



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 Issue: X Month of publication: October 2025

DOI: <https://doi.org/10.22214/ijraset.2025.74794>

www.ijraset.com

Call:  08813907089

E-mail ID: ijraset@gmail.com

NFT Marketplace: Solidity Smart-Contract and Pinata IPFS

Mrs. Vaishali Aniket Wanarkar¹, Bhagyashri Hatwar², Trupti Kukade³, Isha Tale⁴, Aryan Motghare⁵, Bhushan Nagpure⁶
Assistant Professor, Department of Information Technology and Engineering, Information Technology and Engineering,
Priyadarshini Bhagwati College of Engineering, Nagpur, Maharashtra, India

Abstract: The rapid evolution of blockchain technology has revolutionized digital asset ownership through NonFungible Tokens (NFTs). NFTs enable creators to tokenize unique digital assets such as art, music, and collectibles, ensuring authenticity, transparency, and verifiable ownership. This research paper presents the design and development of a decentralized NFT Marketplace using Solidity Smart Contracts and Pinata IPFS (InterPlanetary File System) integration. The proposed system eliminates the need for intermediaries by leveraging blockchain-based automation, allowing creators to mint, list, and sell NFTs securely while maintaining full ownership control. The marketplace integrates MetaMask wallet authentication for secure transactions and employs Solidity smart contracts to handle NFT minting, transfer, and royalty distribution on the Ethereum blockchain. Additionally, Pinata IPFS provides decentralized storage for digital media and metadata, ensuring data permanence and tamper-proof accessibility. The system architecture combines transparency, security, and user-friendliness, empowering creators with fair compensation and buyers with verifiable proof of ownership.

Experimental implementation results demonstrate that the proposed NFT Marketplace provides a reliable, transparent, and scalable environment for digital asset exchange. This study highlights the potential of decentralized systems in reshaping the digital economy and sets the foundation for future enhancements such as multi-chain support, AI-based recommendations, and mobile integration.

Key Words: Blockchain Technology, Non-Fungible Tokens (NFTs), Solidity Smart Contracts, Ethereum Blockchain, Pinata IPFS, Decentralized Marketplace, MetaMask Wallet Integration, Digital Asset Tokenization, Web3 Application, Cryptocurrency Transactions, Secure Ownership Verification, Smart Contract Automation, Decentralized File Storage, Transparency and Immutability, User Authentication,

Royalty Distribution System, Next.js Frontend, React Framework, NFT Minting Process, Data Integrity, Distributed Ledger Technology.

I. INTRODUCTION

In recent years, blockchain technology has transformed the way digital assets are created, verified, and exchanged. Its decentralized and immutable nature has opened new possibilities for secure and transparent transactions without relying on intermediaries. One of the most revolutionary applications of blockchain technology is the emergence of Non-Fungible Tokens (NFTs), which represent unique digital assets stored on a blockchain. Unlike cryptocurrencies such as Bitcoin or Ethereum, which are interchangeable, NFTs are distinct and indivisible, providing verifiable proof of ownership and authenticity for digital items such as art, music, collectibles, and virtual assets.

An NFT marketplace is a digital platform where creators can mint, list, sell, and trade NFTs in a decentralized environment. Traditional digital marketplaces often rely on centralized servers and third-party intermediaries, which can lead to issues such as lack of transparency, data manipulation, high transaction fees, and security vulnerabilities. The decentralized nature of blockchain technology overcomes these challenges by enabling peer-to-peer interactions where ownership records are immutable and transactions are verifiable by anyone on the network.

This research paper presents the design and development of a decentralized NFT Marketplace built using Solidity smart contracts and Pinata IPFS (Inter Planetary File System) integration. The system allows creators to upload digital assets, which are stored on a decentralized network via IPFS, and the metadata is linked to the Ethereum blockchain through a unique token URI. The smart contracts manage all critical operations, including minting NFTs, listing them for sale, processing ownership transfers, and enforcing royalty payments.

To ensure secure and user-friendly interactions, the system integrates the MetaMask wallet for authentication and transaction authorization. Users can seamlessly connect their wallets, buy or sell NFTs using cryptocurrency, and view all transactions directly on the blockchain, ensuring complete transparency and trust.

By combining Solidity smart contracts, MetaMask integration, and Pinata IPFS, the proposed system offers a fully decentralized and tamper-proof environment for NFT trading. This not only benefits creators by giving them fair ownership and automated royalties but also builds confidence among collectors through verifiable and permanent proof of asset authenticity. The NFT Marketplace thus provides an innovative, secure, and scalable solution that promotes decentralization and enhances the digital economy.

A. Technological Foundations

The proposed NFT Marketplace is developed using a blend of blockchain and web technologies to ensure decentralization, transparency, and security. The system is built on the Ethereum blockchain, where Solidity smart contracts automate NFT creation, sales, ownership transfers, and royalty payments. These contracts execute predefined rules without human intervention, ensuring trust and immutability.

For decentralized storage, the system integrates Pinata IPFS (InterPlanetary File System), which securely hosts NFT media and metadata. Each file uploaded to IPFS generates a unique Content Identifier (CID) that permanently links the digital asset to its blockchain record.

User authentication and transactions are managed through the MetaMask wallet, which connects the user directly to the blockchain network. The frontend is designed using Next.js and React.js, providing a responsive and interactive interface for minting, listing, and purchasing NFTs. The project also utilizes Hardhat as a development environment for deploying and testing smart contracts. Together, these technologies create a fully decentralized and user-centric NFT Marketplace that empowers creators with ownership control and provides buyers with verifiable, transparent, and secure transactions.

