IMPLEMENTATION OF NFT PLATFORM USING BLOCKCHAIN

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ABSTRACT

Before a good can be purchased, it must be understood who has the authority to sell it, and once a purchase has been made, ownership must be transferred from the seller to the purchaser. The solution provided by NFTs allows parties to agree on a common agreement i.e., smart contract of what constitutes ownership. Digital artists truly faced many problems in the ownership and credit of their artworks in fast growing digital world. They are worried about conducting online exhibitions of their artworks because it can be easily forged or replicated by someone. The same problems apply to real-world works of art, although things are a bit simpler when it comes to determining their authenticity. Blockchain is a revolutionary technology and will have great positive effects in our business environment soon. NFT stands for Non-Fungible Token. An NFT can be considered just a digital form of real-world entities. They are traded online, generally with different types of cryptocurrencies.

Keywords: NFT, Blockchain, Web3, Decentralized Applications (dApps), MetaMask.

I. INTRODUCTION

From a technical perspective point of view, NFTs are non-interchangeable units of data stored on blockchain, making them resistant to tampering, destruction, or replication. NFTs can be verified by blockchain technology, giving them extrinsic value as well. Non-Fungible Token (NFT) is a unique form of digital asset on Blockchain. These digital assets are not interchangeable, unlike other types of crypto currency. It provides ownership authentication. Each NFT is a unique asset and can't be recreated or replaced. The following are examples of NFT types: image, file, cartoon, virtual real estate, pet, video, trading card. A unique business space for artists and creators to showcase their creations or collections- which offers newcomers to involve with the digital business field. In response, a revolution is opening up new opportunities for artists to produce and profit from their work, while also providing collectors with complete transparency regarding the authenticity and origin of their purchases. Digital art, collectibles, creative extensions of music, a synthesis of all three, or completely original and unheard-of compositions are all examples of NFT assets. By modifying NFTs in fresh and creative ways, creators continue to push the limits of innovation. NFTs are important because they open a whole new world of possibilities for digital ownership and transactions. With NFTs, users can own digital assets that are truly unique and have real value. This includes everything from digital arts and collectibles to in-game items and virtual land.

II. LITERATURE SURVEY

This paper examines the impact of NFTs on the art industry. The author discusses the advantages and limitations of NFTs in the art market and analyzes the current state of NFT marketplaces for art. [1]

This survey paper provides a comprehensive overview of non-fungible tokens (NFTs) on the blockchain. It covers the basics of NFTs, their features, and use cases of NFTs. The authors also discuss the current state of NFT marketplaces and the challenges they face.[2]

This survey paper focuses on the use of NFTs for digital assets. The authors discuss the advantages and disadvantages of using NFTs in digital assets and examine the current state of NFT marketplaces for digital assets.[3]

This paper examines the potential of blockchain technology and NFTs in the music industry. The authors discuss the use cases of NFTs in the music industry and analyze the current state of NFT marketplaces for music assets. [4]

This paper provides an overview of blockchain-based non-fungible tokens. The authors discuss the technical aspects of NFTs and their potential applications. They also examine the current state of NFT marketplaces and the challenges they face. [5]

This paper discusses the use of NFTs as a solution for digital rights management. The authors examine the technical aspects of NFTs and their potential applications in the entertainment industry. They also analyze the current state of NFT marketplaces for digital assets. [6]

This paper discusses non-Fungible Tokens (NFTs) have gained significant attention in recent years as a new way of representing digital ownership and uniqueness in the digital world. NFTs are unique, digital assets that use blockchain technology to verify ownership and transfer of the asset. However, there are also several challenges and limitations associated with NFTs. One of the primary challenges is the environmental impact of the blockchain technology used to create and manage NFTs. The high energy consumption of the blockchain has been a topic of concern, and some have questioned the sustainability of the technology.[7]

This paper discusses One of the most popular blockchain platforms for creating and managing NFTs is Ethereum. Ethereum is a decentralized, open source blockchain platform that allows developers to create and deploy smart contracts and decentralized applications (dApps). There are several NFT standards on Ethereum, including ERC-721 and ERC-1155. ERC-721 is the most widely used standard for creating NFTs and is used for creating unique, indivisible assets such as digital art, collectibles, and in-game items.[8]

This paper discusses blockchain technology is a distributed ledger technology that enables secure and transparent transactions between parties without the need for intermediaries. The technology uses cryptography to create a decentralized network of nodes that work together to validate and record transactions on the network. Overall, blockchain technology has the potential to revolutionize various industries by improving efficiency, security, and transparency.[9]

These papers provide a good starting point for a literature survey on NFT marketplaces using blockchain. They cover a wide range of topics and provide insights into the current state of NFT marketplaces and the challenges they face.

