Module 3. Gaming and Metaverse

In module 2, we mentioned how NFTs worked, and how they would change what digital ownership meant. We went through Chris Dixon's classification of NFTs (Dixon, 2021), which is very helpful to understand the true potential of this technology and how far-reaching it can be. But there is one particular type of NFT that we didn't go into any depth, since it is of particular interest, and deserves a more thorough explanation. That is NFTs for video games.

The video game industry is one of the biggest pillars in the entertainment industry, and, as of 2020, there were around 2.7 billion gamers in the world (over a third of the world's population), with a total revenue in the industry of $165 billion dollars (Omri, 2020). One can only assume that, after the pandemic and lockdowns, numbers have only got more impressive. So, it is a big industry that we are talking about, and there are a lot of crypto enthusiasts that assure blockchain is going to absolutely revolutionise how it works.

There are two concepts that we are going to discuss in this module: gaming NFTs and the metaverse, which has become a huge buzzword—but not everybody means the same thing when they talk about it. We will also see some specific examples that can be of much use for the sporting industry, and gaming in sports.

Gaming: from Pong to in-game purchases

Video games evolved a lot along history. It is obvious that, as computers became more elaborate, the games we played on them became more complex. Think of Pong, what many people regard as the first video game ever, created in 1972. It was developed by Atari, and it consisted of just two bars bouncing a ball, in what seems to be a virtual ping-pong game (Cohen, 2019). It was incredibly simple, but computers were barely a thing back then.

Figure 1. Young boy playing a video game

Source: [online image of a young boy playing a video game], (n.d.), https://bit.ly/3HKjMKt.

Gaming in the early days was as simple as one can think. It was all our computers could do back in the day.

We then got Pac-Man, Tetris, and all the arcade games. With the advent of personal computers and video game consoles, more diverse games started to show up, with richer graphics and even more engaging storylines and music. We can all think of some classic titles of those early days, like Super Mario or Mortal Kombat. It is clear to see how video games and computing advances go hand in hand.

The advent of the internet gave new possibilities for video games, and this is where things start to get interesting for us trying to understand blockchain. When games went online, users could engage with each other. At first, the only possibility you had was to have a human being rival on the other side of the web. But, as games became more and more complex, the possibilities of interaction became each time more profound.

Gaming has become a whole world in itself. And this is meant literally. Many games have worlds built inside them, sometimes developed through many years of painstakingly

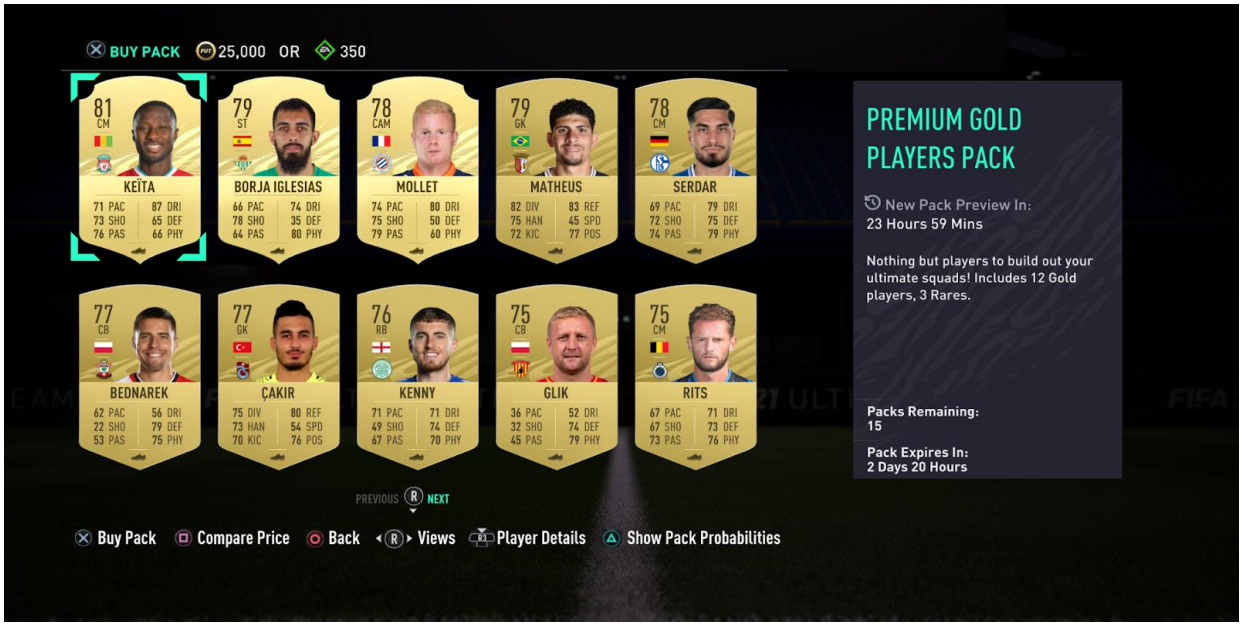
detailed work either by players or game developers. Games like Assassin's Creed, Final Fantasy, or Red Dead Redemption have whole cities built inside them which can take hours on end to explore. Besides, the characters acquire in-game items, which are hard to find, and can be used to further advance inside the game.