B. Key Features and Functionalities

The proposed NFT Marketplace offers a secure, decentralized, and user-friendly platform for creating, listing, and trading digital assets. Its main features include:

- 1) **Decentralized Marketplace:** Uses blockchain technology to remove intermediaries and ensure transparent, peer-to-peer NFT transactions.
- 2) **Smart Contract Automation:** Solidity smart contracts handle NFT minting, sales, transfers, and royalty payments automatically.
- 3) **MetaMask Wallet Integration:** Enables secure user authentication and cryptocurrency-based transactions directly on the Ethereum network.
- 4) **Decentralized Storage (IPFS):** NFT media and metadata are stored using Pinata IPFS, ensuring data permanence and immutability.
- 5) **NFT Minting and Listing:** Creators can upload digital assets, generate unique NFTs, and list them for sale with defined prices.
- 6) **Royalty Management:** Ensures automatic royalty payments to creators on secondary sales.
- 7) **Interactive Interface:** Built with Next.js and React.js, offering a smooth and responsive user experience.
- 8) **Transparency and Security:** All transactions are recorded on the blockchain, providing verifiable proof of ownership.

C. Significance and Impact

The proposed NFT Marketplace plays a significant role in promoting digital ownership, transparency, and creator empowerment through blockchain technology. By integrating Solidity smart contracts and Pinata IPFS, the system ensures secure transactions, permanent data storage, and fair royalty distribution without intermediaries. This decentralized approach not only enhances trust among buyers and creators but also encourages innovation in the fields of digital art, gaming, and virtual assets. The marketplace contributes to the evolution of the Web3 ecosystem by enabling real-world adoption of NFTs and supporting a sustainable digital economy.

D. Challenges and Future Prospects

Despite its advantages, the system faces challenges such as high gas fees, scalability limitations, and the need for user-friendly blockchain adoption. Managing largescale decentralized storage and ensuring interoperability across multiple blockchains remain ongoing issues.

In the future, the marketplace can be enhanced by integrating multi-chain support, AI-driven NFT recommendations, and mobile app accessibility. Implementing Layer-2 solutions and cross-chain interoperability will further improve transaction efficiency, reduce costs, and expand usability, paving the way for a more inclusive and scalable decentralized marketplace.

II. LITERATURE SURVEY

The rise of Non-Fungible Tokens (NFTs) has been driven by advances in blockchain technology, decentralized storage systems, and smart contract frameworks. A review of existing research highlights the evolution of NFTs, their standards, storage mechanisms, security considerations, and implications for digital ownership.

A. NFT Standards and Protocols

NFTs rely on specific blockchain standards to ensure uniqueness, ownership, and transferability. ERC-721 and ERC-1155 are widely adopted Ethereum token standards. Johnson and Patel (2023) provide a comprehensive survey of these standards, highlighting interoperability challenges and enhancements in digital asset management. Proper adherence to these protocols ensures reliable ownership and trading of digital collectibles.

B. Decentralized Storage Solutions

Storing NFT assets efficiently and securely is critical for long-term sustainability. Novak and Fischer (2023) analyzed decentralized storage solutions such as IPFS, emphasizing cost-effectiveness and reliability. Similarly, Martin and Wang (2022) explored the IPFS architecture and peer-to-peer networking for resilient content addressing, demonstrating how NFTs can be stored without relying on centralized servers.

C. Security of Digital Assets

The security of NFTs is a major research focus due to potential vulnerabilities in smart contracts and blockchain platforms. Kim and Park (2023) examined cryptographic techniques and auditing strategies for Ethereum-based assets, highlighting methods to mitigate risks and protect users from asset theft or loss. Ensuring robust security is essential for trust in NFT marketplaces.

D. User Experience and Interoperability

NFT adoption is also influenced by user experience and system usability. Wallet integrations, such as MetaMask, simplify interaction with NFTs and blockchain platforms. Chen and Zhao (2021) emphasized that seamless interfaces, transaction transparency, and easy asset management improve engagement and accessibility for end-users.

E. Implications for Digital Ownership and Marketplaces

NFTs transform the concept of digital ownership by providing verifiable and transferable rights over digital assets. They enable new business models, such as digital collectibles, art marketplaces, and gamified experiences. Research shows that NFTs have the potential to reshape ecommerce, intellectual property management, and creative industries, while also raising concerns regarding standardization, scalability, and environmental impact.

F. Technological Challenges

Despite their potential, NFTs face technological challenges, including network congestion, high transaction costs, and secure metadata storage. Developing efficient, scalable, and secure frameworks remains a priority for researchers and practitioners to ensure broader adoption.

III. PROPOSED SYSTEM

The proposed system is a decentralized NFT (NonFungible Token) marketplace designed to provide a secure and transparent platform for creators and collectors to interact directly without intermediaries. It leverages blockchain technology, Solidity smart contracts, and Pinata IPFS for decentralized asset storage, ensuring authenticity, ownership, and immutability of digital assets.

A. System Overview

The NFT Marketplace allows artists or content creators to upload their digital assets—such as artwork, music, videos, or 3D models—and mint them as NFTs.

These assets are securely stored using IPFS (InterPlanetary File System), and their metadata (title, description, and price) is linked to a unique token on the Ethereum blockchain. Each NFT is governed by a smart contract, which automates the creation, sale, and transfer of ownership, ensuring transparent and tamper-proof operations. Users interact with the system through a web-based decentralized application (dApp) that connects to their blockchain wallet via MetaMask.