III.   MOTIVATION

The emergence of Non-Fungible Tokens (NFTs) has revolutionized the digital art industry by providing a secure and transparent way for artists and creators to sell their unique works and retain ownership of their intellectual property. NFTs are cryptographic assets that represent ownership of a unique digital asset, such as artwork, music, or videos, and are traded on blockchain-based marketplaces. The development of NFT marketplaces has led to a new era of democratization in the art world, where artists from all over the world can reach global audiences and earn money for their creations without relying on traditional art institutions. The use of blockchain technology ensures that each NFT is unique, traceable, and immutable, which provides a secure way for artists to authenticate their work and avoid fraud. Research in the field of NFT marketplaces is essential to understand the impact of this technology on the art industry and the wider economy. By studying the behavior of buyers and sellers on NFT marketplaces, researchers can gain insights into the factors that affect the demand and value of NFTs. This knowledge can be used to improve the design of NFT marketplaces and make them more efficient, transparent, and user-friendly. Moreover, research in the field of NFT marketplaces can have implications beyond the art industry. The use of NFTs can revolutionize the way that other digital assets, such as real estate, collectibles, and patents, are traded and verified. This can lead to the creation of new markets and business models that are more secure, efficient, and accessible. In summary, the emergence of NFT marketplaces has created new opportunities for artists and creators and has the potential to transform the art industry and other sectors of the economy. Research in this field is essential to understand the impact of NFTs on the art market and to explore the potential of this technology for other applications.

IV.   OBJECTIVE

The objective of this research paper is to investigate the impact of Non-Fungible Tokens (NFTs) on the art industry and to analyze the effectiveness of NFT marketplaces as a new model for buying and selling unique digital assets. Specifically, this paper aims to: Identify the key features and benefits of NFTs as a new asset class for digital art and other unique digital assets. Explore the growth and development of NFT marketplaces and the impact they have had on the traditional art market. Analyze the behavior of buyers and sellers on NFT marketplaces and the factors that affect the demand and value of NFTs. Investigating the role of blockchain technology in providing a secure and transparent platform for NFT trading. Evaluate the potential of NFTs and NFT marketplaces as a new model for buying and selling other unique digital assets, such as collectibles, patents, and real estate. Provide recommendations for the design and improvement of NFT marketplaces to make them more efficient, user-friendly, and accessible. Overall, this research paper aims to contribute to the growing body of literature on NFTs and their potential impact on the art industry and the wider economy. By providing a comprehensive analysis of NFT marketplaces, this paper can inform future research and policy discussions on the use of NFTs as a new asset class and their potential for transforming the way that unique digital assets are traded and verified.

V.   METHODOLOGIES

1. MATHEMATICAL MODEL

A mathematical model for an NFT platform would typically involve several variables and equations that describe the behavior and interactions of various components of the platform. Here are some possible variables and equations that could be included in such a model:

- **Variables:**

Total number of NFTs on the platform

Current market value of each NFT

Total transaction volume on the platform

Total fees earned by the platform.

Number of active users on the platform

User engagement metrics (e.g., time spent on the platform, number of transactions per user)

- **Equations:**

NFT Market Value = (Demand - Supply) / Total NFTs

Total Transaction Volume = Total NFTs Sold * Average Sale Price

Total Fees Earned = Total Transaction Volume * Fee Percentage

User Engagement = (Total Time Spent on Platform / Total Active Users) * 100%

Monthly Revenue = Total Fees Earned - Monthly Operating Costs

These equations would allow the platform to track key metrics related to its performance, such as the market value of NFTs, transaction volume, and user engagement. The equations could also be used to make predictions and inform decision-making about pricing, fees, and other aspects of the platform's operation. The specific variables and equations used in a mathematical model for an NFT platform would depend on the platform's goals and the data that is available to track its performance.

- **Input:**

N: Number of buyers and sellers in the marketplace/platform.

C: Maximum number of unique NFTs a seller can create.

B: Maximum budget of a buyer.

c: Fixed cost of creating an NFT.

