

# The Use of Blockchain for Royalty Distribution in the Music Industry

Rahul Supekar<sup>1</sup>, Rushikesh Savalke<sup>2</sup>, Nikita Sable<sup>3</sup>, Ankush Ingale<sup>4</sup>,

Department of Computer Engineering, Amrutvahini College of Engineering, Sangamner,

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**Abstract**—The growth of digital music streaming platforms has changed the way music is distributed and accessed across the world. These platforms make music easily available to listeners the royalty distribution process still faces several challenges. Limited transparency, delayed payments, and the involvement of multiple intermediaries often reduce efficiency and affect the earnings received by artists.

This work shows a blockchain-based framework for music royalty distribution. The given system combines Ethereum smart contracts, Non-Fungible Tokens (NFTs), and the Inter Planetary File System (IPFS) to support secure ownership management and automated royalty payments. Smart contracts execute royalty transactions based on predefined conditions, while NFTs represent ownership of digital music files. IPFS is used for decentralized storage to maintain secure and tamper resistant media files.

By reducing dependency on central authorities, the framework makes royalty transactions easier to track and supports fair revenue distribution for artists. The obtained results show fast royalty processing and improved revenue sharing compared with old royalty management systems [18].

**Keywords**—Blockchain, Ethereum, NFT, Smart Contracts, Royalty Distribution, IPFS, Web3, Music Industry

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## I. INTRODUCTION

In last few years, the music industry has experience changes due to the rise of digital streaming platforms. Applications such as Spotify, Apple Music, and YouTube allow listeners to access music easily at any time and from different locations. While this has improved many things for users, it has also created challenges for artists like in terms of fair revenue distribution. Many musicians, particularly independent artists, still find it difficult to understand how royalties are calculated and shared.

One of the main problems in the traditional royalty system is its dependence on centralized organizations. In this process, intermediaries such as record labels, publishers, and distributors are responsible for handling royalty payments. Because of this, payments often become slow and less transparent, and artists may receive a smaller share of the revenue. In many situations artists cannot track how their earnings are divided, it reduces trust in the system. many creators believe that they are not being compensated fairly for their work [1].

Another challenge involves ownership and rights management. In current systems, proving ownership of digital music content is not always simple and can sometimes lead to disputes. Problems such as unauthorized usage, piracy, and copyright violations can also affect artists financially and reduce motivation. These issues highlight the need for a system that is secure, transparent, and efficient while also protecting artist rights and supporting fair royalty payments [2].

Blockchain technology offers an alternative approach to address these problems. In traditional systems, blockchain functions without relying on a central authority and stores transaction records in a distributed digital ledger. Since the recorded data cannot be modified easily, the system improves transparency and helps build trust among users. Smart contracts can further automate royalty payments according to predefined conditions, reducing delays and limiting the role of intermediaries.

This Research paper shows a blockchain-based system for improving royalty distribution in the music industry. The proposed system uses smart contracts for automated payments, NFTs for representing ownership of music files, and IPFS for decentralized storage. Through this approach, artists can interact more directly with listeners, maintain better control over their content, and receive royalty payments more efficiently. The work focus on to support a more transparent and fair royalty management process in the digital music system [7].

## II. SCOPE OF THE STUDY

This study focuses on developing a practical system to address one of the issues in the music industry, called fair royalty distribution. The primary objective is to create a blockchain-based platform where artists can

directly manage their music content and earnings without depending on intermediaries. The process is designed to be more transparent, secure, and automated so that artists can receive payments more simply.

In this project, smart contracts are the reason for automatically calculating and distributing royalties. This reduces manual processing and helps minimize delays and payment related errors. Every music asset is converted into an NFT, which gives the proof of ownership and helps identify the original creator. This approach can reduce conflicts related to digital ownership. For storage purposes the system uses IPFS, a decentralized storage method that keeps data secure, continuously accessible, and resistant to unauthorized modification.

All royalty transactions are stored on the blockchain, making payment records simple to verify and improve the reliability. This system is also designed with scalability. It can support a growing number of users, music files, and transactions without affecting system performance. However, the current work mainly concentrates on the technical implementation of blockchain-based royalty distribution. Legal things such as copyright regulations, banking integration, and multi-blockchain interoperability are outside the present scope and can be done in future work.