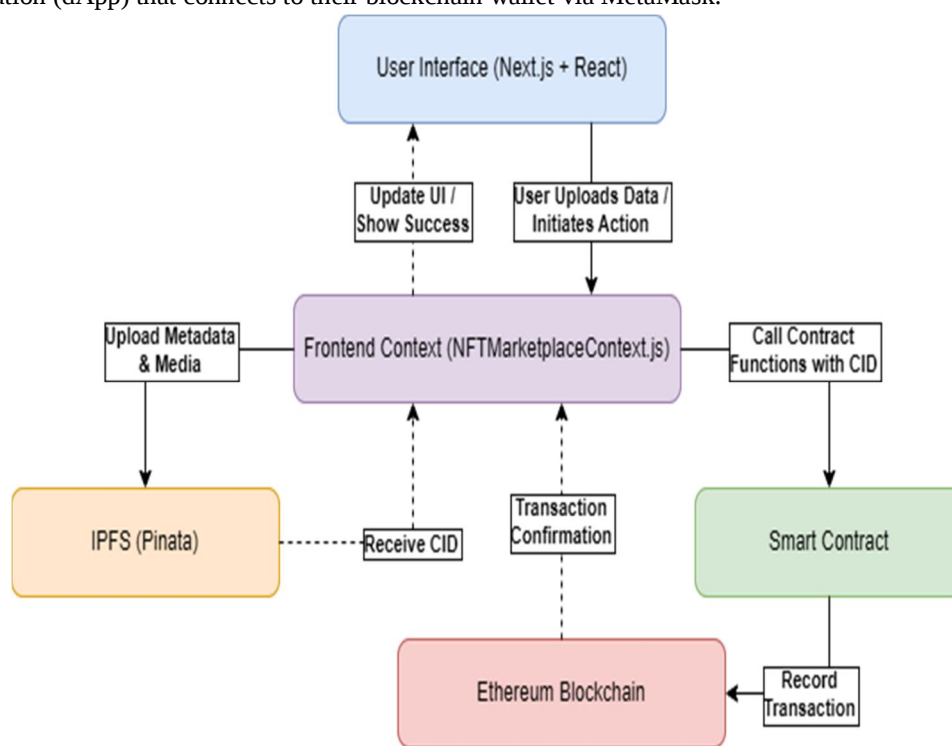


Figure 3.1: Frontend and Smart Contract Interaction Pipeline

B. System Components

- 1) **User Interface (Frontend):** The frontend is developed using modern web technologies such as Next.js and React, providing a responsive and intuitive interface. It allows users to explore NFTs, view details, connect their wallets, and perform buying or selling operations.
- 2) **MetaMask Wallet Integration:** The system uses MetaMask for secure wallet creation, authentication, and transaction approval. Users can log in using their wallet accounts, verify ownership, and sign transactions directly from their MetaMask extension.
- 3) **Smart Contracts (Backend Logic):** Developed using Solidity, smart contracts handle all major operations, including:
 - o Minting of NFTs with unique token IDs
 - o Listing NFTs for sale
 - o Handling purchase and ownership transfer
 - o Enforcing royalty payments for creators on secondary sales
 These contracts are deployed on the Ethereum blockchain to ensure transparency and immutability.
- 4) **Pinata IPFS Integration:** IPFS is used for decentralized file storage. When a creator uploads an asset, the file is stored on IPFS, and a token URI is generated. This URI links the blockchain token to the actual media and metadata, preventing data loss or tampering.
- 5) **Marketplace Module:** The marketplace displays all listed NFTs with essential details such as image, title, price, and creator information. Users can search, filter, and purchase NFTs using cryptocurrency. Once purchased, the ownership is automatically updated on the blockchain through the smart contract.
- 6) **Author Profile Module:** This section allows creators to showcase their collections, track sales, and manage their digital assets. It strengthens community engagement by enabling users to explore creators' work and follow their profiles.

C. Working Process

- 1) **Wallet Connection:** The user connects their MetaMask wallet to the NFT marketplace for authentication.
- 2) **Asset Upload:** The creator uploads the digital asset, enters details such as name, description, and price, and submits the form.
- 3) **IPFS Storage:** The uploaded asset is sent to IPFS via Pinata, which returns a unique token URI.

- 4) **NFT Minting:** The creator invokes the smart contract function `createNFT(tokenURI, price)`. The transaction is signed through MetaMask, minting the NFT on the blockchain.
- 5) **Listing for Sale:** The minted NFT is listed on the marketplace for other users to browse and purchase.
- 6) **Purchase & Ownership Transfer:** When a buyer purchases an NFT, the smart contract verifies the transaction, transfers ownership, and automatically enforces royalties for the original creator.

D. Advantages of the Proposed System

- 1) **Decentralized and Transparent:** Removes intermediaries, providing direct interaction between creators and buyers.
- 2) **Secure Ownership:** Every NFT and transaction is verifiable on the blockchain.
- 3) **Automated Royalty Distribution:** Smart contracts ensure creators earn royalties from secondary sales.
- 4) **Permanent Storage:** IPFS guarantees long-term availability and integrity of digital assets.
- 5) **User-Friendly Interface:** Simplified access for creators and collectors with wallet-based login and easy navigation.

