“An OverView of NFTS: Disruptor of all the Disruptors ”

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NFT's:
What Are they?

What is an NFT? NFT stands for Non-Fungible-Token. What does that mean? Non-fungible means, the item cannot be exchanged or traded with another item. For cryptocurrency context, it means, unlike crypto currencies they are not fungible [1]. NFTs are completely unique, cannot be changed, removed or destroyed because the data of an NFT, similar to Bitcoin, is stored on blockchain, an immutable and decentralized digital ledger used to record transactions on a peer-to-peer network. NFTs could also be described as blockchain-traded rights to any digital asset; comprising images, videos, music, and even parts of virtual worlds [13.]

Blockchain is the major technology disruptor and is the driving force behind Bitcoin and Ethereum. The value of these NFTs stems largely from the idea of scarcity, with the technology behind NFTs being verification of authenticity. Each NFT contains data that differentiates it from any other NFT, and such data cannot be replicated [1]. Therefore, replicating NFT's is meaningless because each NFT can be traced back to the original issuer using the blockchain. It should be noted that the digital ledger of blockchain creates a sense of validity, authenticity, and transparency, as all individuals can see the whole history of this digital content, since the ledger stores the whole history [6]. This ability to trace an NFT back to the original creator removes the need for third-party verification, which increases efficiency and reduces overall costs. An NFT is a way to represent anything unique as an Ethereum-based asset [6]. NFTs provide the ability to give more power and ownership to the content creators than ever before, powered by smart contracts on the Ethereum blockchain. The tokens/NFTs are how ownership of unique items can be represented.

These tokens can be almost anything yet most of the tokenized items have thus far been art, collectibles, sport highlights, still images of tweets, and real estate related ideas [1]. There can only be one official owner at a time secured by the Ethereum blockchain, and no one can modify the record of ownership or copy/paste a new NFT into existence. The innovation of the internet has allowed for many real-world problems to be solved, and the internet is still in its infancy stage. The bottom line is simple, an internet with NFTs allows the content creators to receive monetary rewards in the present and in the future.

NFTs are unique digital tokens on the blockchain that can represent digital work, digital intellectual property, digital value and no two are the same. In theory, the scope for NFTs is anything that is unique that needs provable ownership. The advancement, innovation and exponential user growth of augmented and virtual realities has opened great opportunities for the NFT space. NFTs can essentially be any form of digital content. That content can be art, an essay, book, collectible, domain name, ticket that provides access to an event, or even an in-game digital item like a digital shoe in a VR/AR game[6].

Digital Virtual Worlds

The NFT phenomenon has created marketplaces such as Niftygateway.com, Rarity, OpenSea, Metagrail, and Decentraland as platforms where people can buy NFTs. Decentraland is possibly the most interesting concept, as it is an internet NFT marketplace for the virtual and augmented reality worlds. Simply put, you have your VR game in which there is a whole open world, including plots of real estate, and other digital assets. These virtual worlds are built on the blockchain and are popularly referred to as metaverses [13].

The concept of Decentraland is revolutionary, as they are merging two disruptive and young technologies, blockchain and virtual reality. In the virtual world or, metaverse, to join or play in it, all you need to do is buy LAND, a coded piece of metaverse that translates to a 16m by 16m plot of virtual land [13]. 90,601 pieces of this virtual LAND exist, with 43,689 for private use [13]. This private LAND can be traded freely, with each change in ownership money exchanged and permanently recorded on an Ethereum smart contract.

The Decentraland marketplace allows an individual to purchase those plots of land or items via NFT through Decentraland, also known as MANA crypto currency[13]. This is another scenario of what NFTs do, as visitors who enter the world can shop promoting virtual or real merchandise [13]. So, NFTs are a store of value with many use cases but most importantly allow individuals or content creators to monetize their creation by attaching royalties to the NFTs when they are sold.

How do they work? What Do they Solve?