$v(p_j)$: Valuation function that measures the utility of NFTs of quality p_j for buyer j.

- **Output:**

p_i: Price of NFTs sold by seller i.

qi: Quantity of NFTs created by seller i.

dj: Demand of buyer j.

pe: Equilibrium price.

- **Variables:**

qi: Quantity of NFTs created by seller i (i = 1,...,, N)

pi: Price of NFTs sold by seller i (i = 1,..., N)

bi: Budget of buyer i (i = 1,..., N)

si: Strategy of seller i, where si = (qi, pi) (i = 1,..., N)

bj: Budget of buyer j (j = 1,..., N)

dj: Demand of buyer j, which is a function of the price of NFTs, pj, such that dj = f(pj, bj) (j = 1,...,N)

- **Constraints:**

qi ≤ C (for all i = 1,..., N)

pi ≤ max {pj | dj ≥ qi} (for all i = 1,..., N)

dj = max {0, (bj - ∑dj' x pj') / pj} (for all j = 1,..., N)

∑qi = ∑dj (for all i = 1,..., N)

∑pi x qi = ∑pi x dj (for all i = 1,..., N)

∑pi x dj ≤ bj (for all j = 1,..., N)

2. ALGORITHMS

[I] Encryption and Decryption Algorithms

- **Keccak-256:** Keccak-256 is a hashing algorithm used in Ethereum, a blockchain-based platform for building decentralized applications (dApps). It is used to generate a unique and fixed-size digital signature for each block in the blockchain and for each transaction on the network.

Keccak-256 is a member of the SHA-3 family of hashing algorithms, which were selected by the National Institute of Standards and Technology (NIST) as the winner of a cryptographic hash function competition in 2012. It is based on the Keccak algorithm, which was developed by Guido Bertoni, Joan Daemen, Michael Peeters, and Gilles Van Assche.

In Ethereum, Keccak-256 is used to compute the hash of each block, which includes a list of all the transactions that have been processed in that block. The hash serves as a unique identifier for the block and ensures that it cannot be altered once it has been added to the blockchain.

Keccak-256 is also used to generate the addresses of Ethereum user accounts, which are derived from the public keys associated with those accounts. When a user creates an Ethereum account, a public key is generated and hashed using the Keccak-256 algorithm to produce a 256-bit address.

Overall, the use of Keccak-256 in Ethereum helps to ensure the security and integrity of the blockchain and its transactions, as well as the privacy and security of user accounts.

[II] Consensus Algorithm

- **Proof-of-Work (PoW) Algorithm:** The PoW algorithm is used in blockchain-based NFT platforms to secure the network and validate transactions. It requires miners to perform a certain amount of computational work to solve a mathematical puzzle and validate transactions.

- **Proof-of-Stake (PoS) Algorithm:** The PoS algorithm is an alternative to PoW and is used in some blockchain-based NFT platforms. It requires validators to hold a certain amount of cryptocurrency as collateral to participate in the network and validate transactions.

- **Random Number Generation Algorithms:** Random number generation algorithms are used in NFT platforms to ensure fairness in the selection of winners in auctions, lotteries, and other events. Common random number generation algorithms include Mersenne Twister and Blum Shub.

VI. EXISTING SYSTEM

While Non-Fungible Tokens (NFTs) have gained popularity in recent years, existing NFT platforms still have some drawbacks. Here are some of them:

- **Environmental concerns:** One of the biggest drawbacks of NFT platforms is their impact on the environment. The energy consumption required for the creation and trading of NFTs is quite significant and contributes to the carbon footprint of the blockchain network.

- **High transaction fees:** Another significant drawback of NFT platforms is the high transaction fees associated with them. Buying or selling NFTs can be costly due to the gas fees required for each transaction.

- **Limited platform functionality:** Some NFT platforms have limited functionality, making it difficult for users to navigate and use the platform effectively.

- **Lack of regulation:** NFTs are a relatively new and unregulated asset class, which means that there is a lack of oversight and protection for investors and creators.

- **Limited interoperability:** Many NFT platforms are not interoperable, which means that users cannot easily transfer their assets between different platforms.

- **Complexity:** For many users, NFT platforms can be complex and confusing to navigate, which can limit their adoption and use.

- **Ownership verification:** The verification of NFT ownership can be difficult, particularly when it comes to proving ownership of physical assets tied to NFTs.