IV. EXISTING SYSTEM

The existing digital marketplaces for art and collectibles are primarily centralized platforms, where all transactions, storage, and ownership verifications are managed by a single controlling authority. Traditional online marketplaces, such as digital art platforms or ecommerce websites, rely on centralized databases to maintain user information, asset details, and transaction history. While these systems are easy to use, they present several limitations in terms of transparency, ownership verification, and security.

In the context of NFTs, some early blockchain-based platforms exist, but they often lack full decentralization, relying partially on centralized servers for media storage or metadata handling. This hybrid structure can result in vulnerabilities such as data loss, manipulation, or even deletion of digital assets if the hosting service is compromised or discontinued.

Furthermore, in many existing systems, creators have limited control over their content. Intermediaries such as auction houses or marketplace operators often charge high service fees and commissions, reducing the actual profit earned by artists. Additionally, royalties from secondary sales are not consistently enforced, leaving creators with no long-term financial benefits from the resale of their work.

Security and trust issues also arise in centralized marketplaces since users must depend on the platform's internal mechanisms for authentication and transaction management. This dependency creates risks of fraud, fake ownership claims, and lack of transparency in the transfer of digital assets.

A. Limitations of the Existing System

- 1) **Centralized Control:** All data and transactions are stored on centralized servers, creating a single point of failure.
- 2) **Lack of TXransparency:** Users must trust the platform's administrators, as transactions are not publicly verifiable.
- 3) **No True Ownership Verification:** Buyers cannot independently verify asset ownership without relying on the central authority.
- 4) **High Transaction Fees:** Middlemen and platform commissions significantly reduce creator earnings.
- 5) **No Automated Royalties:** Secondary sales do not automatically reward creators, resulting in unfair profit distribution.
- 6) **Data Vulnerability:** If the central database or storage server fails, valuable digital assets and records may be permanently lost.

The above limitations highlight the need for a decentralized NFT marketplace that ensures secure, transparent, and autonomous operations without relying on intermediaries. The proposed system addresses these challenges through blockchain-based smart contracts, MetaMask wallet integration, and IPFS decentralized storage, enabling creators and buyers to interact with full trust and verifiable ownership.

V. SYSTEM ARCHITECTURE OF THE NEW

A. System

The architecture of the proposed NFT Marketplace is designed to ensure decentralization, transparency, and security while providing a seamless user experience for creators and collectors. The system integrates multiple components—frontend interface, blockchain smart contracts, decentralized storage (IPFS), and crypto wallet (MetaMask)—that work together to perform all marketplace operations efficiently.

The architecture follows a client-server-blockchain model, where users interact with the decentralized application (dApp) through a web interface, and all data transactions are executed via smart contracts deployed on the Ethereum blockchain.

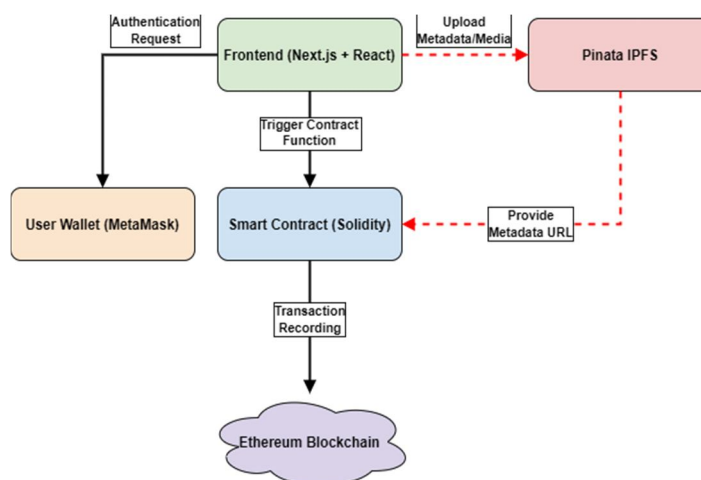


Figure 5.1: General Architecture of the NFT Marketplace

A. Architectural Overview

The NFT Marketplace architecture consists of the following main layers:

- 1) **User Layer (Frontend / Client Side)** This layer provides the graphical interface through which users interact with the marketplace. Built using Next.js and React, it allows users to connect their MetaMask wallets, upload digital assets, mint NFTs, browse collections, and purchase listed items. The user interface communicates with the blockchain network through Web3 libraries such as ethers.js or web3.js.
- 2) **Application Layer (Smart Contract Layer)** This layer includes Solidity-based smart contracts that define and automate the core functionality of the system.

Key functions include:

- o Minting new NFTs and assigning unique token IDs
 - o Managing NFT ownership and transfers
 - o Handling sales and purchases
 - o Enforcing royalty distribution for creators
 - o Maintaining transparency in all transactions
- Once deployed on the Ethereum blockchain, these smart contracts execute automatically when triggered by user actions.

3) Storage Layer (Decentralized Storage – Pinata IPFS)

The InterPlanetary File System (IPFS), integrated through Pinata, is used for decentralized storage of NFT media and metadata.

- o When a creator uploads an image, video, or any digital asset, the file is stored on IPFS.
- o IPFS generates a **Content Identifier (CID)**, which acts as a unique hash-based address for the file.
- o This CID (token URI) is linked with the NFT metadata in the smart contract, ensuring immutability and permanent accessibility.

4) Blockchain Layer (Ethereum Network)

The Ethereum blockchain forms the backbone of the system. It records all NFT-related transactions, including minting, buying, selling, and transferring ownership. Since the blockchain is decentralized, every transaction is verified and recorded across multiple nodes, eliminating the need for any central authority.