How do NFTs work? The instrument for NFT creation involves uploading a file onto an NFT auction market, where the file is recorded on the digital ledger (in this, the Ethereum Blockchain) as an NFT, and can be purchased or sold using digital currencies [15.] Each token minted has a unique identifier, such that one NFTs are not directly interchangeable with other tokens 1:1 [1]. For example, 1 Ethereum is exactly the same as another Ethereum. This isn't the case with NFTs. Every NFT is unique and is not divisible and cannot be merged [14.] Each token has an owner, and this information is easily verifiable. NFTs live on Ethereum and can be bought and sold on any Ethereum based NFT market [3]. It is important to note that while the creation of an NFT that represents a piece of content can be exclusive to an artist, that artist can still retain the copyright to the work, enabling the artist to reproduce more NFTS highlighted by the same content [15.] ERC-721, first introduced in late 2018, differs from ERC-20 standard as it increases the common interface for tokens by more functions to verify that these tokens are based on are distinctly non-fungible and thus unique [14.] NFTs have distinct properties, that can be used by practitioners for a variety of use cases [14.] The ERC-721 standard denotes that every NFT has a globally unique ID, is transferable, and can optionally include metadata, as NFTS were created for a specific purpose-- to represent ownership over digital or physical assets [14.] Simply put, if you own an NFT you can easily prove it, no one can manipulate it, you can hold it, you can sell it, and, in some cases, earn royalties if you are the creator of it; the original creator receives resale royalties.

As an NFT creator, you can easily prove you are the creator, determine the scarcity, earn more royalties every time it's sold, sell it on any NFT market or peer-to-peer, and you are not locked in on any platform, so you do not need anyone to intermediate[3]. Thus, NFTs have reenabled the content creator's power, after platforms like Youtube and Spotify have hindered the creator's ability to monetize in a royalty-like way, and have improved the viewer's experience by eliminating advertisements. No ads existed when Youtube and Spotify came onto

the scene. Normally, you would view a music video/movie/or song without an ad and enjoy the material. These days, you will have to sit through an advertisement at least once during your listening session, as YouTube profits from the advertisement they sell. Even though the artist is receiving some form of compensation or payment for the view, the video/audio-ad sold by the platform impedes the experience for the user and cuts into the profit for the artist.

One of the main benefits from owning a digital collectible versus a physical collectible, like a baseball card or a rare, minted coin, is that each NFT contains unique information that makes it both distinct from any other NFT and easily verifiable[6]. This makes the creation and circulation of fake collectibles pointless, because each item can be traced back to the original issuer [1,2]. Thus, they provide a store of value that can be verified as authentic due to the underlying technology of the blockchain. NFTs allow the opportunity to prove authenticity of an item, and particularly digital authenticity. Take, for example, tickets to a sporting event or concert. Each NFT contains specific information about the purchaser and date of the event[4]. This data makes it impossible for it to be traded with other festival tickets. Also, if tickets are issued on the blockchain as NFTs, then no individual would even be able to create fake physical tickets. Since NFTs can be thought of as digital proof of authenticity and a duplicate one is impossible to add to the blockchain, NFTs provide another means of establishing authenticity and value, or proof of purchase.

Key Characteristics of NFTs

NFTs are non-interoperable, indivisible, indestructible, and verifiable. Cryptokitties, a virtual online game, was the first widespread use of NFTs that came in 2017. This game had immense popularity, as it at one point accounted for 70% of the transaction capacity on the Ethereum network [14]. Cryptopunks, NFTS similar to Cryptokitties, are 10,000 digital files of humanoid avatars. Yet Cryptopunks cannot be exchanged for Cryptokitties as they have different properties. NFTs also cannot be divided into smaller denominations like Bitcoin or Ethereum, they exist as a whole unit [1,6].

