JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

NFT-Marketplace

Khush Fadadu[1] , Sahil Kachhadiya[2] , Axat Kalawatia[3] , Prof. Shruti Jaiswal[4]

1. B-tech Student, Computer Science and Engineering, Indus Institute of Technology and Engineering, Ahmedabad – 382115

2. B-tech Student, Computer Science and Engineering, Indus Institute of Technology and Engineering, Ahmedabad – 382115

3. B-tech Student, Computer Science and Engineering, Indus Institute of Technology and Engineering, Ahmedabad – 382115

4. Professor , Computer Science and Engineering, Indus Institute of Technology and Engineering, Ahmedabad – 382115

Abstract :- Non-Fungible Tokens (NFTs) have recently attracted significant investor attention, with some NFTs fetching selling prices previously deemed unthinkable for virtual assets. The emergence of blockchain technology and NFTs presents a lucrative opportunity for artists and content creators to monetize their creations directly. No longer reliant on traditional avenues like auction houses or galleries, artists can now sell their work directly to buyers in the form of NFTs. NFT marketplaces facilitate the buying, selling, and trading of NFT art, offering a substantial revenue stream for talented individuals such as composers and artists. The NFT market has witnessed substantial growth, with a staggering $828 million in sales recorded in 2022 alone. NFT marketplace development presents a unique opportunity for individuals to showcase their collectibles and promote effective digital asset management. Despite the burgeoning demand, building a complex NFT marketplace remains challenging due to the scarcity of resources and expertise in blockchain technology. However, NFTs offer a myriad of use cases, with the marketplace serving as a central platform for minting and trading these unique tokens.

KEYWORDS

NFT, Token, Blockchain, Marketplace, Asset, Ethereum, Fungible.

I. Introduction

Non-Fungible Tokens (NFTs) are digital assets representing physical or digital creative works, such as music, digital art, games, gifs, and video clips. Unlike fungible tokens, each NFT is unique and not exchangeable with another token, making it a distinct entity representing a specific object. These tokens store digital information, typically in the form of media, with their value calculated in cryptocurrencies. While NFTs are part of the Ethereum blockchain, they differ from fungible Ethereum coins.

With rapid technological advancements come increased security risks, particularly regarding authenticity.

However, NFTs address this issue by incorporating unique digital signatures of the owner into each token, making assets easily traceable and minimizing the risk of counterfeits. This feature ensures legitimate purchases and prevents customers from being deceived into buying counterfeit items, such as tickets or artwork.

The popularity of NFTs surged following notable events, including the sale of digital artist Mike Winkelmann's work for nearly USD 70 million. This significant transaction garnered widespread attention, propelling NFTs into the mainstream and leading to substantial growth in the market. Initially limited to a niche community within the blockchain sphere, NFTs now boast a market of their own, with sales reaching up to USD 1.2 billion as of July 2021.

This paper introduces our project, Art cart, a powerful NFT art marketplace designed for digital art and other digital assets. Art cart aims to empower creators by providing a platform to display and sell their items, while enabling buyers to resell them using cryptocurrency transactions.

In this paper, We Discuss the remarkable increase in NFT deployment since its inception.
Present the significant challenges posed by NFT applications in the current technological and legal landscape.

Explore the diverse applications of NFTs across various domains.
The research paper is structured as follows: Section 2 provides an introductory overview of NFTs, including their creation technologies, history, and current market status. Section 3 examines the various use cases of NFTs in different domains. Section 4 discusses the challenges associated with implementing NFTs. Finally, Section 5 summarizes the research findings and outlines future directions

II. How NFT Works?

The process of creating an NFT involves uploading a file onto an NFT marketplace [2], where it is stored as an NFT on the digital ledger, allowing it to be bought or sold using digital currency.

While an artist's creation of an NFT, which represents a work of art, may be unique to them, they retain the copyright to the work and can create additional NFTs based on the same work.