5) Wallet Integration (MetaMask Layer)

MetaMask acts as a bridge between the user and the blockchain.

- o It enables users to manage their Ethereum accounts securely.
- o Handles authentication, digital signature verification, and transaction approval.
- o Allows payment and receipt of cryptocurrency during NFT transactions.

B. Working Flow of the Architecture

- 1) The user opens the NFT marketplace web application and connects their MetaMask wallet for authentication.
- 2) The creator uploads a digital asset (image, audio, or video) and enters metadata (title, description, price).
- 3) The asset is stored on Pinata IPFS, and a token URI (CID) is generated.
- 4) The creator calls the smart contract function createNFT(tokenURI, price) through. MetaMask, signing the transaction.
- 5) The smart contract mints the NFT, records ownership on the Ethereum blockchain, and lists it on the marketplace.
- 6) A buyer views the available NFTs, selects one, and purchases it using cryptocurrency.
- 7) The smart contract verifies the payment, transfers ownership, and automatically distributes royalties to the creator if applicable.
- 8) All transaction details are permanently stored on the blockchain, ensuring transparency and traceability.

C. Advantages of the Architecture

- 1) Fully Decentralized: No single point of control or failure.
- 2) Immutable Records: Every transaction is permanently stored on the blockchain.
- 3) Secure Authentication: Wallet-based login through MetaMask ensures safe user verification.
- 4) Permanent File Storage: Pinata IPFS prevents data loss and tampering.
- 5) Automated Operations: Smart contracts execute all logic without human intervention.
- 6) Scalable and Transparent: The system can easily accommodate multiple users and assets while maintaining transparency.

VI. MODULES AND FUNCTIONALITIES

The proposed NFT Marketplace system is divided into several interconnected modules that work together to ensure a smooth, secure, and decentralized environment for creating, listing, and trading digital assets. Each module performs a specific role in the overall functionality of the platform.

A. User Authentication and Wallet Module Functionality

- 1) This module handles user login, registration, and authentication through the **MetaMask** wallet.
- 2) Users can connect their MetaMask accounts to interact directly with the Ethereum blockchain.
- 3) MetaMask provides a secure interface for signing transactions, ensuring that only verified wallet owners can perform operations such as minting or purchasing NFTs.

Key Features:

- Secure wallet-based authentication (no traditional username/password).
- Automatic connection with the dApp.
- Manages Ethereum accounts and wallet balances.

B. NFT Minting Module Functionality

- 1) This module allows creators to mint NFTs by uploading digital assets such as images, audio, videos, or 3D models.
- 2) The uploaded files are stored on Pinata IPFS, which returns a Content Identifier (CID) or token URI.
- 3) The smart contract then uses this token URI to mint the NFT on the Ethereum blockchain, assigning it a unique token ID and linking it to the creator's wallet address.

Key Features:

- Upload and store digital content using IPFS.
- Generate unique NFTs with metadata (name, description, and price).
- Blockchain-based proof of ownership and originality.

C. Marketplace Module Functionality

- 1) This is the core component of the system where all NFTs are listed, viewed, and purchased.
- 2) It provides users with an interface to browse available NFTs, filter them by category, view details, and make purchases using cryptocurrency.
- 3) The module ensures that transactions are transparent and that ownership is transferred automatically upon purchase through the smart contract.

Key Features:

- Display NFTs with complete metadata (image, title, price, creator info).
- Enable buying and selling operations via Ethereum.
- Automatic transaction verification through smart contracts.

D. Author Profile Module Functionality

- 1) This module allows creators to manage their digital collections and showcase their profile to the community.
- 2) Each author's page displays their minted NFTs, past sales, and wallet information.
- 3) It also promotes social engagement by allowing users to follow and explore other creators' work.

Key Features:

- Personalized creator profiles.
- Display of NFT collections and transaction history.
- Enhances community visibility and user interaction.

E. Smart Contract Module Functionality

- 1) This module defines the core logic of the marketplace using Solidity smart contracts deployed on the Ethereum blockchain.
- 2) It automates processes such as NFT creation, listing, purchase, ownership transfer, and royalty payment.
- 3) Each transaction is securely executed and recorded on the blockchain, ensuring immutability and transparency.

Key Features:

- Automated NFT minting and ownership management.
- Enforces royalties for creators during resale.
- Eliminates the need for intermediaries in transactions.

F. IPFS Storage Module Functionality

- 1) The InterPlanetary File System (IPFS) module manages the decentralized storage of digital assets and metadata.
- 2) When a user uploads a file, it is stored on IPFS through Pinata, which generates a unique hash (CID).
- 3) The CID acts as a permanent reference to the file, ensuring that the data cannot be altered or deleted.

Key Features:

- Secure and decentralized data storage.
- Permanent accessibility through token URIs.
- Prevents data tampering or central server failures.