Since all NFT data is stored on the blockchain via smart contracts, each token cannot be destroyed, removed or replicated. Original intellectual property and data can be time-stamped and indisputably filed as NFTs on the blockchain as proof-of-knowledge for firmly establishing creatorship made possible by blockchain-based (self-sovereign) identity management [12.] “To avoid potential conflict with present employment regulation and tax status, academic research could initially focus on blockchain-tracked reputation systems, instead of potentially conflict-laden pecuniary rewards by crypto-assets, which would then largely map the current framework,” says Jens Ducree in her paper, *Research- A blockchain of Knowledge[12.].*

Ownership of these tokens are immutable, meaning gamers and collectors actually possess their NFTs, not the companies that create them. This contrasts with buying things like music from the iTunes store, where users do not actually own what they are buying; they just purchase the license to listen to it. Further, the digital ledger allows for storing historical ownership data on the blockchain so that items such as digital artwork can be traced back to the original creator, which allows pieces to be authenticated, thus also allowing the original creator to receive a royalty each time it is bought and sold.

NFT Types:
ERC-721 V.S. ERC-1155

In the early days of NFT's, companies looked for ways to progress and improve the standard of blockchain gaming, resulting in the creation of the non-fungible tokens using the ERC721 standard. The ERC721 standard was formed with Cryptokitties being of the first games to show this development. The blockchain company Enjin created a new and approved Ethereum token standard called ERC1155 token. *Refer to Table2 for detailed breakdown of ERC-721 vs ERC-1155[10].*

Joining the Decentralized Economy & Unique ways to Monetize the Digital Decentralized World

The internet has given birth to a new marketplace, as NFTs are now the new craze that millennials and generation Z are rushing to buy, similar to how millennials rushed to buy Pokemon Cards and Beanie Babies back in the 90's. NFTs now present the opportunity for individuals to buy digital content with digital currencies, thus also giving birth to a new economy or expanding the growing decentralized digital economy[8]. NFTs allow content creators to receive monetary gain exponentially, as they will always be given credit and rewarded for their original work[9]. NFTs have become immensely popular with crypto users and companies alike because: #1 they use the same technology of blockchain; and #2 the numerous ways they revolutionize the gaming/collectibles space[5].

Virtual worlds like Sandbox and Decentraland are digital marketplaces where individuals can sell digital items they accrue during gameplay, such as costumes, avatars and in-game currency on secondary markets. Decentraland is also a cryptocurrency blockchain that anyone can invest in, yet it's main use is for currency in video games. Though people have bought digital items in video games for years with U.S. dollars, these items can now be easily transacted using a digital currency/a blockchain designed for this specific purpose. As video games and virtual reality continue to evolve, the marketplace to exchange items via a form of data will grow as well, with the difference being this that data can go up or down in value. The assumption that digital content (in this case, items in a game, which is technically data) will hold an actual monetary value follows the ideology that *data is the new currency.*

The birth of a new digital decentralized economy has begun as digital marketplaces have been created to encapsulate the content created by artists, and also revolutionize the reach to a global audience of buyers without using an auction or gallery. This allows the artists to keep a significantly greater portion of the profits they make from sales. Royalties can also be programmed into digital artwork so that the creator receives a percentage of sale profits each time their artwork is sold to a new owner[9].

Due to the scarce nature and high demand for NFTs, gamers, collectors, and investors are often prepared to pay a lot of money for them. Some NFTs also have the potential to make their owners significant profits. For instance, one gamer on the Decentraland's virtual land platform decided to purchase 64 lots and combine them into a single estate. This was named "The Secrets of Satoshi's Tea Garden", and it sold for $80,000 worth of Decentraland purely because of its desirable location and road access [6]. Again, keep in mind that this is desirable because of its location and road access in a virtual world. Another investor parted with $222,000 to purchase a segment of a digital Monaco racing track in the F1 Delta Time game, which is a virtual reality racing game. The NFT representing the piece of this digital track allows the owner to receive 5% dividends from all races that take place on it, including entry ticket

fees. The owner of this racetrack could have a very nice lifelong fixed-income if the popularity of these races take off.

