Non-Fungible Tokens (NFTS)

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Though sometimes confused with bitcoins or other digital currencies, NFTs are not a form of payment; they are digital records that assign value to an asset that can be bought, sold, or traded by validating its originality. The token tracks an asset's movement over blockchain, triggering payment once it is transferred from one owner to another.

Fungibility is defined as the property where "individual units are essentially interchangeable, and each of its parts is indistinguishable from another part." The best example of a fungible asset is fiat currency. Any $1 bill is the same in value as the $1 stored in a bank account or as the $1 bill that someone might own. Anyone can exchange a $1 bill without changing the fundamental characteristics of its use, thus making the currency fungible.

The idea of fungibility is not always binary. Some may view the tickets to a sporting event as fungible if they are in the same section (i.e., one court-side ticket for another), but not fungible in other cases (i.e., one seat at the 50-yard line vs. behind the goal post at a football game).

NFTs, by the virtue of being on the blockchain, provide some desirable characteristics to underlying digital assets:

- **Standardization**: Conventional digital assets (in-game collectibles, event tickets, domain names, etc.) are very different from each other. But when they are represented as NFTs on public blockchains, they can have common, reusable, and inheritable standards for ownership, transfer, and access control.
- **Interoperability**: NFTs can easily move across multiple ecosystems and different wallet providers. They are tradeable on marketplaces and can be displayed inside virtual worlds.
- **Tradability**: NFTs enable digital assets to move outside their original environments and into marketplaces with sophisticated trading capabilities e.g. eBay-style auctions, bidding, bundling, and the ability to sell in any currency.
- **Liquidity**: Instant tradability of NFTs leads to higher liquidity.
- **Immutability & Provable Scarcity**: Smart contracts enable the placing of hard caps on the supply of NFTs and the enforcement of persistent properties that cannot be modified.
- **Programmability**: NFTs are fully programmable and have complex mechanics like forging, crafting, redeeming, random generation, etc.

While Ethereum remains the most popular NFT platform, high gas fees (the cost of computing energy required to process and validate transactions on the blockchain) have opened an opportunity for other layer one blockchains to house the growing NFT economy. With new projects being created and older ones pivoting to include NFTs, investors have noticed.

There are non-Ethereum-based NFT standards emerging (ERC-998, dGoods), but a vast majority of NFTs fall under these Ethereum standards:

- **ERC-721**: the first NFT standard pioneered by CryptoKitties. ERC-721 defines the interface for unique tokens to be owned and traded. Tokens hold a mapping of its unique identifier with the owner's address and implements a transfer from interface to exchange NFTs in a programmable way.
- **ERC-1155**: developed by the Enjin team, ERC-1155 defines a multi-token standard that introduces the idea of classes to assets. This allows developers to capture more complex representations beyond a simple one-to-one relationship between an asset and a token. A classic example is the different classes of items in a game. ERC-1155 can represent different types of items (*e.g.* swords, guns, shields, armor) that are semi-fungible in a similar way to how we view tickets within the same section of the stadium in the physical world. This facilitates large scale trades, instead of having to create a new contract per item. Since ERC-1155 is a superset of ERC-721, the advantage here is efficiency in the representation and batch transfers.

Note that these standards do not mandate much beyond ownership, classification of assets, and transferring mechanism. This allows developers to enrich each NFT token *via* metadata to bake in special features of their token. This may include the characteristics of the asset (*e.g.,* how quickly a CryptoKitty can breed) or visuals (*e.g.,* what the asset looks like). Due to the storage and performance limitations of Ethereum, most NFTs store these metadata off the blockchain and only hold references to these metadata in the contract itself.

Key NFT Ecosystem Players

Infrastructure Projects:

- **Enjin (ENJ): Market capitalization of $ 128 million**. One of the most famous crypto projects in the NFT space is Enjin. The team creates a blockchain-based ecosystem for virtual worlds and focuses on the gaming area.
- **Decentraland (MANA): Market capitalization of $ 114 million**. Decentraland is a virtual platform based on Ethereum that enables users to purchase virtual objects within a virtual world with the MANA Coin. Users in Decentraland can use MANA as a means of payment for games and other services.
- **WAX (WAXP): Market capitalization of $ 57 million**. The Worldwide Asset eXchange (WAX) describes itself as a platform that allows you to create, sell, and buy NFTs all over the world without restrictions. The platform Token WAXP, which runs on Wax's in-house blockchain, can work with the EOS blockchain. This would make it possible to trade NFTs across blockchains.