This approach is not limited only for the music industry and may also be extended to other forms of digital content such as video streaming, digital artwork, and publishing platforms. Through the use of decentralized technologies, the study attempts to create a more transparent and good environment where creators maintain better control over their digital assets and earnings.

### **III. BACKGROUND AND MOTIVATION**

In this music industry, major streaming platforms such as Spotify and Apple Music control a large part of digital music distribution. These platforms have made music easily accessible to listeners in the world, but they have also introduced some challenges for artists. One of the major things is the limited transparency in royalty calculation and revenue sharing. Many artists still don't know of how their earnings are calculated or distributed. Also payment delays and the involvement of intermediaries such as record labels, publishers, and distributors further reduce the revenue received by artists.

Because of this many creators receive only a small percentage of the total income generated from their content. This not only affects their financial condition but also reduces confidence in current royalty systems. New artists face additional difficulties because they generally have fewer resources and limited control over content distribution. These issues highlight the need for a royalty management system that is more transparent and provides artists with greater control with their work.

Blockchain technology introduces an alternative approach for focusing these limitations. Rather than depending completely on a centralized authority, blockchain operates through a decentralized network where transaction records are stored in a secure ledger. The information cannot be modified easily, improving trust within the system. Smart contracts further support automation by processing royalty payments according to rules. As a result, artists can receive payments more quickly and with reduced dependency on intermediaries.

#### *A. Role of Blockchain in Royalty Management*

Blockchain technology provides a more efficient method for handling royalty payments in digital music systems. Instead of relying on centralized management, blockchain maintains transaction records through a decentralized ledger where each transaction can be verified securely. Since these records are difficult to alter, the system improves transparency and helps establish trust among users. Using blockchain, artists can interact more directly with listeners, while transactions related to music ownership and royalty payments can be tracked more accurately [4].

#### *B. Smart Contracts for Automated Payments*

Smart contracts are one of the key components of blockchain technology. These are automated programs that execute predefined actions whenever certain conditions are met. In music royalty management systems, smart contracts can automatically transfer payments to artists whenever music is streamed, purchased, or resold. This helps reduce payment delays, minimizes human errors, and decreases manual involvement, making the royalty distribution process faster and more reliable [2].

#### *C. NFT-Based Ownership in Music*

Non-Fungible Tokens (NFTs) offer a digital method for representing ownership of music content. Since every NFT is unique and cannot be duplicated, it can be used to verify ownership of songs, albums, and other digital assets. By converting music files into NFTs, artists can maintain better control over their content and monitor its usage more effectively. NFTs also enable artists to receive royalties not only from the initial sale but also from future resales, creating additional income opportunities.

#### IV. LITERATURE REVIEW

In recent years, blockchain technology has attracted significant attention in the music industry for solving problems related to royalty distribution, copyright management, and transaction transparency. Existing royalty systems mostly rely on centralized platforms and multiple intermediaries, which often result in delayed payments and limited transparency for artists. Because of these issues, researchers are exploring de-centralized solutions that can support faster and more reliable royalty management.

Traditional music distribution models mainly depended on record labels, publishers, and streaming platforms to manage content distribution and payments. While these systems helped music reach a large audience, they also created problems such as unequal revenue sharing and reduced control for artists. In many cases, independent creators receive only a small portion of the total revenue generated from their work. Recent studies suggest that conventional royalty systems are becoming less suitable for the modern digital environment, especially with the rapid growth of independent music creators and online streaming services [4].

##### *A. Blockchain-Based Music Distribution Systems*

Several blockchain-based approaches have been proposed to improve transparency and operational efficiency in music distribution systems. These platforms use decentralized ledgers to store transaction records securely, reducing the possibility of unauthorized modifications. Dhore et al. presented a decentralized music distribution framework that integrates NFTs and smart contracts to automate royalty payments while reducing dependency on intermediaries [1]. Similarly, Li et al. proposed a blockchain-based copyright management system capable of securely tracking ownership information and usage rights [6].

