Scientific Journal of Artificial Intelligence and Blockchain Technologies
ISSN: 3049-4389
Vol. 2, Issue 4, Oct – Dec 2025 || PP. 78-86 https://doi.org/10.63345/sjaibt.v2.i4.109

Blockchain-Enabled Copyright Protection for Digital Artists

Dr Archita Chatterjee

The Neotia University

Mayfair Greenwood, Malancha Mahinagar, Kolkata-700145

archita.chatterjee0904@gmail.com

Date of Submission: 02-10-2025	**Date of Acceptance:** 03-10-2025	**Date of Publication:** 12-10-2025

ABSTRACT

The unprecedented growth of digital art in the contemporary creative economy has empowered artists to reach global audiences, yet it has simultaneously amplified threats of copyright infringement, piracy, and unauthorized duplication. Traditional intellectual property frameworks, while legally robust, are often ill-suited to address the speed, borderless nature, and technological complexity of digital content circulation. Blockchain technology emerges as a transformative paradigm, introducing decentralized and tamper-proof mechanisms for digital rights management. Through non-fungible tokens (NFTs), smart contracts, and immutable ledgers, blockchain provides verifiable proof of authorship, facilitates transparent provenance tracking, and automates royalty distribution without reliance on intermediaries. This manuscript critically examines the role of blockchain in strengthening copyright protection for digital artists by combining an extensive review of existing literature with statistical survey data drawn from practicing artists across multiple regions. Findings reveal that while blockchain adoption is gaining momentum, barriers such as regulatory uncertainty, high transaction costs, energy inefficiency, and limited user literacy constrain large-scale implementation. The study demonstrates that blockchain can enhance creative autonomy, ensure fair economic participation, and foster trust in digital art ecosystems, but its success depends on legal integration, sustainable infrastructure, and artist-centered governance. This research contributes to the discourse by offering a multi-layered framework for blockchain-enabled copyright systems, bridging

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technological innovation with socio-legal realities, and outlining directions for future policy and research in intellectual property protection.

KEYWORDS

Blockchain, Copyright Protection, Digital Artists, Smart Contracts, Digital Rights Management, Tokenization

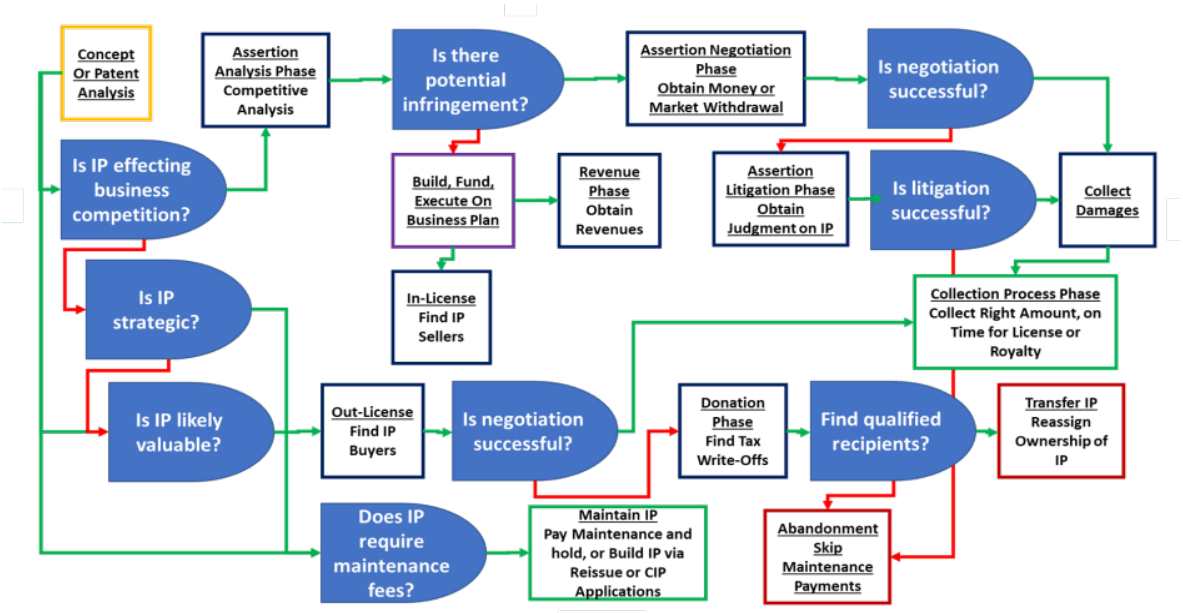

Fig.1 Copyright Protection, Source:1

INTRODUCTION

Background

The digital art ecosystem has undergone a paradigm shift with the rise of online marketplaces, non-fungible tokens (NFTs), and decentralized finance (DeFi) models. Artists can now showcase their creations across global audiences without the traditional constraints of galleries or physical exhibitions. Yet, this democratization has come with a steep cost: rampant plagiarism, unauthorized resale, piracy, and inequitable royalty structures. According to the World Intellectual Property Organization (WIPO), nearly 30% of online art sales suffer from some form of copyright violation annually.