For instance, in Red Dead Redemption II, the player can improve the character they play with. The game is set in the Wild West, the American frontier of the nineteenth century. Players can improve their avatars with better equipment, such as pistols, horse saddles, cowboy hats, boots, and even getting them haircuts and their beards trimmed. The more time the player spends and the more effort they put into the game, the better items they can get. It takes time and effort to get your character in top shape. Those in-game items that the player acquires are then very valuable, and lots of people are willing to pay for those upgrades in their avatars.

This has been a huge business model for video games in recent years. Games are fully playable once purchased, but there are some perks and bonuses for those who are willing to pay a little extra on the side. These are called 'in-game purchases', and have become the new paradigm in the video game industry. Especially in mobile games, which are most of the time free to download and to play, up to a certain extent, progress becomes too slow unless you pay extra for in-game items that allow you to develop further and keep up the pace with other players. There is a great video made by Vox Media in association with YouTube Originals, that explains this business model in more depth:

Source: **Vox**. (2020, October 8). *Why Spend Money in Video Games? – Glad You Asked S1* [video]. YouTube. https://www.youtube.com/watch?v=ZBxvAE_ux9U.

Figure 2. FIFA packs



Source: [online image of FIFA packs], (n.d.), https://bit.ly/3yfVzZd.

One of the most popular games of all time, the FIFA franchise, introduced 'FIFA packs', an in-game purchase that would allow the players to buy a random collection of cards, that they could use to strengthen their teams in the game.

One of the most popular games of all time, FIFA Football (which holds the record of the most sold sports video game franchise in the world) uses in-app purchases to improve the playing experience (Batchelor, 2021). FIFA players get to assemble their own football teams, and make them compete against other players. You can assemble a team for free and win, just based on skill and persistence; but then you also have the possibility of buying points and coins that enable you to get better players and, therefore, assemble better teams.

These in-game purchases are common practice in most recent games, but most games nowadays are created by huge companies that have complete power and ownership on everything that goes on. So, imagine you spend a lot of money in your character. You buy weapons, 'skins', items, but, for any reason, your account gets deleted, or the company goes bankrupt! Everything you 'owned' is lost. You only own the items as long as the game grants you access to that item, and you are not really in control of the game.

If you have been following module 1 and especially module 2 (where we talked about NFTs), you can see where this is going. What if ownership of items in video games was established and recorded immutably on the blockchain?

Gaming and NFTs

As we said earlier, gaming and computer developments have always gone hand in hand. Therefore, it seems only logical that blockchain technology, which is undeniably a huge innovation in computing technology, gets soon incorporated into the gaming world. And, although it still remains a controversial technology and many people see significant drawbacks (Pouard, 2021), some of the biggest companies in gaming (like Ubisoft, the company behind the Assassin's Creed and Far Cry franchises, for example) have already taken steps towards incorporating blockchain in their games (Valentine, 2021).

How would that look? Blockchain and gaming? At a glance, it would not look very different. You would still play games where you have an avatar, and you log in, walk into a different world, encounter creatures, monsters, have quests and missions, different levels of difficulty to unlock.

But if crypto tokens are introduced into the game, suddenly a whole new dynamic emerges within the game, and it can radically impact the gaming experience. Imagine a game with its own native cryptocurrency. Instead of 'gold coins', you get crypto tokens, that are valuable within the game because they allow you to buy armours, swords, cars,

whatever you wish. Now, since those tokens are based on blockchain technology, they don't exist only within the game, but also in the real world. If the game is very popular, and tokens are hard to come by, they could become very valuable, and actually worth real-world money. These tokens could be used to buy and sell anything within the game; but, since they exist on blockchain and can be traded for other cryptocurrencies, they could also be used to buy and sell stuff in the real world.

If the demand for the native token of the game is strong enough, the game suddenly has a real economy going on intertwined with the gameplay. Imagine armours, skins, swords, houses, all being unique, and scarce NFTs that can be bought, sold and traded. So, when you earn tokens inside the game, you are earning real, usable money. It might be that every teenager's dream actually becomes a reality: get paid real money to play their favourite game.

