022) and Valeonti et al. (2021) concluded that there are concerns with regards to the lack of regulation. Also in this study, this was one of the concerns that was brought up by the respondents and further supports the need for further exploration and development of regulations for NFTs.

Finally, the findings in this study support the conclusion of Popescu (2021) that NFTs can spark new internet communities that have their own micro-economies. The implementation of NFTs in games can create an in-game economy that can also connect with external communities and platforms.

This exploratory study contributes to a better understanding of how NFTs impact different ecosystems, in this case that of video games. Based on the collected data from five respondents, the current state of NFTs in games, their opportunities, advantages, disadvantages and risks are mapped out. Also the stakeholders and their relation to each other are identified. The study shows that engagement, cooperation and responsibility rely on each other. NFTs can facilitate in this by giving game developers tools to stimulate engagement and the stakeholders a way to trade in-game assets with each other and participate in the decision-making process. Though, the implications NFTs bring do change the responsibility aspect for many of these stakeholders, as shown in this study.

5.3 Managerial implications

Although NFTs can help game developers align their business more closely with the three principles of the stakeholder capitalism theory that this thesis focuses on, there are several managerial implications to keep in mind when developing an NFT game, or considering implementing them in an existing game.

First and foremost, the complexity of an in-game economy based on NFTs and digital currencies, in combination with game design should not be underestimated. While certain game designs may help attract new investors quickly, the sustainability of a game may be heavily impacted if the in-game economy inflates too much.

Connected to the first implication, developers should carefully evaluate where the balance lies between entertainment and the possibility to earn while playing. Giving gamers the possibility to earn while playing, can engage players more, but too much focus on this aspect could lead to a focus of the gamer to solely focus on extracting value out of the game, something that is unlikely to be sustainable in the long run. Also, it can impact the reputation of a game developer as seen with the Ubisoft case, where gamers expressed their worry that NFTs were simply another way to generate more revenue.

This means that game developers should keep in mind why and how it wishes to implement NFTs, what abilities they give the NFTs and if it should or should not be a

central part of a game. This, of course, heavily depends on the type of the game. But in the end, the implementation of NFTs should be logical and give gamers value, other than the pure monetary aspect of it.

Thirdly, game developers should properly communicate their plans and the risks that are involved in buying and owning an NFT. As NFTs and crypto in general are in their infancy, many investors, gamers and other stakeholders may not realize that there are risks involved with regards to the future of the game and with that the value of their investments. Especially since any investor, big and small, can participate within the ecosystem. Regulators could start to play a role in this in the future, as regulations keep on evolving. Game developers should keep up to date with the applicable regulations when it comes to NFTs.

Developers should also consider the fact that their actions, also in the external sphere of the game, may impact the value of in-game assets. Also, if external brands are collaborating with the ecosystem, actions of both the developers and brands may affect both their reputations and the value of the game assets.

Fifthly, when incorporating a DAO structure, game developers should realize that their role may shift to one more of a community servant. Therefore, developers must evaluate what this means to their position within their gaming ecosystem, as well as how this affects their responsibilities.

All in all, the Respondents that participated in this study were optimistic about the opportunities blockchain technology offers for games, though some of them expressed some concerns. In the end, if a developer decides to embrace NFTs, it should first and foremost benefit the gaming experience and not only be a new way to create a new revenue avenue. It should give gamers the option to monetize the effort and time they have put into a game, while keeping the playing field level enough to prevent ‘pay-to-win’ environments.

5.4 Reliability and validity of the research

Reliability and validity define the quality of qualitative research in social sciences. The reliability of research means the ability to replicate the research design and achieve the same findings. Validity means the accuracy of the analyses, appropriateness of the methods that were used, and the generalisability of the findings (Saunders et al., 2015, p. 202). As this study was an exploratory, qualitative study in which the findings are based on the personal opinions and knowledge of respondents, and data was gathered through semi-structured interviews, complete replication may be difficult. When it comes to consistency, however, the gathered data during these interviews were generally consistent.

The validity of the study may be limited as many of the findings were based on respondents' personal opinions. The generalizability may be limited as well due to the small sample size of five respondents. However, the techniques used to gather the data, analyze it, and interpretation of the findings are based on existing scientific literature as explained in chapter 3, which supports the validity of this research.

5.5 Limitations and future research

In this section, the limitations and future research topics are discussed, starting with the limitations that may have had an effect on the data gathering and findings.

Firstly, as the researcher's professional position solely revolves around the crypto sector, the views and interpretations may be biased. Relevant to this is that all respondents were also active within the crypto (gaming) industry and their opinions may be biased in favour of using NFTs as well.

Furthermore, all respondents were positive about using NFTs. Ideally, some of the respondents should have been a clear opposers of the idea of using NFTs in gaming to get a more complete image. Overall, as the sample for this study consists of only five respondents, this could be considered as one of the limitations too.

Future research topics based on this study could be a more detailed look into the roles of the different identified stakeholders in an NFT gaming ecosystem. Also, the role of regulators should be explored.

Finally, as this study only explored the implications of NFTs in gaming in the context of three stakeholder principles, further research could explore the remaining principles to further expand the knowledge in this field.

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7 APPENDICES

Appendix 1: Interview questions

1. What is your current position?
2. What kind of professional background do you have?
3. What kind of experiences do you have with NFTs in games?
4. How could NFTs be implemented in (some of your) games?
5. Could you explain who are the stakeholders of NFT gaming ecosystem?

Stakeholder cooperation

6. What group of stakeholders could benefit from the implementation of NFTs?
7. How can the fact that NFTs can be created/traded between gamers (also outside of the game itself) improve the experience for different stakeholders?
8. Do you think that NFTs put more responsibilities of value-creation into the hands of gamers? If yes, to what effect? If not, why not?

Stakeholder engagement

9. How can NFTs help engage players?
10. Aside from gamers, how could NFTs engage other stakeholders with an NFT gaming ecosystem?
11. How could this change the role a game developer has within its ecosystem in light of other stakeholders within that same ecosystem?

Stakeholder responsibility

12. What are, in your opinion, some of the different motives for gamers/other stakeholders to own gaming NFTs?
13. How can NFTs impact the responsibilities of game developers?
14. How can NFTs impact the responsibilities of other stakeholders' (like gamers)?