- **Intellectual property concerns:** The ownership and use of intellectual property tied to NFTs can be complex and raise legal issues, particularly when it comes to issues such as copyright and licensing.

Overall, while NFT platforms have potential, there are still several significant drawbacks that need to be addressed to make them more accessible, user-friendly, and sustainable.

VII. PROBLEM DEFINITON

The problem definition of an NFT platform is to provide a secure and decentralized platform for the creation, buying, and selling of unique digital assets known as Non-Fungible Tokens (NFTs). NFTs are unique digital assets that represent ownership of a specific item or piece of content, such as artwork, music, videos, or other digital creations.

The NFT platform aims to solve the problem of ownership and authenticity of digital assets by using blockchain technology to create a unique and immutable record of ownership. The platform allows creators to mint their digital assets into NFTs, which can be bought and sold on the platform. The platform provides a marketplace for buyers and sellers to exchange NFTs, and it ensures the authenticity and ownership of each asset through its decentralized architecture.

However, the current problem with NFT platforms is that they have some drawbacks, as mentioned earlier. These drawbacks include environmental concerns, high transaction fees, limited functionality, lack of regulation, limited interoperability, complexity, ownership verification, and intellectual property concerns. These issues must be addressed to make NFT platforms more accessible, user-friendly, and sustainable in the long term.

VIII. PROPOSED SYSTEM

A NFT (Non-Fungible Token) marketplace/platform using blockchain can be built using the following system:

- **Smart Contract Development:** The first step is to develop smart contracts that will enable the creation, transfer, and ownership of NFTs on the platform. The smart contract will also include the rules and conditions for the sale of NFTs, including the percentage of the sale that goes to the platform and the creator of the NFT.

- **User Registration and Wallet Creation:** Users will need to register on the platform and create a digital wallet to store their NFTs. This wallet will be linked to the user's blockchain address, and it will be used to make transactions on the platform.

- **NFT Creation and Listing:** Users can create their own NFTs by uploading their digital artwork, music, videos, or other unique digital assets to the platform. Once the NFT is created, the user can list it for sale on the platform, specifying the price and the conditions of the sale.

- **Marketplace Listing and Discoverability:** The NFTs that are listed for sale on the platform will be displayed in the marketplace for buyers to discover and browse. The platform can also implement a search and filter feature to help users find specific NFTs.

- **Auctions and Bidding:** The platform can enable auctions for NFTs, where users can bid on an NFT, and the highest bidder wins the NFT. The platform can also implement a feature where users can make offers to the NFT owner and negotiate the price.

- **Payment and Transaction Processing:** The platform will process transactions using cryptocurrency, which will be sent from the buyer's wallet to the seller's wallet upon completion of the sale. The platform can also deduct its percentage of the sale and transfer it to the platform's wallet.

- **Ownership Transfer:** Once the NFT is sold, the ownership will be transferred from the seller's wallet to the buyer's wallet. This transfer will be recorded on the blockchain, providing a permanent record of the ownership transfer.

- **Withdrawal and Transfer of Funds:** Users will be able to withdraw their cryptocurrency from their wallet or transfer it to other blockchain wallets.

- **Analytics and Reporting:** The platform can provide analytics and reporting tools to users, allowing them to track their sales, bids, and offers. The platform can also provide metrics on the overall performance of the platform.

- **Security and Maintenance:** The platform must ensure the security of user data and NFT assets. It will also require ongoing maintenance and updates to keep up with new technologies and trends.

IX. SYSTEM ARCHITECTURE

The system architecture for an NFT platform generally consists of several key components that work together to enable the creation, buying, and selling of NFTs in a secure and decentralized manner. Here are the main components of an NFT platform:

- **User Interface (UI):** The user interface is the front-end of the NFT platform that allows users to interact with the system. It includes a website or mobile application where users can view, buy, and sell NFTs. The UI also includes features for users to create and manage their NFT collections, view transaction history, and manage their accounts.

- **Smart Contracts:** Smart contracts are self-executing digital contracts that are programmed to execute transactions based on predetermined rules. In an NFT platform, smart contracts are used to create and manage NFTs. They define the rules for the creation, ownership, and transfer of NFTs, and they execute transactions automatically without the need for intermediaries.

- **Blockchain:** The blockchain is a decentralized digital ledger that records all transactions on the NFT platform. It provides a secure and transparent record of all NFT transactions, ensuring that ownership and authenticity of each asset are verified.