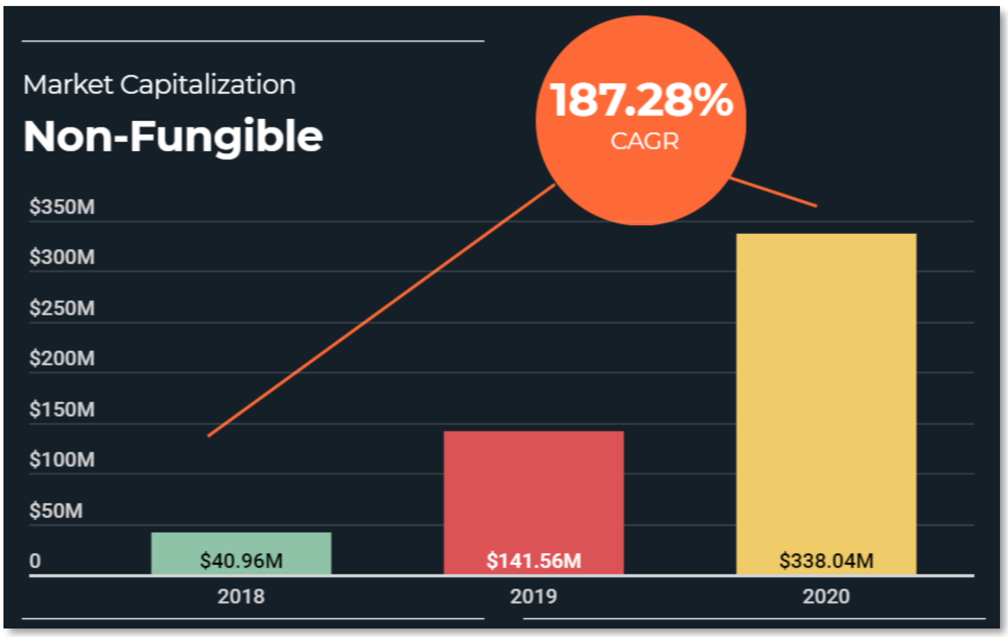
Marketplaces:

- **OpenSea**: This peer-to-peer platform bills itself as a purveyor of "rare digital items and collectibles." To get started, all you need to do is create an account to browse NFT collections. You can also sort pieces by sales volume to discover new artists.
- **Rariable**: Similar to OpenSea, Rariable is a democratic, open marketplace that allows artists and creators to issue and sell NFTs. RARI tokens issued on the platform enable holders to weigh in on features like fees and community rules.

- **Foundation**: Artists must receive "upvotes" or an invitation from fellow creators to post their creations. The community's exclusivity and cost of entry—artists must also purchase "gas" to mint NFTs—may boast a higher-caliber of artwork. For instance, Nyan Cat was sold by creator Chris Torres on the Foundation platform. It may also mean higher prices, assuming demand for NFTs remains steady or increases.