It's important to note that purchasing an NFT does not automatically confer ownership of the original digital file, nor does it grant exclusive access to it.

One notable aspect that has intrigued casual observers of the NFT market is that buyers do not immediately become owners of the original objects, and they lack a means of verifying whether the file has been duplicated or used by another artist or buyer [3]. This issue of provenance, which is prevalent in other forms of blockchain technology, also exists in the NFT space: anyone can potentially mint their own or someone else's artwork as an NFT without proving they are the original artist. This increases the real-world risk of imposters uploading NFTs to auction platforms, falsely claiming to be the rightful owners or creators of valuable assets.

III. Non-Fungible Tokens (NFTs) - A Primer

This section provides an overview of the technologies utilized in the realm of NFTs and the burgeoning growth of NFT marketplaces.

A. Blockchain

Blockchain stands as a distributed digital ledger of transactions [2], encompassing an entire network of computers. It operates in a decentralized manner, eliminating the need for a central authority. Bitcoin, introduced in 2008 and deployed in 2009 [3], pioneered the use of blockchain technology. Since then, blockchain has garnered interest across various industries, particularly finance, due to its ability to accurately identify asset ownership. Blockchain operates by grouping data into "blocks," which are cryptographically linked together to form a continuous digital ledger. Each new block added to the chain reinforces the integrity of the blockchain. This technology ensures transparency and security in transactions and has diverse applications in finance, public services, security, and more [3].

B. Ethereum

Ethereum serves as a decentralized platform for running decentralized applications (dApps), built on blockchain technology. It features a blockchain with an embedded Turing-complete programming language, facilitating the creation and execution of smart contracts. Smart contracts are sets of cryptographic rules executed under specific conditions [6]. Ethereum also hosts Ether, its native cryptocurrency, which powers transactions within the Ethereum network. Ether serves as the fuel for running decentralized applications, executing smart contracts, creating tokens, and facilitating peer-to-peer payments [7]. Ethereum accounts comprise externally owned accounts (EOA) and contract accounts, each controlled differently. EOA accounts are managed via private keys, while contract accounts operate through contract code and consist of various elements such as nonce, ether balance, contract code hash, and storage root [8].

C. NFT Marketplace (Buying and Selling NFTs)

Minting NFTs involves the process of integrating digital art into the Ethereum Blockchain [9]. NFTs, similar to physical coins being minted and introduced into circulation, represent digital assets on the blockchain. This enables digital art to be bought, sold, and tracked digitally throughout its lifecycle [9][10].

The NFT market experienced a surge in the latter half of 2020, with notable sales like an NFT art piece fetching USD 69 million. Total NFT sales in 2020 reached USD 2.5 billion, surpassing USD 10.7 billion in the first half of 2021 [11]. The 24-hour trading volume of the NFT market is USD 4 billion, compared to USD 341 billion for the entire cryptocurrency market [12].

Several online marketplaces facilitate the buying and selling of NFTs, with some being more prominent than others. Notably, the types of collectibles or artworks available vary depending on the marketplace. While most platforms offer a diverse range of NFTs, each operates differently [2].

2021 witnessed a substantial surge in NFT interest, with platforms like Nifty Gateway and Open-Sea recording the highest trading volumes in the first quarter of the year. The most expensive NFTs are listed in Table II.

Market	**Traders**	**Volumes**
OpenSea	46,067	$73.45m
Axie Infinity	40,429	$19.44m
CryptoPunks	12	$2.45m
AtomicMarket	7103	$1.03m
PancakeSwap	1342	$783.74k

TABLE I TOP NFT MARKETPLACES

NFTs	Value
Everydays: the First 5000 Days	$69.3m
CryptoPunk #7523	$11.75m
CryptoPunk #3100	$7.67m
CryptoPunk #7804	$7.6m
Beeple’s Crossroad	$6.6m

TABLE II MOST EXPENSIVE NFTS

IV. APPLICATIONS OF NON-FUNGIBLE TOKENS (NFTs)

This section explores the diverse applications of NFTs and their transformative impact on various domains. A summarized overview of NFT applications is presented in Table III.