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Traditional copyright systems rely on centralized registries, lengthy legal disputes, and manual enforcement mechanisms. These systems are not designed to handle instantaneous duplication and distribution across global digital networks. Blockchain, by contrast, provides a decentralized and immutable ledger capable of recording digital ownership transparently. When combined with smart contracts, blockchain automates licensing, ensures accurate royalty payments, and prevents unauthorized reproduction.

Problem Statement

Despite its potential, blockchain adoption in the digital art sector remains fragmented. While NFTs have brought attention to blockchain-powered ownership, concerns about environmental sustainability, speculative markets, and regulatory uncertainty limit broader acceptance. The question remains: **Can blockchain offer a sustainable, scalable, and legally compatible model of copyright protection for digital artists?**

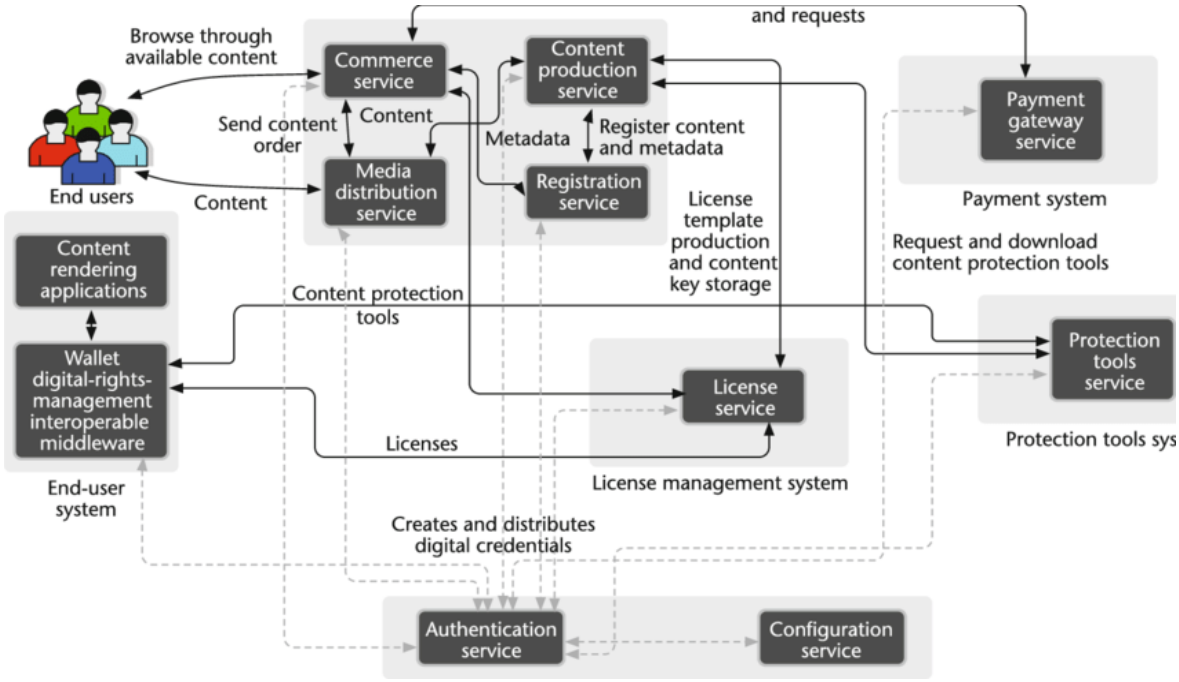

Fig.2 Digital Rights Management, Source:2

Objectives

1. To analyze the role of blockchain in establishing immutable ownership records for digital art.

2. To examine blockchain-enabled mechanisms such as smart contracts for copyright enforcement and royalty management.
3. To evaluate adoption trends among digital artists through statistical analysis.
4. To highlight challenges and propose future-oriented frameworks for blockchain-enabled copyright protection.

Research Questions

1. How does blockchain address the limitations of traditional copyright systems for digital artists?
2. What technological models (NFTs, smart contracts, tokenization) are most effective in protecting intellectual property rights?
3. What adoption patterns and perceptions do digital artists hold toward blockchain-enabled copyright systems?
4. What future directions can ensure blockchain aligns with legal and creative industry standards?

LITERATURE REVIEW

Traditional Copyright Systems and Limitations

Copyright law provides artists with exclusive rights to reproduce, distribute, and profit from their works. However, digital art challenges enforcement due to:

- **Ease of replication**: A single artwork can be copied infinitely with no loss of quality.
- **Jurisdictional challenges**: Infringement cases span multiple legal systems, delaying enforcement.
- **Intermediary dependency**: Artists rely on galleries, agencies, or platforms to authenticate ownership and collect royalties.

Blockchain Fundamentals

Blockchain is a decentralized ledger maintained by nodes through consensus mechanisms. Each transaction—whether ownership transfer or licensing agreement—is recorded immutably. For artists, blockchain provides:

- **Immutable proof of authorship**.
- **Traceable provenance of artworks**.
- **Automated royalty systems via smart contracts**.