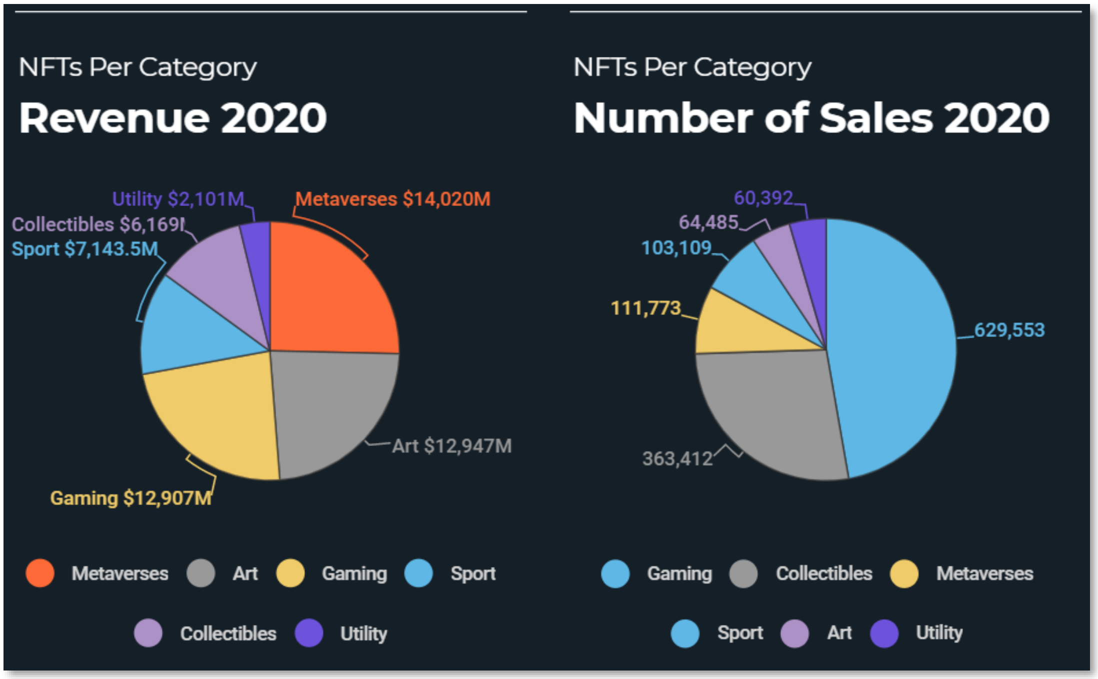
Market Activity and Trends

NFTs are a relatively new trend in the blockchain world, with many pinpointing its origins to 2014's Colored Coins. Since then, the digital tokens have grown in prominence with recent transactions in the millions of dollars. The market capitalization of NFTs has exploded in the last few years. In 2018 the market cap of NFTs was calculated at just under $41M. By 2020 that number had risen to just over $338M for a CAGR of 187.28% from 2018-2020.



Market Size for NFTs ($M USD). Source: TradingPlatforms

NFTs include any digital asset but can be broken down into 6 major categories: Metaverses, Art, Gaming, Sport, Collectibles and Utility. Revenue from NFTs in 2020 were an estimated $55M. Metaverses had the biggest proportion of this revenue with a total of $14.02M or 25% share. Gaming had the largest number of transactions in 2020 with almost 630,000 transactions or 47% of all NFT transactions in 2020.



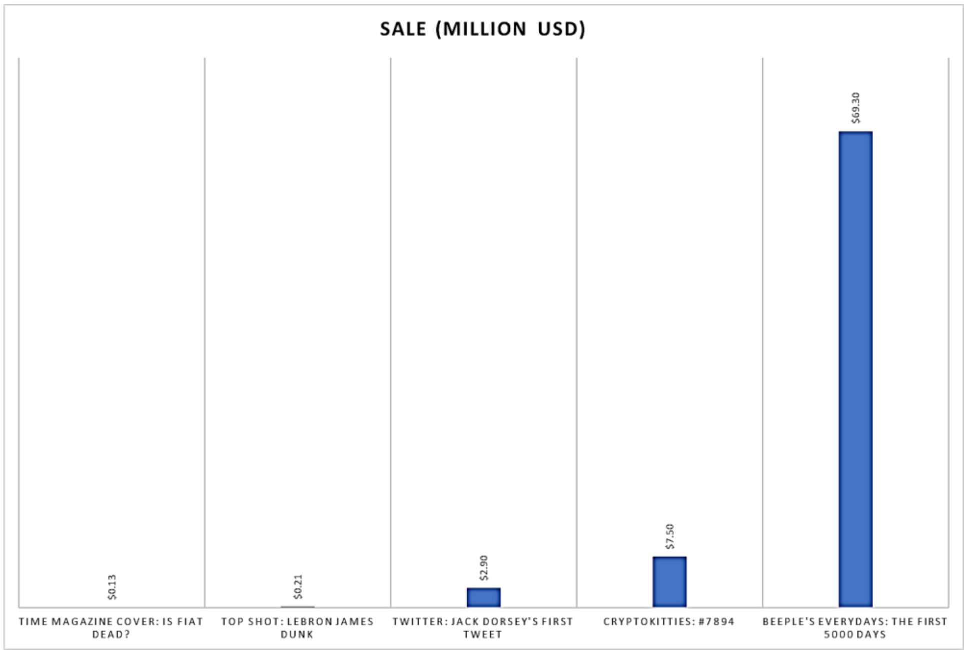
Revenue & Sales for NFTs ($M USD). Source: [TradingPlatforms]