##### *B. Smart Contracts for Royalty Automation*

Smart contracts play an important role in automating royalty payments within blockchain-based systems. These contracts execute predefined operations automatically whenever specified conditions are satisfied. In music distribution platforms, smart contracts can transfer royalty payments to artists without requiring manual intervention. Moreaux and Mitrea demonstrated that blockchain-enabled payment systems can support continuous and fair royalty distribution for digital creators [2]. Such systems help artists receive payments more efficiently whenever their content is streamed, purchased, or resold.

##### *C. NFT-Based Ownership and Rights Management*

Non-Fungible Tokens (NFTs) provide a digital mechanism for representing ownership of music-related content. Since every NFT contains a unique identifier, artists can use them to verify ownership and monitor content usage more effectively. Murray explained that NFT-enabled smart contracts can also support resale royalty mechanisms, allowing artists to continue earning revenue after the initial sale of their work [8]. Additionally, studies on Ethereum-based NFT frameworks indicate that standards such as ERC-721 assist in maintaining transparent and secure ownership records [9].

##### *D. Integration of Blockchain with Emerging Technologies*

Recent studies have also examined the integration of blockchain with advanced technologies such as Artificial Intelligence (AI) to improve digital content protection. Na Li proposed a framework in which blockchain is combined with AI-based techniques to strengthen copyright security and automate content verification processes [5]. These integrated approaches aim to develop more intelligent and efficient systems for managing digital assets in the music industry.

##### *E. Challenges and Limitations in Existing Systems*

Although blockchain technology provides several advantages, multiple challenges still limit its large-scale adoption. Issues including scalability limitations, high transaction costs (gas fees), and lower adoption rates affect practical implementation in real-world environments. Arcos stated that blockchain adoption in the music industry is still in its early phase and requires further improvements to address both technical and financial concerns [7]. In addition to this, user awareness and system usability also influence adoption and long-term acceptance.

##### *F. Research Gaps and Motivation*

Despite the progress made in this field, many existing solutions still do not offer a complete framework. Most available systems focus mainly on individual features such as ownership verification or payment automation rather than integrating all necessary components into a single platform. To address these limitations, the proposed work combines smart contracts, NFTs, and IPFS within a unified system. This integration supports secure storage, transparent ownership tracking, and automated royalty payments. The primary objective is to design a scalable and practical framework that can support artists more effectively and improve trust in digital

music distribution.

## V. PROPOSED SYSTEM

The proposed system presents a decentralized application (DApp) designed to improve royalty distribution in the music industry through blockchain technology. Unlike conventional approaches that depend on intermediaries, the platform supports direct interaction between artists and listeners. By integrating smart contracts, Non-Fungible Tokens (NFTs), and decentralized storage, the system improves transparency, security, and royalty payment processing. This approach helps reduce delays and allows artists to maintain better control over their content and earnings.

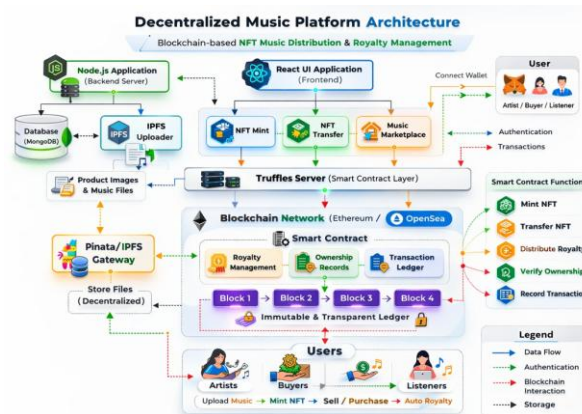


Fig. 1. System Architecture: Blockchain-Based Music Royalty Distribution Platform

### A. System Overview

The platform allows artists to upload music files and convert them into NFTs that represent ownership of digital assets. These files are stored using IPFS, providing decentralized storage where data cannot be modified easily. Smart contracts handle royalty transactions automatically whenever activities such as streaming, purchasing, or reselling occur. Users can access the platform through a web interface and authenticate using crypto wallets such as MetaMask.