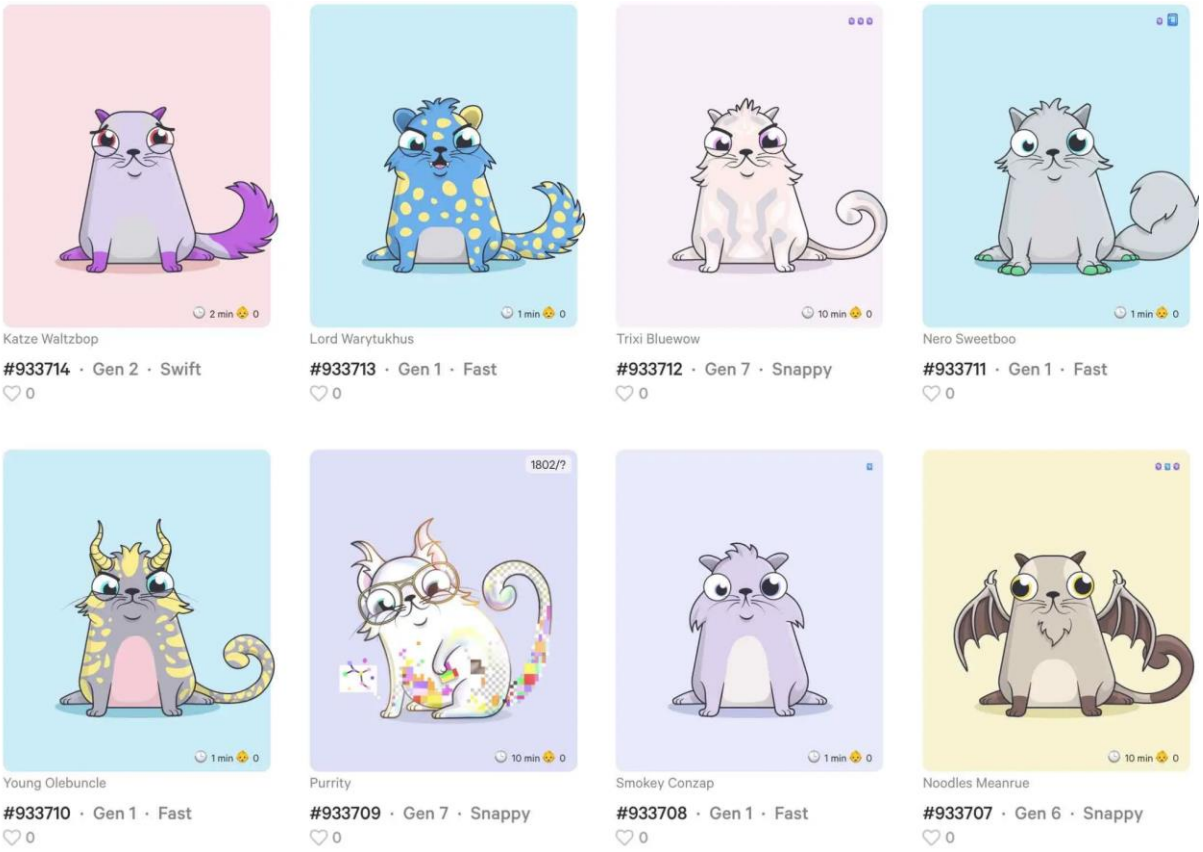
The big difference is that when you own an in-game asset that is recorded on the blockchain, you own it inside the game and outside the game. So, even if you get locked out of your account, or you stop playing, or whatever happens, if you still have the keys to your crypto wallet, you still own the item. If you get bored of the game, you can sell it. Or, if the game allows it, you can carry it between games. So maybe two games developed by the same company allow their players to transfer items from one game to the other.

Play-to-earn: Can you really get paid for video games?

Getting paid for playing video-games is every teenager's dream, and probably most adults' too. There have always been ways in which people made money by getting really good at video games, either by winning tournaments, or training avatars for other players, etc. In any case, it was never an integral part of the game itself. That is until blockchain and gaming became a possibility.

Play-to-earn is a term used to describe the new trend in video games involving crypto: as the term suggests, you play games to earn money. It is not necessarily as straightforward as that, since it depends on the inner dynamics of each game. But, in general, 'play-to-earn' refers to games that enable the player to earn crypto currency as a reward of playing the game. Either by generating NFTs that can be sold in a marketplace later in exchange for a crypto (generally ETH), or by trading game items, or any other possibility. What it refers to is that, since the game is built upon blockchain technology, it involves some sort of cryptocurrency dynamic, and, therefore, it allows for profitable gaming. Of course, all of this is hypothetical until the game becomes actually played and tokens are demanded. If there is no demand, no matter how much you play, there is no way you are going to earn anything.

Figure 3. CryptoKitties



Source: [online image of CryptoKitties], (n.d.), https://bit.ly/3xQFs35.

CryptoKitties was the first popular game that enabled players to sell their items in an NFT marketplace, and make real money while playing.