The idea for [Chiliz] was first conceived in 2016 and launched in 2019; [Enjin] was announced in 2017 and launched in 2018; [Decentraland] had its ICO during the last Bullrun of 2017; [Theta] was launched in 2019. Flow, the Blockchain that powers the NBA TopShots, has seen explosive growth since Mainnet launched at the end of 2020.

	Price Jan 1st 2021	Price Mar 21 2021	% change	Marketcap (Mar 21 '21)	100$ invested
THETA	$ 1.96	$ 8.78	347%	11 725M	$ 347.08
chiliz	$ 0.02	$ 0.58	2572%	4 007M	$2,571.77
	$ 0.13	$ 2.29	1614%	2 491M	$1,613.64
	$ 0.08	$ 0.91	1025%	1 983M	$1,025.22
flow	$ 7.88	$ 31.01	293%	1 183M	$ 293.44

Prices in USD of Top 5 NFT Projects on March 21, 2021. Source: [Coinmarketcap]

What about the actual items that warranted the creation of the NFT?



Sales of High-Profile NFTs. Source: [Medium]

Date	NFT
March 13	A music video by digital artist Slime Sunday and musician 3LAU sells for $1.3 million, with the buyer winning the opportunity to name the song
March 11	"Everydays: The First 5000 Days", a digital work by American artist Beeple sells for $69.3 million at Christie's
March 11	A CryptoPunk, one in a series of 10,000 collectible characters, sells for around $7.6 million
March 6	Bids hit $2.5 million on Twitter founder Jack Dorsey's first Tweet, which he listed as an NFT in an auction due to end on March 21
February 28	Artworks by the musician Grimes fetch $5.8 million
February 28	3LAU releases an album in the form of various NFTs, fetching $11.7 million in total
February 25	A 10-second video clip by Beeple sells for $6.6 million
February 22	A video clip of a LeBron James slam dunk sells for $208,000 on NBA Top Shot
February 19	An animated meme called "Nyan Cat" sells for around $580,000

Recent High-Profile NFT Sales Timeline - 2021. Source: [Reuters]