### B. System Architecture

The system consists of multiple connected components that work together to support platform operations:

Frontend (React UI): Manages user interaction for artists, buyers, and listeners

Backend (Node.js Server): Handles API requests and application-level operations

Blockchain Layer (Ethereum): Stores transaction records and executes smart contracts

Smart Contract Layer (Truffle): Manages NFT minting, ownership transfer, and royalty logic

Storage Layer (IPFS/Pinata): Maintains decentralized storage for music files and metadata

Database (MongoDB): Stores user information and application-related data

These components collectively provide a secure, scalable, and efficient framework for music transaction management and royalty distribution.

### C. System Workflow

- 1) **Artist Upload:** Artists upload music files along with information such as title, genre, and description.
- 2) **IPFS Storage:** The uploaded content is stored on IPFS, which generates a unique hash value for every file.
- 3) **NFT Creation:** Each uploaded music asset is converted into an NFT linked with blockchain ownership records.
- 4) **Smart Contract Processing:** Smart contracts manage royalty distribution rules and maintain ownership details.
- 5) **User Interaction:** Users can stream or purchase music using the platform interface.
- 6) **Royalty Payment:** Royalty payments are transferred automatically to artists according to predefined percentages.

#### D. Mathematical Representation

Let:

$$M = \{m_1, m_2, \dots, m_n\} \quad (\text{Set of music assets}) \quad (1)$$

$$U = \{u_1, u_2, \dots, u_n\} \quad (\text{Set of users}) \quad (2)$$

$$R \quad (\text{Royalty percentage}) \quad (3)$$

The royalty payment can be calculated as:

$$P = R \times T \quad (4)$$

where:

- $P$  = Payment received by the artist
- $T$  = Total transaction amount

#### E. Implementation Details

The platform is developed using modern web and blockchain technologies:

Blockchain: Ethereum

Smart Contracts: Solidity (Truffle Framework)

Frontend: React.js

Backend: Node.js with Express.js

Storage: IPFS using Pinata

Wallet Integration: MetaMask

This architecture supports scalability, improved security, and efficient transaction processing.

#### F. Expected Outcomes

The proposed system is intended to provide: Clear and traceable royalty payments

Fast and automated transactions

Secure ownership verification through NFTs Reduced dependency on intermediaries

The platform aims to create a fair ecosystem where artists can receive direct benefits from their digital content.

#### G. Performance Insight

Compared with conventional royalty management systems, the proposed approach improves operational efficiency by reducing payment delays and improving transaction transparency. Blockchain technology maintains permanent and verifiable transaction records, while smart contracts automate payment execution without requiring manual intervention. As a result, the system provides a scalable and dependable framework for modern digital music distribution.

## VI. RESULTS AND DISCUSSION OF THE PROPOSED FRAMEWORK

The developed blockchain-based framework focuses on improving transparency, efficiency, and fairness in music royalty distribution. Unlike conventional royalty systems that depend heavily on intermediaries, this approach combines smart contracts, NFTs, and IPFS to automate royalty handling and secure transaction records. The obtained results show noticeable improvements in both payment speed and revenue sharing when compared with existing royalty distribution methods [15].

#### A. Royalty Payment Speed Analysis

One of the key improvements observed in the framework is the reduction in royalty payment processing time. In traditional systems, artists may wait for weeks or even months before receiving payments because transactions pass through multiple intermediaries and verification stages.

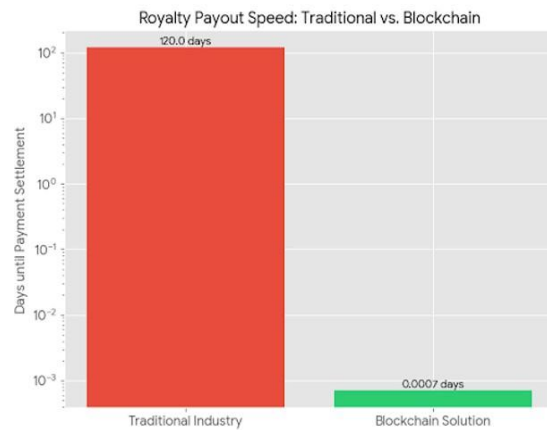


Fig. 2. Comparison of royalty payout speed between traditional systems and blockchain-based solution

Figure 2 shows that conventional royalty systems may require nearly **120 days** to complete payment processing. In contrast, the blockchain-based framework can complete transactions almost instantly (around **0.0007 days**, which is only a few seconds). This improvement is mainly possible because smart contracts automatically execute royalty payments once predefined conditions are satisfied.