NFT Beginnings & Values:

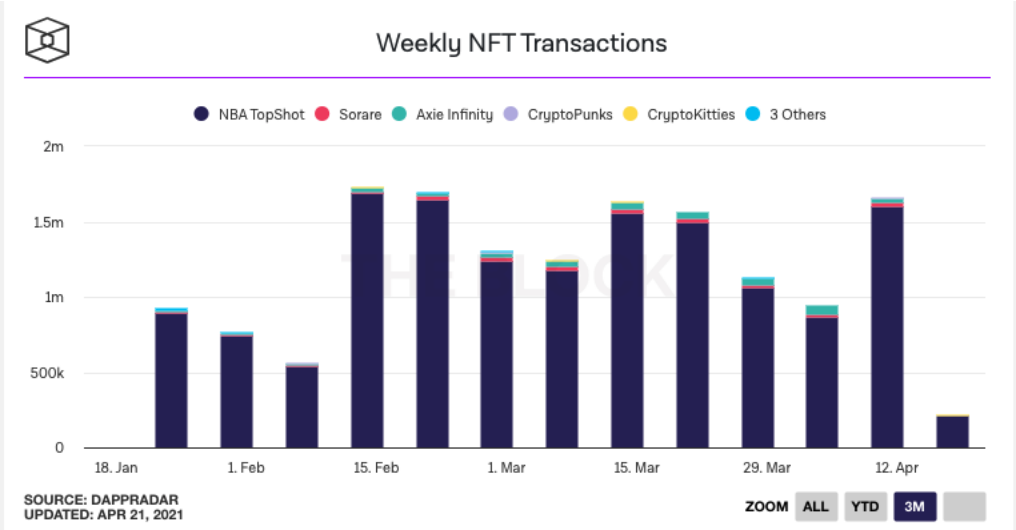
CryptoPunks were released in 2017 as one of the first NFTs on the Ethereum blockchain, developed by American Studio Larva Labs. This was an inspiration for the ERC-721 standard for NFTs and the modern crypto movements. The CryptoPunks idea is simple; create only 10,000 unique crypto punks (avatars) made scarce through blockchain tech. The appeal of CryptoPunks is heightened by the rarities of certain traits and types of characters, with most of the 10,000 punks being human, and three special types consisting of Zombie (88), Ape (24), and Alien (9) [3,5,8.] The two most expensive Cryptopunks ever sold were Cryptopunk #3100 for $7.58 million and CryptoPunk #7804 for $5.57 million respectively. That these NFTs were 2 of only 9 created contributed to this incomprehensible valuation. The most expensive NFT to be sold is the Cryptokitty Dragon, which sold for about 600 Eth. The one-of-a kind “1-1-1” race car from F1 Delta Time sold for 415.9 Eth in May 2019.

NBATOPSHOT, the marketplace for sports related NFTs, famously sold a digital collectible card of pro basketball star LeBron James for over $200,000 [4]. There are many marketplaces where these NFTs can be bought and auctioned off, some of which being, ArtBlocks, SuperRare, Rarity, Decentraland, and the notorious Niftygateway. While these auction houses or market places provide a platform to buy NFTs, it is not certain how NFTs can be accurately valued. As primary interest in NFTs grows from uses that involve creating scarcity to assigning value to code-built digital objects, the valuation can range widely. To understand how this uniqueness and authenticity is created, distributed ledger technology helps authenticate ownership of a digital asset in the physical that world would accrue to a single owner of a material object [15.] As the valuation is nearly impossible to assign, one can assume the value can be whatever the market or buyers are willing to pay for it, similar to any collectible. In this digital, decentralized, distributed world, the buyers and sellers set the value as to how much these NFTS are worth[15].

Blockchain Bubble Popping?

The NFT bubble appears to have popped as the weekly trade volume of NFTs has dropped down to $50 million from a high of $200 million in late February [11]. Though the NFTs did have an amazing run as the weekly trade volume of NFTs went from $25 million late January 2021 to as high as $200 million in about 5-6 weeks, NFT transactions continue to decrease rapidly, and it will be interesting to see which NFT types will retain value in years to come. That being said, the first two weeks of April 2021 have seen increased trade volumes of NFTs, from the lows of March 2021 [refer to table 1]. Average NFT transaction values are actually nearing all-time highs of about $17K as of April 19, 2021, which is fascinating, as overall NFT volume decreased sharply in the month of March. The pop in April NFT prices could also be related to the IPO of Coinbase on April 14, 2021, which most likely spurred a chain of frantic NFT and crypto buying. The initial public offering of Coinbase will be an interesting event to follow as the public now has the ability to invest in the largest U.S. crypto exchange. Nonetheless, it will be fascinating to see the movement of money into public and private blockchain related technology Investments.