Pros and Cons

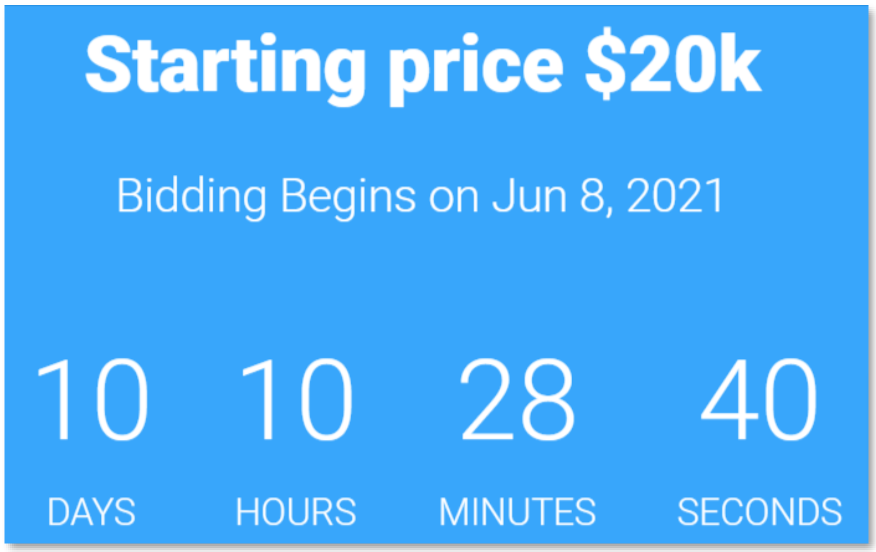
Reasons for Optimism with NFTs

- The NFT art market: According to Sotheby's auction house, NFTs are "reshaping the landscape of digital art," thanks to their scarcity and uniqueness. It's much-needed security for work posted online, where content flows freely and can be easily copied and shared to the detriment of artists.
- NFTs make perfect collectibles: NFT collectibles began to make a splash in January 2018, when Dapper Labs' infamous CryptoKitties caught the imagination of collectors worldwide, the most expensive one selling for 600 ETH (around $170,000 at the time).
- Music could be revolutionized by NFTs: NFTs are also making an impact in the music industry, with popular DJ and EDM remixer 3LAU selling $11.6 million worth of NFTs in February. Dance DJ Steve Aoki also earned $4.25 million from his NFTs in March.
- Gaming is the natural home of NFTs: With more than 2.7 billion online players worldwide gaming is an industry where the concept of digital collectibles is nothing new.
- Using NFTs for real estate: Real estate is mired in a sea of bureaucracy involving layers of intermediaries from estate agents and banks to notaries and solicitors, all inflating the cost of what should be a simple transaction between parties. By replacing these intermediaries with smart contracts that allow for the safe and simple transfer of ownership, NFTs could greatly expedite the property-buying process. All history of ownership and rights are recorded and committed to the blockchain and are instantly and easily verifiable.

"Imagine I could buy a house as an NFT, and instantly borrow against the NFT using DeFi or TradFi products with a 2-4% interest rate. Why would I ever go through the brain damage of using Wells Fargo or Chase, with their months of nightmare due diligence?" - Henry Elder, President of IBREA (International Blockchain Real Estate Association). Source: Forbes

By using blockchain technology to smooth real-world real estate sales by introducing the concept of smart contracts, Propy was the first blockchain startup to make that work. Their platform uses blockchain technology to "simplify the home-purchasing experience and eliminate fraudulent transactions". The idea is to close a traditional real estate deal entirely online – the offer, signed purchase agreements with DocuSign, secure wire payments and title deeds are all taken care of. Propy claims its platforms saves 10 hours of paperwork, per transaction.

Now the company is pushing the boundaries again, by *auctioning a real apartment as an NFT*. Although skeptics might want to brush this aside as a stunt, the event is designed to make the point that it could well be done legally. The auction itself will happen over a 24-hour period beginning June 8th, with the initial listing starting at $20,000:



Main Growth Obstacles to NFTs

- Regulatory uncertainty is slowing the transition from rigid centralization to the flexibility offered by decentralization.
- Doubts regarding the scalability of blockchain technology are hindering adoption.
- Chances of higher transaction fees in the event of congestion issues in the blockchain network.
- Lack of adequate technical and economic infrastructure affecting the usage of NFTs.
- Issues in user experience – especially as NFTs are distributed across multiple users simultaneously.

Killer Issues

1. Because NFTs are digital tokens, they can be owned and, thus, bought and sold on the market, just like the cryptocurrencies on which they are modeled. One of the reasons NFTs have become a hot topic in recent months, beyond some of the staggering initial sale prices, is that many NFTs have then gone on to trade upward in value in secondary sales.

However, it is important to note that nothing about NFTs changes the fact that just as books in a library are found on the shelves, not attached to their library cards, the underlying asset for NFTs always exists somewhere else "off-chain."

Thus, when a user buys the NFT, they are purchasing the token itself, not the digital asset that is linked to the token. The cryptographic link between the token and the asset does not automatically result in the transfer of any rights or obligations to the asset—that results from a contract between the buyer and seller.

The purchase of the token may include, as a matter of contract, other associated rights, and might include transfer of possession of a digital file of the digital asset, but that depends entirely on the terms of sale for any NFT.

Those purchasing NFTs today may not understand that they could be purchasing less than they think. There may be misconceptions among purchasers that by buying an NFT associated with underlying digital assets, they are purchasing the asset itself rather than just the token.

2. Everyone is used to the idea that online material stays online forever. But the internet is dynamic – not static. Anyone that has browsed the internet should know that links die, and 404 errors are common (30% of web links break within 2 years). As great as the Wayback Machine is, it still has its limitations; trying to find a specific webpage dating back 20 years can be challenging.