Application	Description
Digital Art	NFTs authenticate digital art, enabling artists to receive royalties and buyers to own exclusive digital content.
Fashion	Luxury brands utilize NFTs to establish ownership, combat counterfeiting, and auction digital fashion items for substantial amounts.
Licenses/Certificates	NFTs streamline document verification processes, enhancing authenticity and reducing the risk of fraudulent records.
Collectibles	NFTs enable the buying, breeding, and trading of unique digital collectibles, characterized by individual traits and genetic algorithms.
Gaming Potential	NFTs provide ownership data for in-game objects, allowing players to buy, sell, and trade virtual assets while developers earn royalties from secondary market transactions.
Domain Names	Blockchain-based domain name services offer decentralized domain registration, converting lengthy addresses into user-friendly domain names for enhanced accessibility.
Virtual World	Blockchain-powered virtual worlds provide transparent asset evaluation and ownership verification, fostering trust and fair asset valuation within digital environments.

TABLE III. SUMMARY OF NFT APPLICATIONS

V. LITERATURE REVIEW

This section presents a review of relevant literature discussing various aspects of Non-Fungible Tokens (NFTs) and their implications. The table below summarizes the titles, parameters, algorithms, advantages, and limitations of each study:

Title Parameters Algorithm Advantages Limitations A Comprehensive Study of NFTs [1] Blockchain, cryptocurrency, NFTs, event ticketing, creative media Ethereum contract NFTs introduce new use cases for blockchain technology, enhancing existing systems. Privacy concerns due to the potential identification of anonymous data on public blockchains. Non-fungible token (NFT) Markets on the Ethereum Blockchain [11] NFTs,non-fungible tokens, cryptocurrency, cointegration, Granger causality Ethereum Blockchain Identification of additional NFT characteristics like revenue-sharing or voting rights influencing transaction frequency or volume. Challenges in determining the authenticity of NFT market activities.

Smart Collectibles: Unlocking the Value of Non-Fungible Tokens (NFTs) [15]Smart collectibles Solidity Smart Collectibles enable traceable and secure access to value, enhancing the primary NFTs' utility. Areas of improvement include innovation, participation, and interoperability.

The non-fungible token (NFT) market and its relationship with Bitcoin and Ethereum [9] Prior studies on the financial aspects of NFT markets Ethereum Blockchain Bitcoin price shocks influence NFT sales, while Ether price shocks affect the number of active NFT wallets. Dependency of the NFT market on cryptocurrency markets, particularly BTC, with potential for maturity over time.

Fertile Land: Pricing non-fungible tokens [25] Digital art, Non-Fungible Tokens, Hedonic Prices, Lasso Regression Blockchain NFTs enable the free trade of digital assets with permanent record-keeping,

enhancing transparency and accountability. Limited availability of trade data poses challenges in conducting comprehensive analyses. Some Very Simple Economics of Web3 and the Metaverse [19] Metaverse, Web3, non-fungible tokens (NFTs), blockchain technology, smart contracts, digital entrepreneurship, dApp-Benefits of the Metaverse include expanded living spaces and productivity enhancements, while challenges include health-related concerns. Challenges in overcoming health-related issues and addiction associated with technology use.

VI. ARCHITECTURE

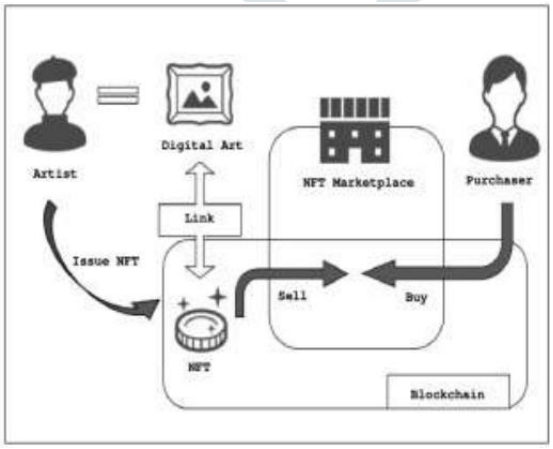
The architecture of an NFT marketplace resembles that of software architecture, providing a blueprint for the system's processes and necessary tasks. In this context, we'll explore the process of creating a digital asset or NFT artwork on a marketplace, which involves minting a new digital token. This process typically includes three main steps:

a) **Connecting Your D-App with a Web3 Wallet:** Minting an NFT on a blockchain requires the user to connect their decentralized application (D-App) with a Web3 wallet such as MetaMask. This connection facilitates secure transactions and interactions with the blockchain network.

b) **Uploading Metadata to IPFS:** To mint an NFT, the user needs to upload the metadata associated with the NFT to the Interplanetary File System (IPFS). Metadata includes essential information about the NFT, such as its assets (image, video, GIF), title, description, and properties. Storing metadata on IPFS ensures decentralization and permanence, as opposed to using a centralized database which poses security risks. Once the metadata is uploaded to IPFS, the user receives a metadata ID (IPFS key) for reference.

c) **Minting Your NFT:** After uploading the metadata to IPFS, the user can proceed to mint their NFT. This involves taking the metadata ID obtained from IPFS and using it as the token Uniform Resource Identifier (URI). The user then signs the transaction to mint the NFT on the blockchain, creating a unique digital token representing the artwork or digital asset.

d) **Listing the NFT for Sale:** Once the NFT is successfully minted, the user can list it for sale on the marketplace. This involves providing details such as the price, duration of the listing, and any additional terms or conditions. Potential buyers can then browse the marketplace and purchase the NFT using digital currency.



By following these steps, creators can tokenize their digital assets and offer them for sale on NFT marketplaces, enabling ownership and trading of unique digital collectibles securely and transparently on the blockchain.

VII. POTENTIAL FUTURE IN THE INDIAN NFT MARKET

The global market for NFTs is currently valued at $40 billion, and in India, it is estimated at $3.3 billion, with a cumulative average growth rate of 61.6% and projected to reach $27 billion by 2028. Presently, India is home to 11 NFT companies, constituting 5.02% of the total global NFT companies. In 2021, India witnessed the addition of 71 NFT startups, bringing the total active NFT startups to 86, showcasing a positive response from the entrepreneurial ecosystem.

NFTs have gained widespread adoption from various sectors such as artists, creators, entertainment and sports celebrities, and brands due to their diverse range of use cases. They have been utilized to increase awareness and engagement among consumers, create new revenue streams, offer access to exclusive events, and serve as digital contracts for owning real estate in the metaverse, among other utilities.

This indicates that NFTs present a promising investment opportunity for investors in India, offering the potential for favorable returns on investment.

Properties: As NFT systems are decentralized applications, they benefit from the inherent properties of their underlying public ledgers.

Here are some of the key properties:

- Authenticity: The existence of NFTs, along with their token metadata and ownership, can be publicly verified.
- Transparent Performance: All activities related to NFTs, including minting, selling, and purchasing, are visible to the public.
- Accessibility: NFT systems are resilient to failures, ensuring that all tokens and issued NFTs are available for purchase and sale at all times.
- Tamper-Resistance: Once a transaction is deemed genuine, the NFT metadata and trading records are stored indefinitely and cannot be altered.
- Usability: Each NFT contains the latest ownership data, presented in a user-friendly and informative manner.
- Atomicity: NFTs can be traded using a single atomic, consistent, isolated, and durable (ACID) transaction, ensuring that all NFTs maintain a consistent state simultaneously.
- These properties contribute to the robustness, reliability, and usability of NFT systems, making them an attractive option for various stakeholders in the Indian market.