- **Wallets:** Wallets are digital wallets that users can use to store their NFTs and cryptocurrencies. They enable users to securely manage and transfer their NFTs and other digital assets.

- **Metadata Storage:** Metadata storage is a database that stores all the information associated with each NFT, such as its name, description, creator, and ownership history. It provides a way to easily search and browse NFT collections on the platform.

- **API:** API stands for Application Programming Interface, which is a set of protocols and tools that allow different software systems to communicate with each other. An NFT platform API allows third-party developers to build applications and services that can interact with the platform.
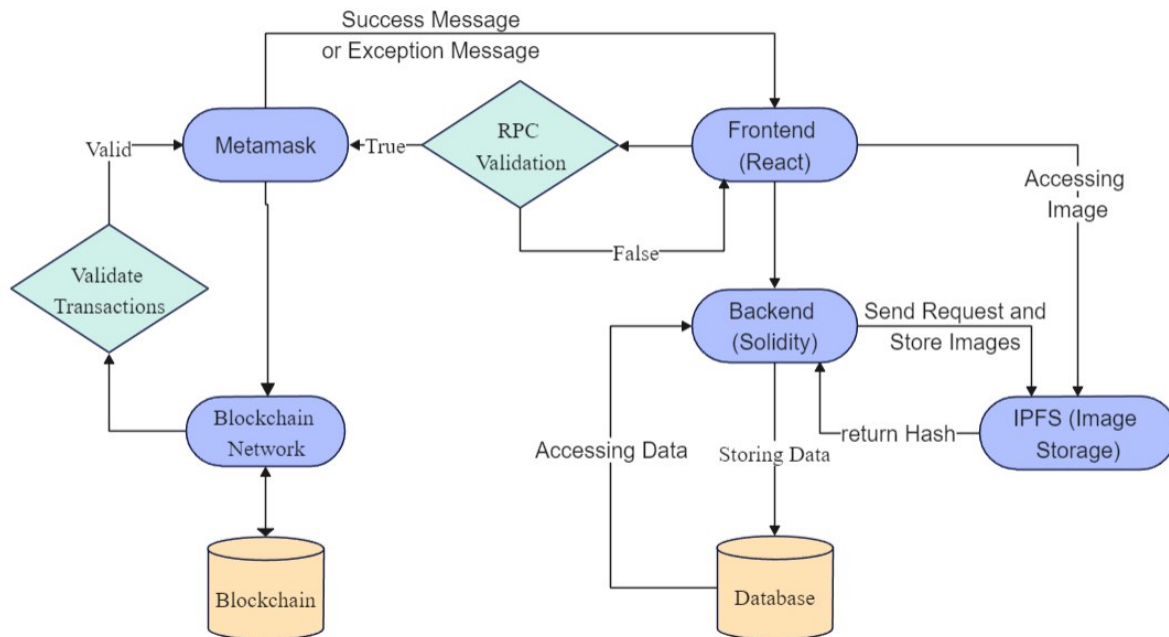
Fig. 1: System Architecture for decentralized NFT Platform using Blockchain.

X.   MODULES

There are several key modules that are typically included in an NFT platform. Here are some of the main modules:

• **User Management Module:** This module enables users to create accounts, log in, and manage their profiles on the NFT platform. It may include features such as two-factor authentication, password recovery, and user roles and permissions.

• **NFT Creation Module:** This module enables creators to create and mint new NFTs on the platform. It may include tools for uploading and verifying ownership of digital assets, setting metadata, and pricing, and defining ownership and licensing terms.

• **NFT Marketplace Module:** This module enables users to browse, search, and purchase NFTs on the platform. It may include features such as filtering and sorting options, a ranking system, and bidding and auction capabilities.

• **Wallet Management Module:** This module enables users to manage their cryptocurrency wallets and NFT holdings on the platform. It may include features such as integration with third-party wallets, transaction histories, and balance management.

• **Smart Contract Management Module:** This module enables the creation, deployment, and management of smart contracts on the platform. It may include tools for defining contract templates, executing transactions, and managing contract updates and upgrades.

• **Metadata Management Module:** This module enables the storage and management of metadata associated with NFTs on the platform. It may include features such as search and filter options, batch editing, and integration with external metadata sources.

