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A Comprehensive Study of NFTs

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Abstract: NFTs are newest entry to possibly groundbreaking technology stemming from blockchain. NFTs have caused a lot of stir in creative media market and everyday transaction consisting of NFTs are a common sight while some even making headlines. We take theoretical view of all that NFT is and all that it can possibly be. Explaining its working in its current setup, we look at its benefits and limitation. We also discuss its role in creative media market and present it as possible solutions to problems in field of event ticketing.

Keywords: Blockchain, crypto currency, NFTs, event ticketing, creative media

I. INTRODUCTION

One of the many features of blockchain technology is its fundamental immutability as a platform. NFTs or Non fungible token is a unit of data that is cryptographically created for unique items of real world in virtual world and is stored on a digital ledger i.e., blockchain. Being Non fungible means that its is not mutually interchangeable. NFTs can represent a vast array of digital files such as art, audio, videos, items in video games and other forms of creative work. While the digital files themselves are infinitely reproducible, the NFTs representing them are tracked on their underlying blockchains and provide buyers with proof of ownership of the NFTs. This proof of ownership is a blockchain verifiable commodity that enthusiast and collectors are paying for. Increased interest in the market for NFTs has resulted in increased speculation, as the same investors who had previously speculated on cryptocurrencies began trading NFTs at greatly increasing volumes. NFTs are gaining much popularity in creative media industry though it is not fundamentally limited to it. As any new technology NFTs can prove to be disruptive. Many new ideas and implementation of NFTs are being put for community reviews and research. We take comprehensive view on all the opportunities that NFTs have put forward for the world to benefit from.

II. BACKGROUND

A. Blockchain and NFTs

Now-a-days blockchain is not unheard of technology but first gained popularity as the protocol behind the cryptocurrency Bitcoin, which was introduced in 2009 at the peak of the financial crisis (1). Soon enough new implementations using this technological protocol started popping. One of the new implementation was the so-called smart contracts, a term coined by Nick Szabo in 1994, allows parties that neither know nor trust each other to securely perform transactions. The trust is ensured by the correct execution of consensus protocol that runs on all participating nodes of the underlying blockchain and provides consistency

B. Short history of NFTs and its Major Transactions

The first application based on NFTs to reach widespread adoption was a virtual online game called CryptoKitties. The game took up more than 70% of the transaction capacity of the Ethereum network at one point and the most expensive NFT that represents ownership of such a cat was sold for over USD 100,000 in late 2017.



Examples of Cryptokitties.

Fig 1: Cryptokitties as NFTs

III. WORKINGS

NFTs existence is based on physical or digital item. One will need to decide on which blockchain they want to issue their NFTs. Ethereum is currently the leading blockchain service for NFT issuance. However, there is a range of other blockchains that are becoming increasingly popular as demand surges, including:

- 1) Tron
- 2) Binance Smart Chain
- 3) Polkadot
- 4) WAX
- 5) Flow by Dapper Labs
- 6) EOS
- 7) Tezos
- 8) Cosmos

Each blockchain has its own separate NFT token standard, compatible wallet services and marketplaces. For instance, if one creates NFTs on top of the Binance smart chain, they will only be able to sell them on platforms that support Binance Smart Chain assets. This means they wouldn't be able to sell them on something like VIV3 – a Flow blockchain-based marketplace – or OpenSea which is an Ethereum-based NFT marketplace.

Since Ethereum has the largest NFT ecosystem, here's what you'll need to mint your own NFT artwork, music or video on the Ethereum blockchain:

- a) An Ethereum wallet that supports ERC-721 (the Ethereum-based NFT token standard), such as MetaMask, Trust Wallet or Coinbase Wallet.
- b) Around \$50-\$100 in ether (ETH). If you are using coinbase's wallet you can buy ether from the platform with U.S. dollars, British pound sterling and other fiat currencies. Otherwise, you will need to purchase ether from a cryptocurrency exchange.