The first game using this model to became massively popular is called CryptoKitties. It is a game developed by a Canadian gaming studio called Dapper Labs, and it debuted in November 2017 to great success (Takahashi, 2018). The game was developed on the Ethereum blockchain, and a few months later it became so big that it accounted by 25 % of all of the traffic in the Ethereum blockchain. The concept was really simple: little cartoonish animated images of crypto kitties could be bought. There were only 50 thousand to begin with. CryptoKitties are, essentially, an NFT. Each one has a different characteristic: either different colouring, or whiskers, some have wings, some have blue eyes, others brown. The combinations are infinite. But there would only be 50 thousand of them issued by the game, not one more. This created scarcity.

Despite this, there is a catch. Players could actually breed new CryptoKitties, and the different combinations of these CryptoKitties would be mixed up, creating all kind of new images. Less than a year later, the players had bred over a million crypto kitties. Of course, the original 50 thousand, called 'genesis' cryptokitties, were rarer and, therefore, more

valuable. Some CryptoKitties are considered to be so rare that their valuation reaches hundreds of thousands; such was the case with this one called 'Dragon' (Dragon, n.d.).

In the words of Cleo Abrams, the *Vox Media* journalist:

> These are **crypto-collectibles**, they are like beanie babies, or baseball cards. It sounds silly, but CryptoKitties is testing a profound idea. Can a digital good be rare? (...) Popular CryptoKitties earn high prices the way collectibles always have: scarcity. And what is interesting about this is that digital scarcity is brand new. (Why people are buying cartoon cats on the blockchain, 2018).

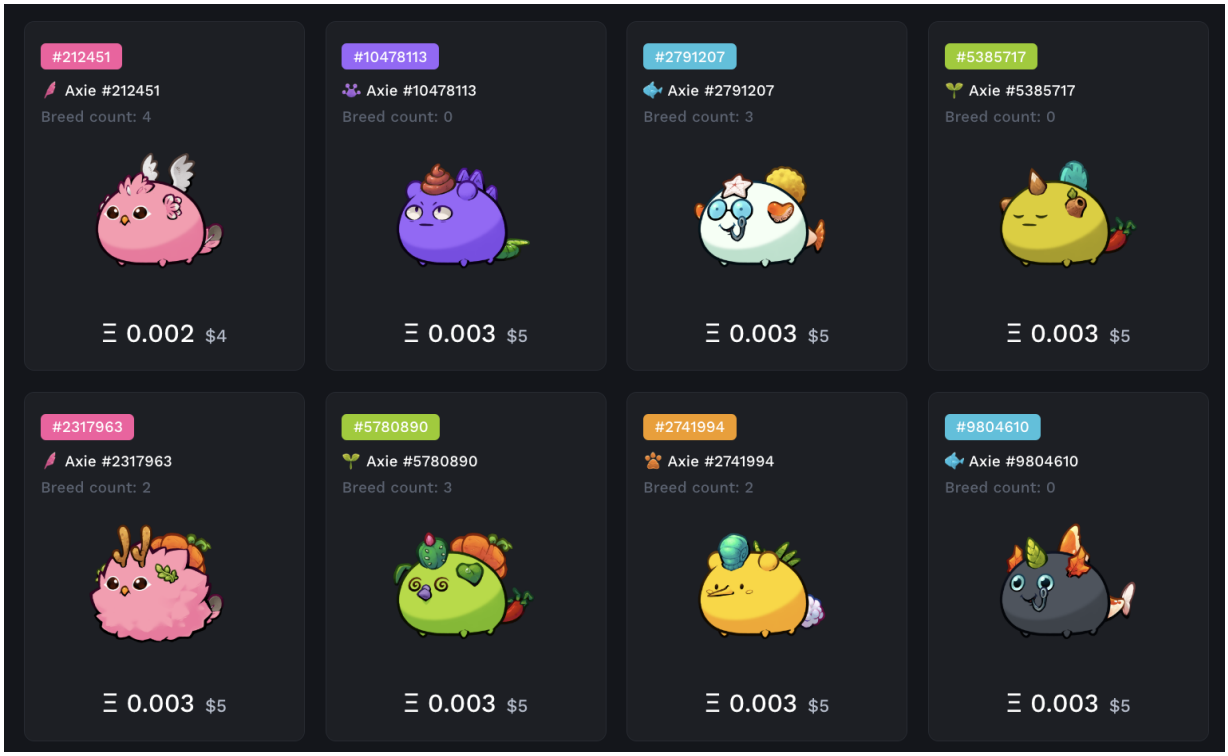
CryptoKitties might have been the first play-to-earn game that became extremely popular, but it was definitely not the last one. The pandemic had a huge impact on how much time people spent playing video-games, and that included play-to-earn games. One particular game became huge, first in Southeast Asia, but later it grew in the rest of the world, called Axie Infinity.