• **Reporting and Analytics Module:** This module provides users with insights into platform usage and performance. It may include features such as transaction logs, user activity reports, and key performance indicators (KPIs) tracking.
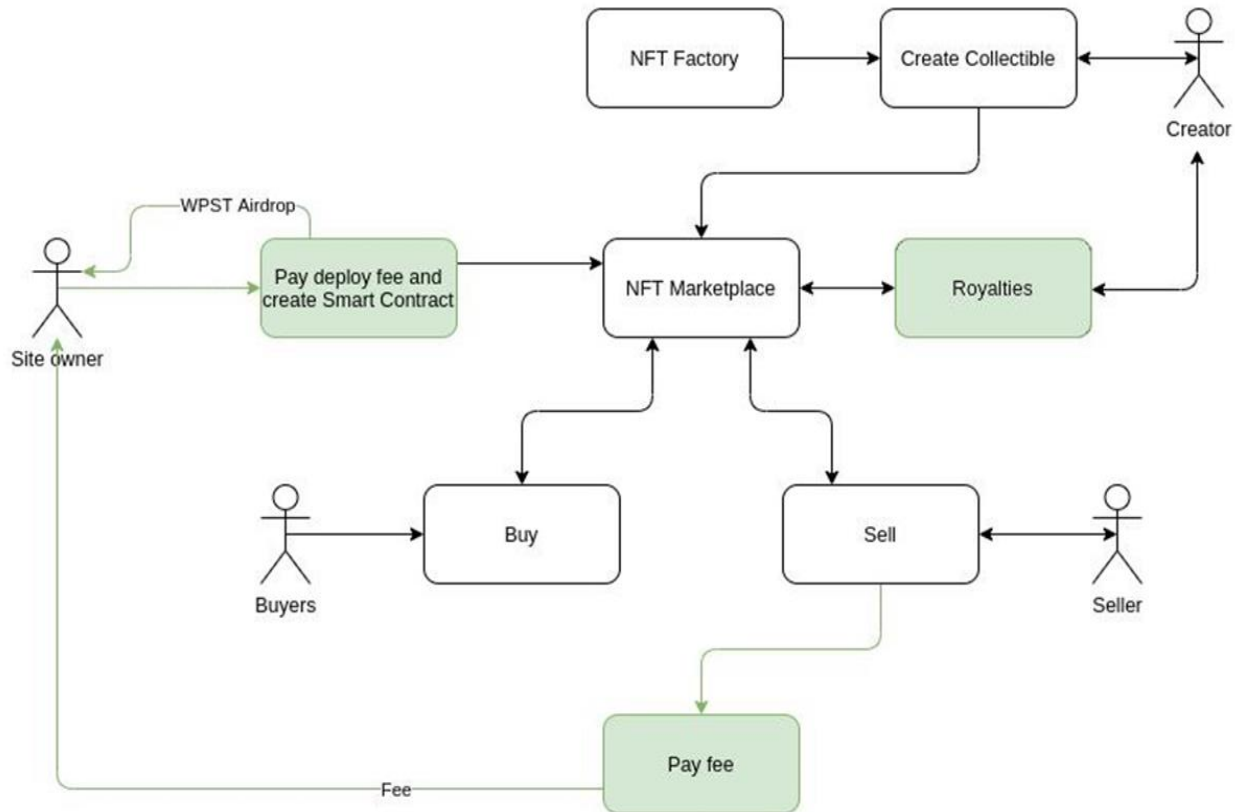
Fig. 2: Use Case Diagram for NFT Platform

XI.   IMPROVEMENTS OVER EXISTING SYSTEM

- **User experience:** Existing NFT Platforms lacks in better user interface, our NFT platforms may have a more intuitive and user-friendly interface, making it easier for users to navigate and participate in the marketplace.

- **Integration with emerging technologies:** Our NFT platforms may be more likely to integrate with other emerging technologies such as machine learning and artificial intelligence to create new experiences and opportunities for users.

- **Security:** Our NFT platforms may have more robust security measures in place to protect against hacks and theft.

- **Token standards:** Our NFT platforms may use more advanced token standards, such as ERC-721 or ERC-1155, which can provide more functionality and flexibility compared to older standards such as ERC-20.

- **Gas fees:** Our NFT platforms may have lower gas fees compared to older ones, due to the use of more advanced token standards and smart contract optimization.

- **Chatbot Integration:** An interactive chatbot is integrated with the NFT platform for better customer interaction.