Once you have these, there are several NFT-centric platforms that allow you to connect your wallet and upload your chosen image or file that you want to turn into an NFT.

The main Ethereum NFT marketplaces include:

- OpenSea
- Rarible
- Mintable

A. *Buying or trading NFTs*

For crypto traders who are primarily interested in buying NFTs, here is a list of the most popular NFT marketplaces in 2021:

- 1) OpenSea
- 2) Rarible
- 3) SuperRare
- 4) Nifty Gateway
- 5) Foundation
- 6) Axie Marketpalce
- 7) BakerySwap
- 8) NFT showroom
- 9) VIV3

IV. APPLICATIONS

NFTs are very versatile and so are its applications. While general public will have to remain patient for applications outside of creative industry to roll out, innovators and entrepreneurs are already developing solutions based on it.

A. Creative artwork and Media

On February 14th, 2018, the Forever Rose project sold a digital picture of a rose to a collective of 10 people for \$1 million paid in cryptocurrency. The sale was conducted and registered on the Ethereum blockchain. The image is publicly available, anyone can copy it, store it on a hard-drive, but the certificate of ownership linked to it, cannot. Only the 10 members of the collective can sell, destroy, exchange their share of ownership in the digital asset and no third party is required to process any of these transactions.

The Forever Rose project is one of many possibilities provided by the Cryptocollectibles movement, a technological movement based on using blockchain technology, a decentralized and trustless data storage protocol, to create unique assets and bringing it to the art business. We can define a Cryptocollectible as a “cryptographically unique, non-fungible digital asset” , which, simply put, means they are like art pieces stored on a blockchain, any form of data, (image, text, sound), that is uniquely identified by a blockchain. Unlike cryptocurrencies which are fungible, meaning that any Bitcoin is equivalent in value to any other Bitcoin, just like a dollar is equivalent to any other dollar, non-fungible assets are unique and differentiated from one another. This unique characteristic of Cryptocollectibles entails the notion of scarcity, a digital art piece stored on a blockchain can therefore be unique and traced back to its rightful owner with no need for a centralised clearing house keeping records of every transaction.

Since the birth of the Internet artists have struggled in finding a sustainable business model for digital assets, because the very notion of scarcity is rendered non-existent by the fact that data visible on the Internet can freely copied. If an artist creates an image and stores it on his website, anyone can copy it, destroying any notion on ownership, contrary to a physical art piece. The blockchain revolution is bringing about a wide variety of evolutions that the art business can greatly benefit from. Scarcity is the cornerstone of the art business and, so far, digital art has failed to find a viable business model. Blockchain technology provides interesting new ways to create, sell, authenticate and exchange digital art and more broadly any art piece. But with these new capabilities come new legal, economic and artistic challenges.

B. Event Ticketing

Tickets represent a mechanism to demonstrate entitlement to access any event like sports or culture. They are available in several forms, starting from physical paper to electronically legible codes on paper or chips embedded in sensible cards or wristbands(2). Tickets are bought on the first market directly from the event organizer or from approved resellers like appointed agents, principally for a set worth. Secondary markets additionally exist, with the notable distinction that any worth are (often) charged and consumers and sellers often directly interact in business or admit secondary price ticket sale platforms, which usually take 25-30 % of secondary sales in fees (2). Pricey ticket selling may be a growing business globally, totalling eight billion USD in revenue every year (3). However, whereas platforms and third parties move, the establishment isn't satisfactory for the 2 central stakeholders – the event organizer and also the client – as multiple complaints at shopper protection agencies show (3). customers need to trust third parties once shopping for tickets on secondary markets and therefore face the chance of buying dishonorable or nullified tickets, that are counterfeits or may be off. Exploitation QR-codes or barcodes, that inscribe info, however don't code it, isn't decent to form tickets as tamper-proof. Further, customers lack the likelihood to validate if the barcode on their price ticket is valid. In varied cases, constant barcodes are sold-out multiple times or been obtained by extracting it from footage of a price ticket announce online. The matter of ticket fraud isn't precisely small: in one in twelve music tickets, consumers get scammed, that amounts to calculatable yearly injury of a couple of bn USD (2).