The game has been developed by the Vietnamese company Sky Mavis, co-founded and headed by the young developer, Trung Nguyen (Lee, 2020). In 2018, when he was 26, the beta version of the game he created called 'Axie Infinity' went online. The concept is not entirely different to that of CryptoKitties, but it is richer and more complex. In fact, the creator first got inspired to create a game with NFT tokens while playing CryptoKitties. He got fascinated by the economic aspect that Cryptokitties developed, and thought that it would be great to mix some of the everything he was seeing with something more inspired in Pokémon games (Lee, 2020).

He then created 'Axie Infinity', which consists in breeding and growing 'axies', little digital creatures inspired in a real-life fish called Axolotl, that is native to the Gulf of Mexico. These creatures lived in digital 'terrariums' and had to be fed, put to sleep, and taken care of. Remember Tamagotchi, anyone? Think crypto-version of the famous 90s pocket pet. But you can also make your 'axies' battle other players, so of course the improvements you make can help win more battles.

Each 'axie' can be sold as an NFT in an open marketplace. Of course, more developed 'axies' are more valuable than the less developed ones. They are sold and bought in ETH. So, in essence, if you got an 'axie' and develop it, you could later sell it for real life money. Axies became really demanded in the gaming world, and the most expensive axie NFT ever sold was valued at 750 ETH (The Most Expensive Axie to be Sold, 2022), which, at the time of this writing, is around 1,320,000 dollars.

Figure 4. The Axie Infinity marketplace



Source: Axie Infinity, (n.d.), https://bit.ly/3A21sdV.

The Axie Infinity marketplace allows players to sell their characters (which are in essence NFT tokens) and make a profit if they are valued properly. Exchanges are generally made in ETH.

So, we began this segment asking ourselves if it was possible to win money playing video games, and, as you can see, it is quite possible. But if you can win real-life money, the game is tied to real-life economic laws. Axie Infinity was a game in high demand, and their NFTs were highly sought after. Speculation or not, a lot of people were trying to buy them, which drove the price up. So, if you play a game, no matter if it is based on blockchain technology or not, if there is no demand, the tokens will not go up in price. Seems an obvious point, but it needs to be made. You can call yourself 'play-to-earn' all you want, but that does not mean you will actually earn something.

Big companies want in: Ubisoft and EA

Not every company is excited about this new technology. For example, Valve, the company behind some very famous video games such as Counter Strike and Half-Life, has removed all games related to blockchain technology from their distributing platform Steam (Osorio, 2021). But it seems that other big players in the industry are taking note of where things are heading. If the current trend continues, the whole NFT and blockchain

revolution will not only take place in small, independent gaming companies; but they are also going to be an integral part of the gaming industry as a whole.

Big companies such as Ubisoft and EA Games have shared their views on gaming and NFTs, and their attitude seems to be receptive. Ubisoft has recently purchased Animoca Brands, a Hong Kong-based company that specialises in blockchain play-to-earn games. But Ubisoft has plans to develop games of their own using the blockchain technology, although their plans still remain vague and no real precision on what is being developed has been known. Yves Guillemot, the company's CEO, stated that blockchain is very attractive in the long term:

> As you see, this industry is changing regularly with lots of new revolutions happening. We consider blockchain one of those revolutions. It will imply more play-to-earn that will enable more players to actually earn content, own content, and we think it's going to grow the industry quite a lot. (...) So, we have been working with lots of small companies going on the blockchain, and we're starting to have a good know-how on how we can impact the industry. We want to be one of the key players there. (as cited in Neikirk, 2021, para. 6).

EA games, the company behind some blockbusters like FIFA or Madden NFL, has also pronounced itself in favour of blockchain technology in gaming. In an earnings call that took place in November 2021, the CEO of the company was asked about play-to-earn games and NFTs. Andrew Wilson, the company's CEO, responded:

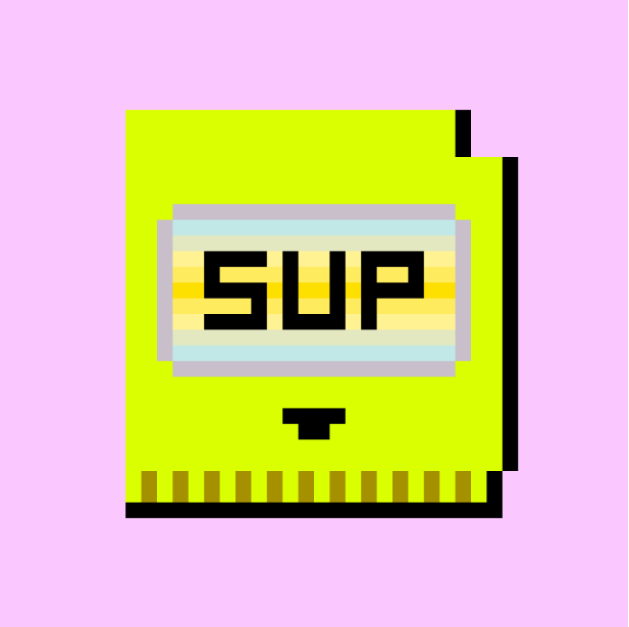
> I think that in the context of the games we create and the live services that we offer, collectible digital content is going to play a meaningful part in our future (...) So, it's still early to tell, but I think we're in a really good position, and we should expect us to kind of think more innovatively and creatively about that on a go-forward basis. (as cited in Colp, 2021, para. 2).