XII.   FUTURE SCOPE

The future scope of NFT marketplaces is quite promising, with potential for growth and innovation in several areas. Here are some potential future developments for NFT marketplaces:

- **Expansion of use cases:** While NFT marketplaces are currently primarily used for digital art and collectibles, there is potential for them to be used in other areas such as gaming, real estate, and even physical assets such as cars or luxury goods. As more use cases are explored, the demand for NFT marketplaces could increase.

- **Integration with DeFi:** Decentralized Finance (DeFi) has been a rapidly growing area in blockchain, and there is potential for NFT marketplaces to be integrated with DeFi protocols to create new financial instruments and opportunities.

- **Enhanced features and functionality:** As NFT marketplaces continue to mature, there may be additional features and functionality added to improve the user experience and increase adoption. This could include improved search and discovery features, enhanced security measures, and more intuitive interfaces.

- **Integration with other emerging technologies:** NFT marketplaces could potentially integrate with other emerging technologies such as virtual reality, augmented reality, and artificial intelligence, to create new experiences and opportunities for users.

- **Regulation and compliance:** As the NFT market continues to grow and mature, there may be a need for regulation and compliance measures to be put in place to ensure that buyers and sellers are protected and that the market operates fairly.

Overall, the future of NFT marketplaces is exciting and full of potential, with many opportunities for growth and innovation. As the technology and market continue to evolve, we can expect to see new use cases, integrations, and features that will continue to drive the growth and adoption of NFT marketplaces.
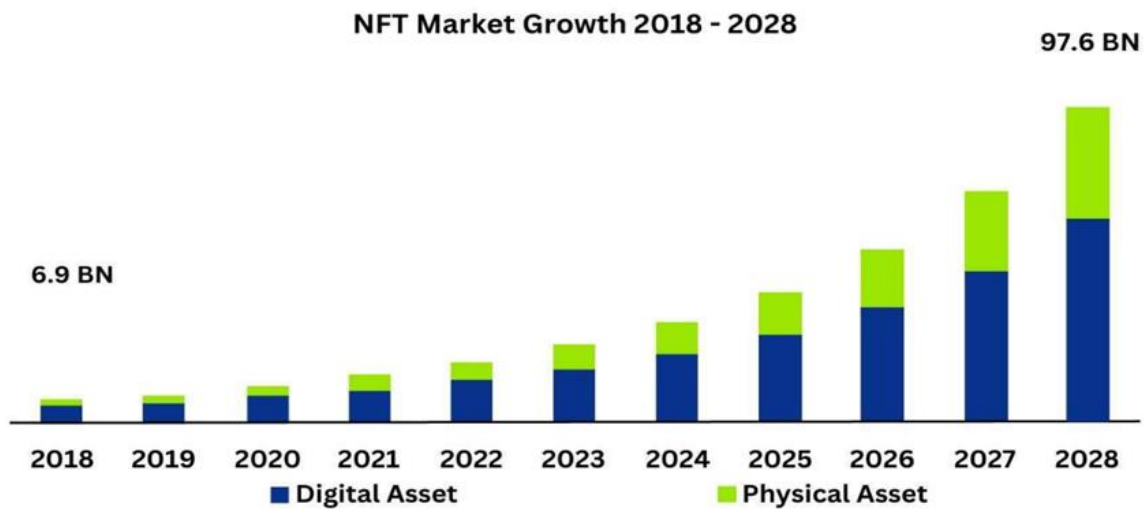

Fig. 3: NFT market growth in future.

XIII.   CONCLUSION

In conclusion, NFT (Non-Fungible Token) marketplaces/platforms are a rapidly growing sector within the blockchain industry. NFTs allow for the creation, transfer, and ownership of unique digital assets, providing creators and collectors with new opportunities for monetization and ownership. The development of a NFT marketplace/platform requires the creation of smart contracts, user registration and wallet creation, NFT creation and listing, marketplace listing and discoverability, auctions and bidding, payment and transaction processing, ownership transfer, withdrawal and transfer of funds, analytics and reporting, and security and maintenance.

Successful NFT marketplaces/platforms will provide a user-friendly experience, a broad range of NFT assets, and robust security measures to protect user data and NFT assets. Additionally, the platform's ability to provide liquidity to its users will be a critical factor in its success. As the NFT market continues to grow and evolve, it is essential to stay up to date with emerging technologies and trends. As new applications of blockchain technology emerge, the potential for NFTs to expand into new areas, such as gaming and virtual reality, will continue to increase.

ACKNOWLEDGEMENTS

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