Table 1: Weekly NFT Transactions



Disrupting the Disruptors & Age Old Standards (What will NFTs cannibalize?)

NFTs will be industry disruptors that will interrupt tech disruptors that have already disrupted industry during this millennia. NFTs are simply digital IP (intellectual property)/ digital content that have been placed on the Ethereum blockchain by the use of smart contracts. Smart contracts are digitally programmed rules which governs the transfer of value, and are one of the unique and important features that distinguishes Ethereum from Bitcoin[2]. These tools have provided a platform for content creators and artists to have more control over the profits from their creations.

How will NFT disrupt industry and which industries are at risk to be cannibalized the most? Before I share my point of view on this subject, I will return some of the important characteristics of NFTS. NFTs have a creator. This creator sets the original number of copies that can be made/sold. Once that number is set, it cannot that be changed [2.6]. The creators can then program in what royalty percentage they will receive every time this NFT is sold and bought. Thus, the content creator will receive royalties for eternity (assuming no Armageddon) every time an individual buys and sells their NFTs. What is a simple analogy for an NFT? Trading cards like baseball or Pokemon cards. A digital collector's item that has a certain quantity and is exchanged on the blockchain. Why can these be thought of as digital collector's items?

The majority of NFT transactions are meaningless content and data, providing no real physical value. Similar to trading/baseball cards, except they are digital. That is simply it. People like buying and collecting stuff. For example, baseball cards of Hall of Famers (HOFs) from long ago such as Honus Wagner, Mickey Mantle, and Babe Ruth are all worth millions of dollars. Why? Because of very high demand and extremely low supply, the players are HOFS, and these cards are very old. This kind of valuation applies to all sports collectibles. This same kind of valuation applies to other collectibles such as Pokemon cards, Magic cards, and Yu-Gio-Oh cards. This frenzy and mania has recently translated into in top athletes from all sports making their own NFTS, as they believe they can capitalize on their past successes by selling video

highlights as NFTs, or simply selling digital autographs like Tom Brady's new NFT gig. This brings us to the main topic of this section, the industries that be will be threatened most.

NFTs will disrupt many industries. I believe that the music and video streaming industries will face the stiffest competition and disruption. Popular tech companies that provide video/music stream services like YouTube, Vimeo, SoundCloud and Spotify will face the most disruption. Similar to how Netflix and video streaming services killed Blockbuster, NFTs will soon disrupt past industry disruptors. How? Instead of uploading videos to YouTube, where users have to sit through ads, an individual could watch the same video if it was made into NFT without ads, assuming they have purchased the NFT for a small price. How many NFTs the artist will create is their decision, as is the price users pay and the royalty they will receive per transaction. Assume an artist follows the model Apple iTunes used in the 2010's, the music video NFT will hopefully cost $.20 or around that price point. Thus, users who watch music videos or stream music will be able to do so with an ad-free experience as well, while also rewarding the creator for their hard work and the content they created. Moreover, this process could cost the user less money, as Spotify has pricey monthly fees. Spotify, SoundCloud, and YouTube will face the biggest problems because significant amounts of their profits come from advertising revenue. Podcasts, a major source of revenue for Spotify, which have tremendous reach, and music/instructional videos, which are major sources of ad revenue for YouTube, could be made into NFTS. The users could buy these NFTs, enjoy them ad-free, and possibly be given the opportunity to resell them for profit, no profit, or a loss, if they choose to do so.