Use cases of blockchain in video games can extend beyond in-game items. There is a very interesting case that is worth mentioning: Supdrive.

The creator of Supdrive is Dom Hoffman, one of the founders of Vine, the formerly popular social network. He calls Supdrive an "on chain fantasy game console" (Hoffman, 2021), which does not clarify much. But he later explained on the project's Discord channel that he intended to put out games, and each game in itself would be an NFT. This implies that there will be a limited number of copies of the games and that each copy will have unique

characteristic, like colours, difficulty levels, and more. At first, the games would be simple games like those we know from the arcade world like Pac-Man, Asteroids, etc. (Clark, 2021).

Figure 5. Supdrive on Twitter



Source: Hoffman, 2021, https://bit.ly/3NnyLuW.

We mention this case as one of particular interest because we have been developing the intersection between games and NFTs mainly as a possibility to develop in-game items. But here is a radically different approach where the game itself is an NFT and, therefore, a collectible item. It is a step in a different direction that most of us probably would not have thought about. And it goes to show that new possibilities and different innovations will take place all the time, most of which we cannot even see the beginnings of.

The metaverse

There is a new word that has been circulating a lot recently, not only in the gaming industry, but everywhere: the 'metaverse'. Nobody really knows what it means, or at least everybody has a different understanding of what it means. And this comes as no surprise really, since the metaverse is still a vague concept, that has started to take shape only recently. A venture capitalist, called Matthew Ball, author of the 'Metaverse Primer', defines it as follows:

> The Metaverse is an expansive network of persistent, real-time rendered 3D worlds and simulations that support continuity of identity, objects, history, payments, and entitlements, and can be experienced synchronously by an

> effectively unlimited number of users, each with an individual sense of presence. (as cited in Robertson and Peters, 2021, para. 8).

That means it is a digital world that users can enter and interact with. It can be entered through virtual reality goggles, or just by using a computer or a cell phone. It can be totally immersive, or rather work in tandem with the real world.

It is a space where people connect and interact with each other, and are able to build things and create. It can be a space where you own stuff, or just a space where you go to trade. And there is not one, single metaverse, there are plenty. Just as there is not a single website, there is a multiplicity of websites with different looks, functionalities, and experiences.

Some people consider, for example, the 'Fortnite' arenas as a metaverse. A place where players go in, have their own avatars, they can talk to each other, personalise their look with skins, own, and trade weapons and items. 'Second Life', back in the 2000s, can also be considered as a pioneering metaverse. In Second Life, people met each other, made friends, and visited digital places that were exact representations of their real-world counterparts.

Figure 6. Second Life

Source: [online image of Second Life], (n.d.), https://bit.ly/3xTaaIB.

Second Life was a hugely popular digital space where people interacted online using 3D avatars. Many people consider it an early version of the metaverse.

The term 'metaverse' was coined by the author Neal Stephenson in his 1992 novel *Snow Crash*, where he describes 'the metaverse' as a digital world that people can access through a fibre-optic connection, and consists of a single street that stretches along the entire circumference of an otherwise empty, black planet. It is a dystopian future that most of us would hate to live in.

Another dystopian representation of the metaverse was seen in the 2018 Steven Spielberg film, *Ready Player One*, where the world has been ravaged by climate change and citizens access a digital world, much more exciting, called Oasis, to escape the depressing, grim real world.

We are far away (really far away) from any of these scenarios to become a reality. But it is remarkable how the idea of accessing a virtual world, different than ours, has been lingering in the collective imagination for quite some time. So much so that today we see real-life attempts of creating an actual digital world for everybody to enjoy. But before we dive into the blockchain based, NFT related options of a metaverse, we should take a look into the event that many consider historic: Facebook's announcement of their own metaverse.

Facebook and the metaverse

In October 2021, Facebook announced it would change the company's name to Meta. The move was part branding, part business strategy. Mark Zuckerberg wanted to differentiate the company as a whole (owner of Instagram, WhatsApp, and other products) from the Facebook social media app. But it also meant that the company had a new, broad horizon to aim for, and work towards building the metaverse (Heath, 2021).

In the link below, you may find Mark Zuckerberg's announcement:

Source: **Meta**. (2021). *The Metaverse and How We'll Build It Together -- Connect 2021* [video]. YouTube. https://www.youtube.com/watch?v=Uvufun6xer8.