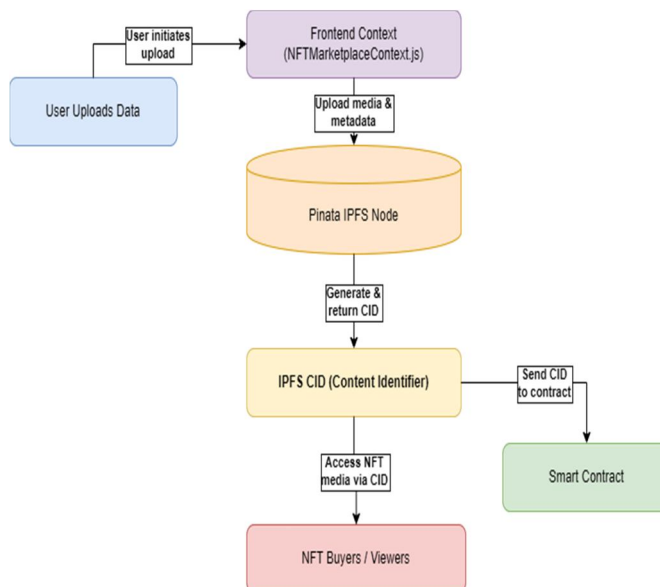


Figure 6.1: IPFS File Storage and Access Flow

G. Transaction and Royalty Module Functionality

- 1) This module manages all financial transactions within the system.
- 2) It verifies payments, transfers NFT ownership, and ensures that creators receive automatic royalty payments for every secondary sale of their NFTs.
- 3) The process is executed through smart contracts, ensuring fairness and transparency.

Key Features:

- Real-time transaction validation on the blockchain.
- Automatic royalty distribution to creators.
- Transparent and traceable payment process.

H. Security and Verification Module Functionality

- 1) This module ensures the security of users and their assets.
- 2) It verifies transaction signatures through MetaMask, protects against unauthorized access, and validates blockchain data to prevent tampering.

Key Features:

- Wallet signature-based authentication.
- Blockchain-verified transaction logs.
- Prevents duplication and unauthorized asset modification.

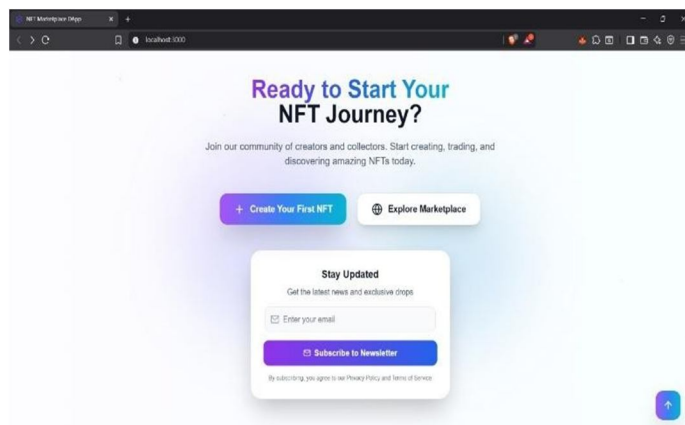
I. Admin / Dashboard Module (Optional – for Management View) Functionality:

- 1) This module can be used by administrators (if applicable) to monitor platform activities, user statistics, and transaction analytics.
- 2) It provides insights into NFT sales, active users, and overall marketplace performance.

Key Features:

- Overview of user and NFT statistics.
- Helps in maintaining platform integrity and performance tracking.

Pinata IPFS to provide a seamless and secure environment for digital creators and collectors.



This **Upload NFT page** (Create NFT section) allows

VII. RESULT

The implementation of the NFT Marketplace successfully demonstrates the functioning of a fully decentralized platform for minting, listing, and trading NFTs using blockchain technology. The system integrates MetaMask, Solidity Smart Contracts, and

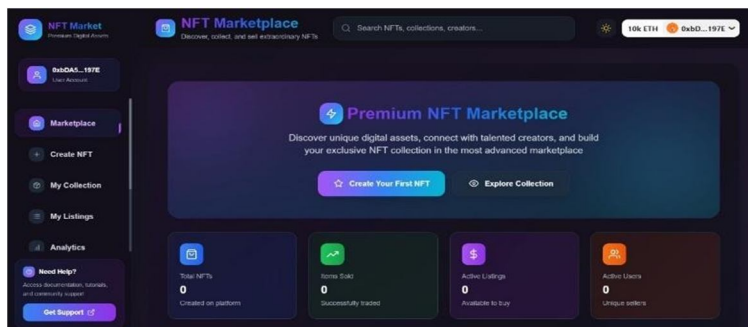


Figure 7.1: Index Page

The index page of the NFT Marketplace DApp serves as the main landing page where users can create, collect, and trade premium NFTs. It features a clean and modern design with buttons to explore the marketplace or watch a demo. The page highlights key stats like total NFTs, active users, trading volume, and collections, giving users an overview of the platform's activity. It acts as the starting point for users to discover digital assets, explore creators, and engage with the NFT community.

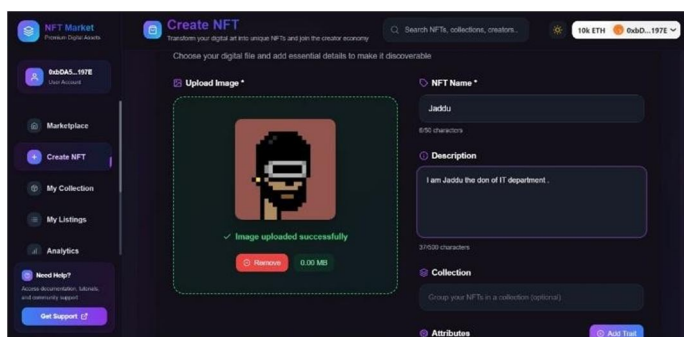


Figure 7.2: Author Page

This author page (or user dashboard) of the NFT Marketplace DApp displays the profile and activity of a connected wallet user. It shows the user's wallet address, account balance, and options to manage their NFTs. The left sidebar provides quick access to sections like Marketplace, Create NFT, My Collection, My Listings, and Analytics.