If an NFT is just a URL hosted on a server somewhere, then it could be that given enough time, the URL will lead to a 404 error. But not all NFTs are created equal: many NFTs are likely to be a link to something like artwork that will probably one day lead to nothing but a blank webpage. More valuable ones, however, have built-in mechanisms to ensure that the NFT is more likely to persist.

Many NFTs turn to a system called InterPlanetary File System (IPFS). Rather than identifying a specific file at a specific domain, IPFS addresses point to a piece of content so long as someone somewhere on the IPFS network is hosting it. That means a multitude of hosts, rather than a single domain owner, could ensure that NFT files remain online. This system also gives buyers control. They can pay to keep their NFT's files online. They must remember to pay the hosting bill, but they can host it anywhere in the IPFS network.

The problem with IPFS is that they require the owner of the NFT to consistently pay a hosting fee. Assume a buyer pays $100 for an NFT and it costs $5/year to host. If the buyer forgets to pay the hosting fee, losing that piece of art or collectable that went from $100 to $1000 in 3 years is unfortunate, but it's not the end of the world. But what if the NFT was the deed to their house?

The other solution to the 404-error problem is permanent data storage. Would it not make sense to build into NFTs a mechanism that ensures that the NFT lives forever without the owner having to worry about paying the hosting bill? Protocols such as Arweave do that: the best part is that the hosting fee can be minimal (Arweave has a onetime fee of $5/GB right now). But that's not what's happening now – the market is more focused on buying and selling NFTs in the present rather than worrying about that same NFT in the future.

3. Cryptocurrencies were introduced in 2009 with Bitcoin, and twelve years later they play almost no role in normal economic activity. Usually, the only time they are discussed as a means of payment – versus speculative trading – is in association with illegal activity like money laundering or the Bitcoin ransom Colonial Pipeline paid to hackers who shut it down. Tesla's experiment in accepting Bitcoin as legitimate payment ended after only three months due to "concerns about rapidly increasing use of fossil fuels for Bitcoin mining and transactions"; with Elon Musk stating that cryptocurrencies are promising but should still be considered speculative at this point, urging people to be wary when investing in cryptocurrencies.

Although investors continue to pay huge sums for NFTs, the following questions still offer no clear answers:

- What problem does this technology solve?
- What does it do that other much cheaper and easier-to-use technologies can't do just as well or better?

Key Takeaways

- The greatest potential for NFT value will be realized if they can transition from protecting digital collectables (images, music, tweets, etc.) to protecting physical assets (paintings, classic cars, homes & properties, etc.).
    - There is an estimated $78 trillion of non-bankable assets in the world right now, spanning fine wine, real estate, rare stamps, and other such collectibles. NFTs may provide the answer for unlocking this liquidity by bringing these assets on-chain and allowing for a simple, provable transfer of ownership.
- The IPFS has flaws. The team behind Check My NFT has been looking inside of NFTs to see if their IPFS addresses actually work, and in several cases, they've found files that won't load. The team found artworks temporarily missing from major artists, including Grimes, deadmau5, and Steve Aoki. The files came back online eventually, but only after the team called attention to their absence. The files must be actively available on the network for the system to work, and unlike a domain owner, no host has a singular responsibility to do that for files on IPFS.
    - "One hard drive crashing could lead to permanent loss of the assets," the Check My NFT team warned.
- "NFTs are risky because their future is uncertain, and we don't yet have a lot of history to judge their performance," notes Arry Yu - chair of the Washington Technology Industry Association Cascadia Blockchain Council and managing director of Yellow Umbrella Ventures. "Since NFTs are so new, it may be worth investing small amounts to try it out for now."
    - Since an NFT's value is based entirely on what someone else is willing to pay for it, demand will drive the price rather than fundamental, technical or economic

indicators, which typically influence stock prices and generally form the basis for investor demand.

- NFTs are also subject to capital gains taxes—just like selling stocks at a profit. Since they're considered collectibles, they may not receive the same preferential long-term capital gains rates stocks do and may even be taxed at a higher collectibles tax rate, though the IRS has not yet ruled how NFTs are defined for tax purposes. Cryptocurrencies used to purchase the NFT may also be subject to taxation if they've increased in value.

This Report has been Completed and Delivered by:

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