The entire announcement is over an hour long, so we will try to summarise it in a few words. Meta's vision for the metaverse is that of a place where users can have a virtual space, like a virtual home, furnished in incredible ways. Where they can have meetings, either for work or for leisure, with other users. They can attend virtual concerts, virtual nightclubs, and buy and sell digital assets.

But there is a problem for us who are interested in blockchain that cannot escape our sight. The metaverse that is being built by Mark Zuckerberg's company will be entirely controlled by the company, and centralised under their watch. This raises a whole range of issues, ranging from censorship to digital ownership. If I buy something in Facebook's metaverse, will it be really mine? Or will I depend on Meta's willingness to let me 'own' it?

This leads us to the next logical question: is it possible to match blockchain technologies and the metaverse?

Blockchain and the metaverse

Blockchain technology seems to be a perfect match for developing a metaverse. If we are going to start integrating our real-world life to a digital environment, we might want it to be a safe place where we know our data is being kept private and our stuff is actually our stuff, of which **we** have full ownership, and not a multinational corporation.

Like we said, there is not only one metaverse, there are many being developed right now. Meta's project of a metaverse is a concentrated, private, corporate owned metaverse. On the other hand, following the decentralised way of thought we have been talking about, there is Decentraland.

Decentraland is an Ethereum-based metaverse that is owned collectively by the users.

Figure 7. The Genesis Plaza at Decentraland

Source: [online image of Decentraland], (n.d.), https://bit.ly/3OqDei0.

Like we discussed in module 1, the Ethereum blockchain runs smart-contracts that execute automatically. Smart-contracts have many applications, from De-Fi to gaming, which is Decentraland's case. It has a handful of smart-contracts that created a digital world in which users can interact with each other, buy land, play, and create (Márquez, 2021).

Decentraland invites users to navigate a virtual world where they can build stuff, or visit places built by other users. It presents itself as the first-ever virtual world owned by its users.

The main innovation in Decentraland is the possibility it offers its users to buy parcels of digital land. Each parcel in the game is represented by an NFT, a token called 'LAND' that is unique because each piece of land in the game is located in different parts of the virtual map. Better located parcels of land are more valuable than those poorly located. There has been a 'digital property boom' in the last year, with digital parcels of land selling for the millions in platforms like Decentraland, Sandbox, and Axie Infinity.

This Wall Street Journal video does a great job explaining how this came to be:

Source: **Wall Street Journal**. (2022, January 7). *Investors Buy Up Metaverse Real Estate in Virtual Land Boom | WSJ* [video]. YouTube. https://www.youtube.com/watch?v=uIllSiXVfmI.

NFTs are also present in the game through many items you can buy (or sell) in a marketplace. It makes sense that, if the whole game is decentralised, all the items within it are NFTs. Actually, it is the only way it could work, since there is no central authority regulating the game.

As you can imagine, if you have players that can buy and sell stuff, build their own virtual houses, make friends online, play games, meet and connect, suddenly, the game has a small society growing within it. There is a very real economy growing there too, and, in Decentraland's case, that economy is fuelled by the game's native currency, Mana, which you can trade for any other cryptocurrency.

The opportunities in the metaverse

Right now, the metaverse is only starting. It is still in that very early experimental phase every great innovation has to go through. Yet, many experts agree that the changes that it will bring are big and deep. Morgan Stanley, one of the biggest multinational investment management firms in America, has reported that the metaverse represents a huge investment opportunity for anybody willing to take the risk of such an early investment on a developing technology (Metaverse, 2022).

Still, it is incredibly exciting to see how the world of gaming is shaping towards the incorporation of blockchain technology. From the incorporations of NFTs, to the full-blown creative possibilities that the metaverse allows, we are surely heading to some very innovative time in history. Just as it is hard for us to imagine our life without the internet, it might be the case that one day we look back and wonder how it was that we once had fun with games before blockchain.

References

Axie Infinity: Origin is live in Early Access! (n.d.). *Axie Infinity*. https://marketplace.axieinfinity.com/.

Batchelor, J. (February 2, 2021). EA extends UEFA exclusivity, working on multiple FIFA mobile games. *Games Industry*. https://www.gamesindustry.biz/articles/2021-02-02-ea-extends-uefa-exclusivity-working-on-multiple-fifa-mobile-games.

Clark, M. (August 19, 2021). Vine's creator is now working on NFT blockchain video games. *The Verge*. https://www.theverge.com/2021/8/19/22632765/vine-creator-dom-hofmann-blockchain-video-game-nft-supdrive.

Cohen, D. S. (June 24, 2019). Pong: The First Video Game Megahit. *Lifewire*. https://www.lifewire.com/pong-the-first-video-game-megahit-729739.

Colp, T. (November 3, 2021). EA calls NFT and blockchain games 'the future of our industry'. *PC Gamer*. https://www.pcgamer.com/ea-calls-nft-and-blockchain-games-the-future-of-our-industry/.