Small Glimpse into the NFT Sports World

The process and logic are fairly simple. These athletes are selling NFTs that can be photos, videos, or autographs. The website NBATOPSHOT was the first entrant into the sports NFT world by being a marketplace where individuals could buy and sell NFTs of famous video clips from the NBA [4]. The population took notice of this phenomenon when a LeBron James NFT sold for $200,000 in February 2021. The NFT was just a video clip of Lebron doing a dunk in the NBA playoffs in 2003[4]. Any individual can buy this NFT, there is a limited amount of them, and these individuals personally own the video.

Many pro athletes took notice to this and have started selling NFTs of themselves, such as the Manning brothers [5]. When an NFT is resold, the original creator can still get royalties even though they've already sold it. NFTs are a way for these athletes to monetize these video clips or photo-clips, and they can continue to profit from these video/photo clips after they have already been sold. Thus, athletes will continue to make royalties even after the first point of sale. Athletes will now have the ability to make profits from individuals viewing these video clips as these clips will be made into and sold as NFTs. Since YouTube is arguably the most popular platform to view pro-sport highlights, it could soon face a mass exodus of those viewers, thus resulting in decreased revenues from ads

Concluding Thoughts

NFTs are here to stay. The NFT market has been turbulent so far, and will most likely continue to be so due crypto's volatile experienced thus far. It is not known which types of NFTs will retain value, but the royalty concept behind it has attracted a wide audience. The industries

which experience resale of content that can be reproduced digitally will be the most intriguing to watch, as the creators of this content will now for the first time receive royalties after the initial sale. Content that can be produced both physically and digitally, and then resold, like text book information for example, is the type information that might benefit most from being sold as a NFT[9]. The “text book resale market” should come to an end once text book companies realize they receive royalty forever while also reducing costs for themselves as they won’t have to make as many physical copies[9]. As a whole, the industries which experience resale of physical goods that can just as easily be made digitally and industries like music/video streaming, which profit from ad-revenue, will be disrupted the most. I believe the NFT industry, like it’s counterpart, Cryptocurrency, is just getting started.

Table 2

ERC-721 V.S. ERC-1155		
	ERC-721	**ERC-1155**
Fungibles & Non-Fungibles	Limited to only Non-Fungibles	#Allows both Fungibles and Non-Fungibles #Allows new concepts like semi-fungible tokens. For example, fungible tokens could be "transmuted" into non-fungibles or vice-versa.
Batch Transfers	Supports transferring one token at a time	#ERC-1155: Supports batch transfers of many token IDs in a single transaction.(Since each Ethereum transaction takes around 15-30 seconds, ERC-721 takes a long time to transfer many tokens, while ERC-1155 can send hundreds of different tokens in a single block. Certain optimized implementations of ERC-1155 have been tested for transfers of up to 150-200 tokens per second!)
Single Smart Contract, No Data Waste	Requires a new smart contract deployed for each new type of token (for example, a contract for CryptoKitties, another contract for CryptoCuties)	Can be deployed in sinlge smart cotnract for infinite token types. ERC-1155 tokens cannot be accidentally lockwed in a contract that doesn't supprt ERC-1155. ERC-721 tried achieving this but it ended up being useless, because they included legacy "non-safe" functions in the standard. If a wallet uses the non-safe transfer method, your tokens could be permanently lost
Localization	Supports only 1 language	Supports localization of languages for all metadata, such as the token name, description, or even the toekn image. This makes alll tokens universal
Legacy Metadata	Contains legacy metadaa like "symbol" and "name" which is not necessary for many modern tokens	Defers all metafata to a URI which can be on the web or IPFS
ID Substitution	Supports only stata metadata, so each token ID must have its metadata URI stored or managed by the smart contracts	Contracts can point to an infinite number of otken URIs wihtout storing any additional data on-chain. This cn be used to point to a web service that hosts dynamically generated toekn JSON for each token in a database
Rich Event Logs	Emits transfer and approvals	Includes standardized events for mints, burns, transfers approvals, and metadata changes. This permits ecosystem benefits like deep data analytics on token and rich token explorers