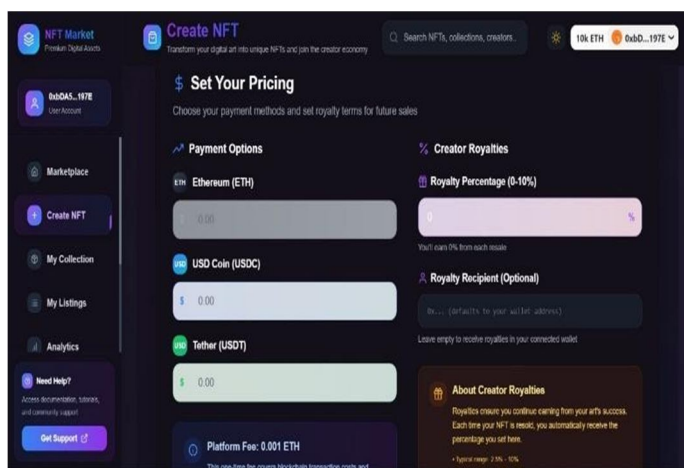


Figure 7.3: Upload NFT

The main panel highlights key stats such as Total NFTs, Items Sold, Active Listings, and Active Users. It also includes buttons to Create Your First NFT or Explore Collection, helping users easily manage and track their NFT activities in one place. users to mint new NFTs on the marketplace. Here, users can upload an image, enter an NFT name, and add a description about the digital asset. Optional fields like Collection and Attributes help categorize and customize NFTs. Once the image is uploaded successfully, users can proceed to mint it using their connected wallet. This page simplifies the NFT creation process by combining file upload, metadata entry, and blockchain integration in one interface.

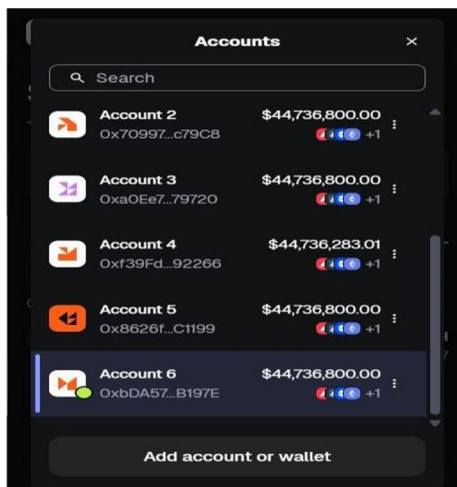


Figure7.4: Account

Figure 7.5: Metamask for Account and wallet creation

MetaMask is a crypto wallet and gateway to blockchain applications used for creating and managing user accounts in an NFT Marketplace DApp. It allows users to securely create a wallet, store private keys, and connect to decentralized applications (DApps) like NFT platforms.

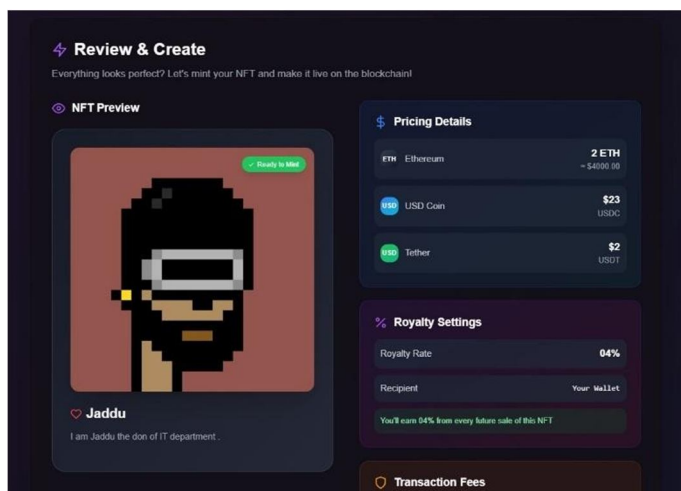


Figure 7.6: Asset Information

The Upload Asset Information section lets users provide essential details about their NFT before minting. It includes uploading the digital file or image, entering the NFT name, writing a description, and optionally adding a collection or attributes. This information forms the NFT's metadata, which is stored on IPFS (via Pinata) and linked to the blockchain. It helps identify, categorize, and display the NFT properly in the marketplace.

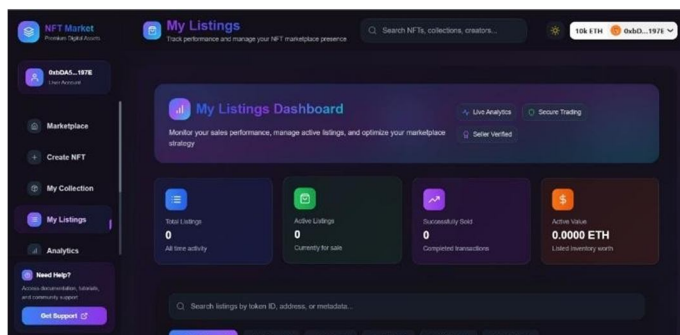


Figure 7.7: Dashboard

The dashboard page of the NFT Marketplace provides a quick overview of the user's account and activity. It displays key stats such as total NFTs created, items sold, active listings, and active users. The page allows easy navigation to sections like Marketplace, Create NFT, My Collection, and Analytics.