VIII. CONCLUSION

NFTs, built on blockchain technology, particularly Ethereum, offer transparency, traceability, and security. Their unique tokenization allows for exclusive ownership of digital assets, enhancing authenticity and traceability. This innovation has captured the interest of art collectors and enthusiasts, resulting in a significant market growth.

Beyond digital assets, NFTs have expanded into physical art, education, fashion, sports, and more. They facilitate the exchange of both digital and physical assets, revolutionizing various industries.

However, the widespread adoption of NFTs presents challenges. These include the lack of industry-wide security standards for smart contracts, uncertainties regarding intellectual property rights, fraud risks from artist impersonation, and transparency issues compromising user security and privacy. Additionally, the environmental impact of NFTs due to high energy consumption is a growing concern.

While solutions like zero-knowledge proofs (ZKP) for privacy enhancement and non-browser wallets for asset protection exist, widespread adoption is still lacking. Furthermore, efforts to migrate blockchain development to more sustainable platforms like SolarCoin and BitGreen are underway but require greater momentum.

Despite these challenges, the potential of NFTs remains immense, and the marketplace continues to grow rapidly. Effectively addressing these challenges is crucial to unlocking the full potential of NFTs and ensuring

their sustainable growth in the future.

IX. REFERENCES

[1] A. Mani, "A Comprehensive Study of NFTs", International Journal for Research in Applied Science and Engineering Technology, vol.
9, no. 4, pp. 1656-1660, 2021. Available: 10.22214/ijraset.2021.34017.
[2] D. Yaga, P. Mell, N. Roby and K. Scarfone, "Blockchain Technology Overview", arXiv: Cryptography and Security, 2018. Available:
10.6028/nist.ir.8202.
[3] H. Wang, Z. Zheng, S. Xie, H. Dai and X. Chen, "Blockchain Challenges and Opportunities: A Survey", International Journal of Web and
Grid Services, vol. 14, no. 4, p. 352, 2018. Available: 10.1504/ijwgs.2018.10016848.
[4] M. Nofer, P. Gomber, O. Hinz and D. Schiereck, "Blockchain", Business & Information Systems Engineering, vol. 59, no. 3, pp. 183-187,
2017. Available: 10.1007/s12599-017-0467-3.
[5] S. Ølnes, J. Ubacht and M. Janssen, "Blockchain in Government: Benefits and Implications of Distributed Ledger Technology for Information
Sharing", Government Information Quarterly, vol. 34, no. 3, pp. 355-364, 2017. Available: 10.1016/j.giq.2017.09.007.
[6] D. Vujičić, D. Jagodic and S. Ranđić, "Blockchain Technology, Bitcoin and Ethereum: A Brief Overview", 17th International Symposium
Infoteh- Jahorina (INFOTEH), 2018. Available: 10.1109/infoteh.2018.8345547.
[7] S. Ferretti and G. D'Angelo, "On the Ethereum Blockchain Structure: A Complex Networks Theory Perspective", Concurrency and
Computation: Practice and Experience, vol. 32, no. 12, 2019. Available: 10.1002/cpe.5493.
[8] V. Buterin, "Ethereum: Platform Review Opportunities and Challenges for Private and Consortium Blockchains."
[9] L. Ante, "The non-fungible token (NFT) market and its relationship with Bitcoin and Ethereum", SSRN Electronic Journal, 2021. Available:
10.2139/ssrn.3861106.
[10] Q. Wang, R. Li, Q. Wang, and S. Chen, "Non- Fungible Token (NFT): Overview, Evaluation, Opportunities and Challenges", 2021. Available:
http://arxiv.org/abs/2105.07447
[11] L. Ante, "Non-fungible token (NFT) Markets on the Ethereum Blockchain: Temporal Development, Cointegration and Interrelations", SSRN
Electronic Journal, 2021. Available: 10.2139/ssrn.3904683.
[12] A. Thilagaraj and J. Davis. "Non-Fungible Token (NFT) – The Game Changer in The Digital Art World", Ciencia Y Sociedad, vol. 51, pp.
190-194, 2021.