Price ticket costs on secondary markets are taken to extremes, part through the utilization of bots that mechanically comes near costs to earn a profit by reselling them at the best potential markups(3). Thus, multiple governments are considering bans on price ticket selling for profit altogether, however, economists stay skeptical concerning outright selling bans(3). From the event organizer's purpose of read, a serious drawback is that the restricted management over secondary transactions. Neither will the utilization of static codes on price ticket allow to link a ticket to the owner if it's resold, neither is it fascinating to strictly bind a price ticket to an individual and require reselling utterly as pricey and long entry checks should be performed (Waterson, 2016). Summing up, a transparent lack of transparency and trust is obvious, and stakeholders are presently in search of economical and effective solutions to tackle this problem(2). looking for current comes within the space of event ticketing systems, we tend to found some plan proposals and early-stage comes involving blockchain technology from corporations like aventus, GET Foundation and IBM. However, a primary associate analysis of those planned solutions disclosed that every of them depends on fungible tokens at the core and also the core options aren't devolved on an immutable ledger however rather off-chain by the corporate.

This implies that tickets aren't actually portrayed by distinctive identifiers on a trust-free blockchain and also the potential improvement exploitation NFTs as a core part has nonetheless to be assessed. the issues in secondary markets within the domain of ticketing are archetypical and apply to several alternative industries. Current literature suggests that industries with serious reliance on third parties for trust are a possible target for disruption through blockchain technology (4).

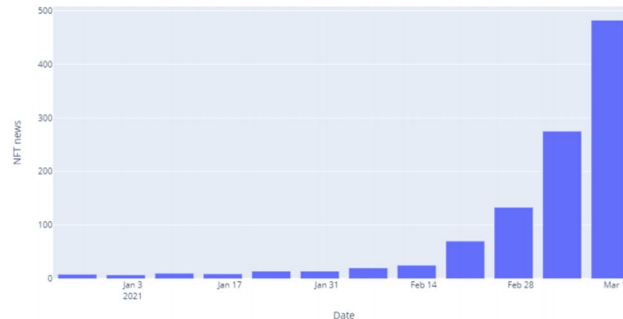


Fig 2: Weekly count of stories coverage (print, online, television) mentioning 'non-fungible token' (early 2021). Source: author own calculations from LexisNexis news info