*B. Revenue Distribution Comparison*

Revenue sharing is another important factor considered in this work. In many existing music platforms, a significant portion of the generated revenue is retained by intermediaries, reducing the final earnings received by artists.

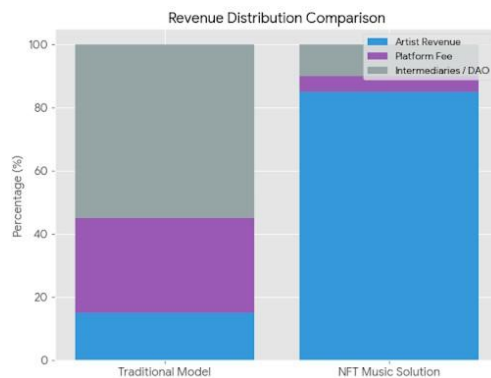


Fig. 3. Revenue distribution comparison between traditional model and NFT-based music platform

As illustrated in Figure 3, artists using traditional royalty systems often receive only a limited share of the total revenue, while platforms and intermediaries retain a major percentage. In comparison, the NFT-based framework allows artists to retain nearly **85% or more** of their earnings. This creates a more balanced and fair revenue model for content creators.

*C. Transparency and Security Analysis*

The framework stores royalty transactions and ownership information on a public blockchain ledger, making records easier to verify whenever required. Since blockchain data is difficult to alter, the chances of fraud and ownership disputes are reduced. This also improves trust among artists and platform users.

For storing music assets, IPFS is used as a decentralized storage solution. In practice, this helps improve file availability and protects data from unauthorized modification or accidental loss.

*D. System Efficiency and Automation*

Smart contracts play an important role in automating royalty distribution. Once payment rules are defined, transactions are executed automatically without requiring manual approval. This reduces operational overhead, minimizes human error, and improves the overall efficiency of the system.

The platform also supports smooth interaction between artists, listeners, and buyers through a user-friendly interface, making the framework more suitable for practical deployment.

*E. Advantages of the Proposed Framework*

- **Instant Payments:** Royalty transactions are processed quickly through automated smart contracts
- **Transparency:** Transaction records can be verified directly on the blockchain
- **Fair Revenue Sharing:** Artists receive a larger share of the generated revenue
- **Secure Ownership:** NFTs help maintain clear and verifiable ownership records
- **Decentralized Storage:** IPFS provides distributed and tamper-resistant storage for digital assets

*F. Limitations and Future Work*

Although the proposed framework offers several advantages, certain limitations still exist. Blockchain networks such as Ethereum may involve high transaction costs (gas fees), which can affect scalability and large-scale deployment. Additionally, adoption of blockchain-based platforms may require time since users need familiarity with decentralized technologies and digital wallets.

Future enhancements may include integrating Layer-2 solutions such as Polygon to reduce transaction costs, improving the user interface for better usability, and extending the framework to support cross-chain communication and real-world payment integration.

*G. Discussion*

The obtained results indicate that the proposed blockchain-based framework improves both efficiency and fairness in music royalty distribution. By minimizing payment delays and increasing transaction transparency, the system contributes to building trust among artists and platform users. The integration of NFTs, smart contracts, and decentralized storage establishes a reliable ecosystem capable of addressing several limitations found in conventional royalty systems.

The proposed approach also demonstrates strong potential for practical implementation and may contribute to improving the management and monetization of digital content in modern distribution platforms.

## VII. COLLABORATION OPPORTUNITIES

Developing a blockchain-based music royalty platform requires not only technical implementation but also effective collaboration among academic institutions, industry partners, and government organizations. Since the framework involves technologies such as blockchain, NFTs, and decentralized storage, access to real-world datasets, infrastructure, and domain expertise is important for improving system performance and supporting practical deployment.