Dragon. (n.d.). *CryptoKitties*. https://www.cryptokitties.co/kitty/896775.

Dixon, C. [@cdixon]. (December 11, 2021). Tweets. https://twitter.com/cdixon/status/1469734078425485317.

Heath, A. (October 28, 2021). Mark Zuckerberg on Why Facebook Is Rebranding to Meta. *The Verge*. https://www.theverge.com/22749919/mark-zuckerberg-facebook-meta-company-rebrand.

Hoffman, D. [@dhof]. (August 18, 2021). Tweet. https://twitter.com/dhof/status/1428093313412915203?s=20.

Lee, T. H. (February 21, 2020). Meet the Vietnamese developer behind blockchain game Axie Infinity. *Tech in Asia*. https://www.techinasia.com/vietnamese-developer-axie-infinity.

Márquez, A. (April 3, 2021). Welcome to Decentraland, where NFTs meet a virtual world. *NBC News*. https://www.nbcnews.com/tech/tech-news/welcome-decentraland-nfts-meet-virtual-world-rcna553.

Meta. (2021). *The Metaverse and How We'll Build It Together -- Connect 2021* [video]. YouTube. https://www.youtube.com/watch?v=Uvufun6xer8.

Metaverse: More Evolutionary than Revolutionary?. (February 23, 2022). *Morgan Stanley*. https://www.morganstanley.com/ideas/metaverse-investing/.

Neikirk, T. (November, 6, 2021). Electronic Arts CEO Says That Blockchain and NFT Games are 'The Future of Our Industry'. *Boss Level Gamer*. https://bosslevelgamer.com/electronic-arts-ceo-says-that-blockchain-and-nft-games-are-the-future-of-our-industry-1865.

Omri, W. (November 27, 2020). The history of the gaming industry in one chart. *World Economic Forum*. https://www.weforum.org/agenda/2020/11/gaming-games-consels-xbox-play-station-fun/.

[Online image of a young boy playing a video game]. (n.d.). https://www.gettyimages.es/detail/fotograf%C3%ADa-de-noticias/young-boy-plays-a-home-video-game-fotograf%C3%ADa-de-noticias/613473384?adppopup=true.

[Online image of CryptoKitties]. (n.d.). https://btcgeek.com/.

[Online image of Decentraland]. (n.d.). https://en.wikipedia.org/wiki/Decentraland#/media/File:Decentraland_Genesis_Plaza_at_evening.png.

[Online image of FIFA packs]. (n.d.). https://www.playstationtrophies.org/news/news-34263-fifa-21-ultimate-team-pack-contents-can-be-previewed-before-you-buy-during-festival-of-futball-event.html.

[Online image of Second Life]. (n.d.). https://www.stirworld.com/think-opinions-digital-legacies-rebranding.

Osorio, N. (October 18, 2021). Steam Abolishes Blockchain, Crypto And NFT Games But Epic Welcomes Innovation. *International Business Times*. https://www.ibtimes.com/steam-abolishes-blockchain-crypto-nft-games-epic-welcomes-innovation-3318653.

Pouard, N. (December 2, 2021). Blockchain is only a game changer if players are stakeholders. *Venture Beat*. https://venturebeat.com/2021/12/02/blockchain-is-only-a-game-changer-if-players-are-stakeholders/.

Robertson, A. & Peters, J. (October 4, 2021). What is the metaverse, and do I have to care? *The Verge*. https://www.theverge.com/22701104/metaverse-explained-fortnite-roblox-facebook-horizon.

Takahashi, D. (October 6, 2018). CryptoKitties explained: Why players have bred over a million blockchain felines. *Venture Beat*. https://venturebeat.com/2018/10/06/cryptokitties-explained-why-players-have-bred-over-a-million-blockchain-felines/.

The Most Expensive Axie to be Sold: a Rundown of the Highest Selling Crypto-Collectibles. (February 16, 2022). *The European Business Review*. https://www.europeanbusinessreview.com/the-most-expensive-axie-to-be-sold-a-rundown-of-the-highest-selling-crypto-collectibles/.

Valentine, R. (November 1, 2021). Ubisoft Plans to Create its Own Blockchain Games to 'Enable More Play-to-Earn'. *IGN*. https://www.ign.com/articles/ubisoft-plans-create-blockchain-games-enable-pay-to-earn.

Vox. (2020, October 8). *Why Spend Money in Video Games? – Glad You Asked S1* [video]. YouTube. https://www.youtube.com/watch?v=ZBxvAE_ux9U.

Vox. (2018, May 24). *Why people are buying cartoon cats on the blockchain* [video]. YouTube. https://www.youtube.com/watch?v=jGfvkjzLrNw.

Wall Street Journal. (2022, January 7). Investors Buy Up Metaverse Real Estate in Virtual Land Boom | WSJ [video]. YouTube. https://www.youtube.com/watch?v=uIllSiXVfmI.