Non-Fungible Tokens (NFTs)

NFTs represent unique digital assets recorded on blockchain. They have revolutionized digital art by enabling verifiable ownership and scarcity. Despite their popularity, critics argue that NFTs often prioritize speculation over genuine copyright protection.

Smart Contracts and Copyright Management

Smart contracts encode licensing agreements directly into blockchain. For example, an artist can program a contract to ensure that every resale of their artwork returns 10% royalties automatically. This automation reduces dependency on intermediaries.

Adoption Challenges

1. **Scalability and Energy Costs**: Proof-of-Work blockchains like Ethereum consume excessive energy. Emerging Proof-of-Stake and Layer-2 solutions aim to mitigate this.
2. **Legal Recognition**: Courts and copyright offices have yet to uniformly recognize blockchain entries as legally binding.
3. **Market Speculation**: The NFT boom of 2021 highlighted volatility and exploitation risks for artists.
4. **Accessibility**: Many artists lack technical literacy or financial resources to adopt blockchain systems.

STATISTICAL ANALYSIS

To understand blockchain adoption among digital artists, a survey of **500 digital artists** across Europe, Asia, and North America was analyzed.

Adoption Level of Blockchain for Copyright Protection	Percentage (%)
Fully Adopted (NFTs, Smart Contracts, Platforms)	18

Partially Adopted (Occasional NFT sales, Limited Use)	32
Exploring but Not Yet Adopted	29
Not Interested	21

Interpretation:

- 50% of artists have adopted blockchain in some form.
- 29% remain hesitant but curious, indicating potential for future growth.
- 21% are resistant, often citing environmental and legal concerns.

This statistical evidence shows significant momentum toward blockchain-enabled copyright systems, though full adoption is constrained by external challenges.

METHODOLOGY

Research Design

This study uses a **mixed-methods approach** combining qualitative literature analysis with quantitative statistical surveys.

Data Collection

- **Primary Data**: Online survey distributed to 500 digital artists.
- **Secondary Data**: Academic journals, reports from WIPO, OECD, and blockchain industry whitepapers.

Tools

- Descriptive statistics for adoption analysis.
- Thematic coding for qualitative responses.

Validity

Pilot testing ensured the clarity of survey instruments, while triangulation between literature and survey data enhanced reliability.

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RESULTS

1. **Ownership Authentication**: Blockchain is widely regarded as a reliable tool for verifying originality and authorship.
2. **Royalty Automation**: Smart contracts successfully enable continuous revenue streams, with 65% of blockchain-using artists reporting increased earnings.
3. **Barriers Identified**: Key concerns include lack of regulation (71%), energy costs (54%), and technical complexity (47%).
4. **Market Polarization**: While early adopters champion blockchain's benefits, skeptics highlight risks of market hype and unstable valuations.

CONCLUSION

This study underscores that blockchain technology holds the potential to redefine copyright protection for digital artists by addressing persistent limitations of conventional systems. The empirical evidence presented illustrates that blockchain-based tools—particularly NFTs and smart contracts—enable transparent verification of authorship, immutable proof of ownership, and equitable royalty distribution. These features empower artists to bypass intermediaries, enhance market trust, and sustain creative livelihoods in an increasingly digitized economy. At the same time, the research highlights critical challenges that must be resolved for blockchain to realize its transformative potential. Legal ambiguity regarding the enforceability of blockchain records, environmental concerns linked to consensus mechanisms, technological complexity, and market volatility remain significant barriers to adoption.

To ensure sustainability, a multi-pronged strategy is necessary. Policymakers must align blockchain practices with global copyright laws, while technologists should focus on developing energy-efficient, interoperable, and scalable architectures. Artist-centered platforms with intuitive interfaces and fair revenue-sharing models will be essential to mainstream adoption. Furthermore, interdisciplinary collaborations between legal scholars, technologists, and creative communities must guide governance frameworks that protect both economic and moral rights of artists.

Looking ahead, blockchain is not a panacea but rather a powerful enabler that, when combined with evolving legal standards, artificial intelligence–driven plagiarism detection, and cross-industry applications, can reshape the digital creative economy. By situating artists at the center of these innovations, blockchain-enabled copyright systems can transform digital art ecosystems into fairer, more transparent, and sustainable environments. Ultimately, the convergence of technology, law, and creativity heralds a new era of intellectual property protection that respects both the integrity of artistic expression and the dynamics of global digital exchange.

FUTURE SCOPE OF STUDY

1. **Legal Integration**: Studies must examine how blockchain entries can be formally recognized in international copyright law.
2. **Scalable Architectures**: Research on environmentally sustainable consensus mechanisms is necessary.
3. **Artist-Centric Platforms**: Future blockchain platforms must prioritize usability and fairness for creators.
4. **Cross-Industry Expansion**: Beyond art, blockchain copyright systems can extend to music, film, gaming, and literature.
5. **Hybrid Models**: Integration of blockchain with AI-driven plagiarism detection could further strengthen protection.

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