V. BENEFITS AND LIMITATIONS

A key good thing about NFTs is representing individuation higher than any blockchain-based instruments before. they'll facilitate to form assets programmable and enhance liquidity and security. Even for assets with bound fungible aspects, a more robust differentiation is achieved if NFTs are used instead of fungible tokens. because of these edges, NFTs change new use cases for blockchain technology and have the potential to enhance existing blockchain systems by simplifying it. 2 main use cases is distinguished. First, tokenization of digital merchandise may be a excellent appropriate NFTs as they'll guarantee legitimacy and individuation. Tickets may well be thought of as a bundle of rights and therefore the tokenization of rights normally may well be thought of a viable use case for blockchain-based systems and specifically NFTs further. throughout analysis of gray literature, we tend to found many use cases that offer additional proof that NFTs are helpful like the enablement of recent business models for computer code licenses and new type of possession in digital art. Second, NFTs are ideally suited to represent physical assets within the digital sphere. A ensuing increase within the Non-Fungible Tokens as Event Tickets transparency of possession edges regulators. However, to bridge the gap between the physical and also the digital world, further elements like intelligent sensors are necessary. Yet, exploitation NFTs poses many challenges. As they're nothing over an identical piece of computer code code dead on a blockchain, they're extremely addicted to the properties of the underlying blockchain protocol. joined skilled explained, "anything you'll do with NFTs is enabled by Ethereum, and everything you can not do isn't enabled by Ethereum". one in every of the foremost notable challenges of Ethereum is its restricted measurability. However, we tend to found that solutions that overcome this challenge exist already, like exploitation state channels(5). If this issue is resolved, NFTs ought to be extraordinarily scalable , as tests disclosed that one contract will handle 2128 NFTs while not problems(6). Another challenge is that the style quandary of privacy vs. permissionless blockchain. Multiple researchers have shown that privacy isn't secured because it is feasible to form sense out of onymous knowledge on public blockchains, wherever transparency and public access may be a key feature. Yet, development of recent promising technologies like zero-knowledge proofs (ZKP) is current and can solve this issue within the future(). ZKP may be a scientific discipline technique permitting to proof to a different party bound properties while not revealing them (e.g. proving that you're of an explicit age, while not revealing your actual age) . Early proof that privacy is possible for NFTs has been achieved by an avid team of the firm EY, that used ZKPs in mixtures with NFTs to facility non-public equity transactions. Further, NFTs lack straightforward accessibility for retail users as they're a backend part and don't offer a easy interface. the need of paying gas for every call, that is priced in Ether complicates the utilization of blockchain-based systems even for knowledgeable users. Thus, users are needed to buy cryptocurrency direct to pay dealing fees, even just in case the business model would typically not charge the retail users . However, a recent EIP (Ethereum Improvement Proposal) known as "Gas Stations Network", sanctionative sensible contracts to pay the gas prices rather than the user, shows that this drawback is resolved . Not solely the worth of gas fluctuates however additionally the worth of the cryptocurrency Ether is very volatile. This makes it terribly laborious for retail users to calculate prices supported act currencies like USD. a possible thanks to overcome this challenge is to use redistributed stable coins like Dai, that try and jibe the worth of act currency and therefore free users from the currency risk and mental effort of unsteady exchange rates. Another vital challenge for the utilization of blockchain-based systems normally is proscribed legal enforceability.

Whereas token owner will admit legitimacy, legal possession and consumption of the rights portrayed by NFTs are a special matter. For a blockchain-based system to be actually trustless, legal correctness and legitimacy among this institutional atmosphere are needed. Further, as NFTs area really young development, people that perceive NFTs areterribly scarce and also the language employed in the blockchain house is extremely technical and usually not well understood by the general public. throughout the development of the physical object, we tend to disclosed a typical issue for NFTs relating to the creation of tokens. not like for fungible tokens, for NFTs it's unfeasible to make several tokens at once. Minting NFTs one by one is cumbersome and inefficient since it needs legion process power and therefore high gas prices occur. One answer we tend to found and applied is to make the tokens only if demanded and purchased by consumers. This strategy is named "user-mintable" tokens. Another challenge is that the two-stepped method of approving dealings before the particular transaction will happen (6). whereas an answer that's unremarkably used is to transfer NFTs briefly to a marketplace contract that takes care of the transactions, this approach has some disadvantages. the actual fact that token possession is briefly transferred aloof from the owner poses a haul for a few use cases and security is negatively affected. what's additional, each further transfer prices gas and reduces potency. Further, the character of sensible contracts typically makes it straightforward to increase the system with new options. However, upgrading existing sensible contracts bears multiple technical and operational risks and prices cash. hoping on development frameworks like OpenZeppelin and Truffle considerably simplifies upgrade procedures and reduces risks.

VI. CONCLUSION

NFTs might be the newest entry in potentially disruptive technologies that uses blockchain framework but its already quite mature for practical use. While its fate as an integral part of creative media market is already set in stone, it will have many applications in other fields too. It is our speculation that as it matures, it will be rapidly accepted by community and its growth will even outshine cryptocurrencies in long run. As world inches toward renewable sources of energy, the only disadvantage of NFTs being not good for environment will disappear.

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