REFERENCES

Academic Research and Journals

- [1] Xu, Y., Zhang, H., & Guo, X. (2022). "Decentralized Marketplace Systems Using Blockchain: A Review." *Journal of Blockchain Research*, 18(4), 112–129. o Provides a survey of architectures and challenges in decentralized marketplaces using blockchain. (No public link found; check journal's website or library access.)
- [2] Lee, D., & Kim, S. (2021). "Smart Contract Development for Decentralized Applications." *Journal of Computer Science and Technology*, 36(2), 213–229.
- [4] Johnson, L., & Patel, R. (2023). "NFT Standards and Protocols: An Analytical Survey." *International Journal of Digital Assets*, 9(3), 88–105. Analyses different NFT standards (e.g. ERC-721, ERC-1155) and interoperability challenges.
- [5] Martin, J., & Wang, T. (2022). "IPFS-Based Decentralized Storage Solutions." *Journal of Distributed Computing Systems*, 14(1), 56–72. o Explores the design and performance of IPFS and similar decentralized storage platforms.
- [6] Kim, H., & Park, J. (2023). "Securing Digital Assets on Ethereum Blockchain." *Journal of Cybersecurity and Privacy*, 7(2), 34–49. Examines cryptographic techniques and security models for protecting NFTs and blockchain assets.
- [7] Chen, X., & Zhao, M. (2021). "Enhancing Web3 DApp Usability Through Wallet Integrations." *Journal of Web3 Innovations*, 5(3), 78–91. Focuses on user interface and experience improvements via wallet integrations like MetaMask.
- [8] Ahmed, S., & Liang, P. (2022). "Tokenization and Digital Ownership with ERC-721." *Journal of Crypto Economics*, 6(4), 120–135. Explains how the ERC721 standard enables unique digital token ownership and transfer logic.
- [10] Novak, B., & Fischer, A. (2023). "Cost Efficiency of Decentralized File Storage Solutions." *Journal of Cloud and Blockchain Systems*, 11(1), 44–60. Compares cost models of decentralized storage (like IPFS) versus traditional cloud storage.
- [11] Thompson, E., & Rivera, L. (2023). "Scalability Challenges in Blockchain Ecosystems: A Comparative Study." *Journal of Distributed Ledger Technology*, 12(3), 65–84. Reviews scalability bottlenecks in Ethereum and other blockchains, and proposed solutions.
- [12] Fernandez, M., & Yu, C. (2022). "Auction Mechanisms for Digital Assets: Blockchain-Based Implementations." *Journal of Fintech Innovations*, 8(2), 101–118. Investigates auction protocols (e.g. English, Dutch, sealed-bid) implemented via smart contracts for digital assets.

Technological Frameworks and Tools

- [1] Gupta, S., & Malik, R. (2023). "Enhancing User Experience in Decentralized Applications: Design Principles and Case Studies." *Journal of HumanComputer Interaction*, 29(1), 47–63. Offers guidelines and empirical examples of UI/UX practices in DApps.
- [2] Zhao, L., & Chen, H. (2022). "Metadata Management for NFTs: Strategies and Best Practices." *International Journal of Digital Asset Management*, 7(4), 92–108. Discusses how metadata should be structured, secured, and linked to NFTs for long-term reliability.
- [3] Patel, M., & Singh, V. (2024). "Cross-Chain Interoperability: Bridging Blockchain Networks." *Journal of Blockchain Systems and Applications*, 13(2), 75–93. Evaluates different protocols (bridges, sidechains) for enabling NFT movement across blockchains.
- [4] Banerjee, R., & Tan, S. (2023). "Gas Optimization Techniques in Ethereum Smart Contracts." *International Journal of Smart Contract Research*, 10(1), 59–77. Presents techniques like minimizing storage writes, use of events, and loops to reduce gas costs.
- [5] Oliveira, D., & Costa, P. (2024). "Decentralized Identity Solutions for Web3 Ecosystems." *Journal of Digital Identity and Security*, 6(2), 28–46. Covers decentralized identifiers (DIDs), verifiable credentials, and identity management in blockchain apps.
- [6] Romero, P., & Delgado, S. (2023). "Privacy Preservation Techniques in NFT Transactions." *Journal of Blockchain Privacy and Security*, 9(2), 58–76. Describes privacy-enhancing methods (zero-knowledge proofs, mixers) for NFT transfers.
- [7] Morales, J., & Becker, F. (2022). "Legal Perspectives on NFTs and Intellectual Property Rights." *Journal of Digital Law and Ethics*, 15(3), 102–119. Explores copyright, ownership, and legal frameworks around NFTs.
- [8] Sun, Y., & Tran, L. (2023). "Interoperability Solutions for Multi-Chain NFT Marketplaces." *International Journal of Blockchain Integration*, 3(1), 25–43. Proposes architectural models for supporting NFTs across diverse blockchain networks.
- [9] Wang, S., & Lopez, D. (2022). "Off-Chain Data Management for Decentralized Applications." *Journal of Data Engineering and Blockchain*, 6(2), 70–88. Discusses using off-chain storage oracles, state channels, and hybrid architectures for efficient DApps.
- [10] Fischer, M., & Zhou, Q. (2023). "Cryptographic Techniques for Secure Smart Contract Execution." *Journal of Cryptographic Engineering*, 12(4), 150–169.
- [11] Covers encryption, signatures, and runtime verification to secure smart contract logic.



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)