Academic institutions including the Indian Institutes of Technology (IITs) and National Institutes of Technology (NITs) can contribute through research in blockchain systems, distributed computing, and digital rights management. Government organizations such as CDAC India may provide computational resources, cybersecurity support, and technical guidance for large-scale deployment. Industry organizations like Tata Consultancy Services (TCS), Infosys, and Tech Mahindra can assist with scalability testing, deployment strategies, and integration with existing digital platforms. Furthermore, collaboration with music streaming services, independent artists, and digital content organizations can help evaluate the framework under practical usage conditions.

*A. Forms of Collaborative Activities*

- Secure and ethical sharing of music-related datasets for testing and evaluation
- Joint research initiatives to improve scalability and optimize transaction costs
- Real-world testing of the framework with active user participation
- Academic and industry collaboration through internships, workshops, and hackathons
- Access to research grants and industry-sponsored development programs

These collaborative efforts can improve the scalability, reliability, and practical applicability of the framework. Through coordinated participation from different stakeholders, the system can support the development of a more transparent, efficient, and creator-focused digital music ecosystem.

## VIII. CHALLENGES AND LIMITATIONS

Although blockchain technology offers an effective approach for improving transparency and fairness in music royalty distribution, several challenges still affect its practical adoption and large-scale deployment. These limitations are mainly associated with scalability, transaction cost, user awareness, and integration with existing digital platforms.

- **Scalability issues:** Public blockchain networks such as Ethereum may experience performance limitations when processing a large number of transactions, which can affect overall system efficiency.
- **High transaction costs:** Executing smart contracts requires transaction fees (gas fees), which may increase significantly during periods of high network activity, making frequent transactions costly.

- **User adoption challenges:** Many users, including artists and listeners, have limited familiarity with blockchain platforms, digital wallets, and NFTs, which can slow system adoption.
- **Integration with existing systems:** Integrating blockchain-based frameworks with current music platforms and traditional financial infrastructures may require additional development effort and time.
- **Data storage limitations:** Storing large music files directly on blockchain networks is not practical due to storage constraints, making decentralized storage platforms such as IPFS necessary.
- **Security risks:** Although blockchain networks provide strong security, vulnerabilities in smart contract code may result in financial risks if contracts are not properly tested and audited.
- **Regulatory and legal issues:** Regulations related to blockchain technology and NFTs are still evolving, which may create uncertainty regarding copyright management and digital ownership rights.
- **Network latency:** Transaction confirmation time may vary depending on network congestion, which can influence real-time transaction performance.
- **Environmental concerns:** Certain blockchain networks consume a considerable amount of energy, leading to concerns regarding environmental sustainability.

The proposed blockchain-based framework improves transparency, automation, and fairness in royalty distribution. However, limitations such as transaction cost, scalability challenges, and lower adoption rates must be addressed for broader implementation.

Future enhancements may focus on improving efficiency through Layer-2 technologies, increasing usability, and strengthening security using advanced smart contract testing and auditing techniques.

## IX. CONCLUSION

The rapid growth of digital music platforms has created new opportunities for music distribution, but it has also highlighted several problems in royalty management and payment transparency. Existing royalty systems still rely heavily on intermediaries, which often leads to delayed payments, reduced earnings for artists, and limited visibility into how revenue is shared.

This work presented a blockchain-based framework for music royalty distribution using smart contracts, Non-Fungible Tokens (NFTs), and decentralized storage through IPFS. The framework automates royalty transactions and maintains transparent transaction records, allowing artists to manage their digital content more directly while receiving payments faster and with fewer processing delays.

The obtained results indicate improvements in payment speed, revenue sharing, and ownership tracking when compared with conventional royalty systems. Since transactions are handled through smart contracts, artists can receive payments more efficiently without depending entirely on centralized platforms. The decentralized structure also improves data security and helps reduce the possibility of fraud or unauthorized modification.

Overall, the developed framework shows strong practical potential for modern digital music ecosystems. It can support a more transparent and fair royalty distribution process while giving artists better control over their digital assets and earnings.

Future work can focus on reducing transaction costs through Layer-2 technologies, improving user experience, and extending the framework to support cross-chain compatibility and integration with real-world financial systems.

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