BLOCKCHAIN TECHNOLOGY IN INTELLECTUAL PROPERTY: REVOLUTIONIZING COPYRIGHT PROTECTION AND ADDRESSING CHALLENGES

Malay Kumar Behera, Dept. of Law, Research Scholar. Sambalpur University, Odisha

Prof. Sudhansu Ranjan Mohapatra, HOD, Dept. of Law, Guru Ghasidas University, Bilaspur, (C.G.)

ABSTRACT

This paper critically examines the transformative potential of blockchain technology in reshaping copyright protection under the intellectual property (IP) framework. With the rise of digital content creation and distribution, copyright enforcement has become increasingly complex due to piracy, unauthorized reproductions, and inefficiencies in existing systems. Blockchain, with its decentralized and immutable ledger, offers innovative mechanisms for ensuring transparency, authorship authentication, efficient licensing, and fair royalty distribution. Through a multidisciplinary approach, this paper explores blockchain's integration with copyright law, evaluates its strengths and limitations, and identifies potential pathways for global adoption. By engaging with international treaties, national legal systems, and case studies, the paper highlights blockchain's ability to augment copyright protection while recognizing challenges related to scalability, interoperability, legal enforceability, and regulatory acceptance. The study concludes by suggesting a roadmap for harmonized adoption of blockchain in copyright protection, with implications for policymakers, creators, and global IP governance.

Keywords: Blockchain, Intellectual Property, Copyright, Digital Rights Management, Smart Contracts, Innovation

1. Introduction

Intellectual property (IP) rights constitute the foundation of modern knowledge economies, incentivizing creativity, fostering innovation, and ensuring fair commercial exploitation of intangible assets. Copyright, as a core pillar of IP law, plays a pivotal role in safeguarding literary, artistic, musical, and digital works. However, the exponential growth of the internet and digital ecosystems has amplified infringement risks, including piracy, unauthorized duplication, and difficulties in enforcing rights across borders.

Traditional copyright frameworks, rooted in centralized systems, often fail to keep pace with the demands of real-time content distribution and globalized digital markets. Registration delays, evidentiary challenges, and lack of transparency further weaken their effectiveness. Against this backdrop, **blockchain technology has emerged as a disruptive tool with the potential to revolutionize copyright protection.**

Blockchain, a decentralized, immutable, and transparent ledger system, enables secure record-keeping and automated enforcement through *smart contracts*. By embedding copyright metadata within blockchain systems, creators can assert authorship, automate licensing, and track royalty payments with unprecedented accuracy. Yet, despite its promise, blockchain integration raises pressing legal, technical, and policy challenges.

This research seeks to address the following key questions:

1. How can blockchain technology be effectively leveraged for copyright protection and enforcement?

2. What challenges arise in integrating blockchain with existing legal frameworks?

3. How can global harmonization of blockchain-based copyright systems be achieved?

2. Literature Review

The intersection of blockchain and intellectual property has received increasing scholarly and policy attention in recent years. Swan (2015) highlighted blockchain's potential beyond cryptocurrency, particularly in decentralized record-keeping. De Filippi and Wright (2018) underscored blockchain's legal implications, including governance of digital assets. In

copyright scholarship, Finck and Moscon (2019) examined blockchain's application to authorship verification and licensing, while Choi (2021) analyzed its role in addressing cross-border enforcement.

Empirical studies show that blockchain platforms like **KodakOne**, **Ascribe**, and **Mycelia** demonstrate feasibility for image licensing and music royalties. The World Intellectual Property Organization (WIPO) has also initiated discussions on blockchain's role in digital copyright, emphasizing interoperability with national IP offices.

Despite enthusiasm, gaps remain. Existing scholarship often highlights blockchain's technical promise without sufficiently addressing issues of legal enforceability, jurisdictional conflicts, and integration with international copyright treaties. This paper fills that gap by offering a comprehensive legal-technological analysis.

3. Blockchain Technology: Concept and Mechanisms

Blockchain is a **distributed ledger technology (DLT)** where data is stored in blocks linked through cryptographic hashes, ensuring immutability and transparency. Key features include:

- **Decentralization:** No single authority controls the ledger.
- **Immutability:** Records cannot be altered once validated.
- **Consensus Mechanisms:** Proof-of-Work, Proof-of-Stake, and other models ensure reliability.
- **Smart Contracts:** Self-executing agreements coded on the blockchain.
- **Tokenization and NFTs:** Representation of assets as digital tokens, increasingly relevant to copyright-protected works.

These attributes collectively make blockchain uniquely suited for copyright management, where authenticity, traceability, and secure ownership claims are essential.

4. Blockchain in Copyright Protection

4.1 Registration and Proof of Authorship

Blockchain allows creators to timestamp works at the moment of creation. This creates an immutable record of authorship that can serve as **prima facie evidence** in legal disputes. Platforms like *Po.et* and *Ascribe* already offer such services.

4.2 Digital Rights Management (DRM) and Licensing Automation

Smart contracts automate licensing agreements by embedding terms directly into blockchain systems. This reduces transaction costs, enhances transparency, and ensures royalties are automatically distributed to rights holders.

4.3 Transparent Royalty Distribution

The music industry faces persistent challenges in royalty allocation. Blockchain-enabled platforms such as **Mycelia (founded by musician Imogen Heap)** demonstrate how smart contracts can distribute royalties equitably, reducing disputes.

4.4 Cross-border Enforcement

Blockchain facilitates global recognition of copyright claims by providing a universally accessible ledger. This feature is particularly valuable for creators in jurisdictions with weak enforcement infrastructure.

4.5 Case Studies

- **KodakOne:** Developed for photographers to register images and monitor unauthorized usage.
- **Ascribe:** Early blockchain platform for digital art registration.
- **Mycelia:** Focused on fair-trade music distribution.

5. Legal and Regulatory Perspectives

5.1 International Framework

The **Berne Convention (1886)**, **TRIPS Agreement (1994)**, and **WIPO Copyright Treaty (1996)** form the foundation of international copyright law. However, these instruments predate blockchain and offer no explicit recognition of decentralized records.

5.2 National Laws

- **United States:** Copyright registration is centralized under the U.S. Copyright Office. While blockchain can serve as supporting evidence, courts have not yet uniformly recognized blockchain records.
- **European Union:** The EU has explored blockchain integration with IP registries through initiatives like the *EUIPO Blockchain Pilot Project*.
- **India:** Copyright registration remains manual, though discussions on adopting blockchain for IP records are underway.

5.3 Admissibility of Blockchain Evidence

Courts in China have explicitly recognized blockchain records as admissible evidence (Hangzhou Internet Court, 2018). Similar recognition in other jurisdictions is evolving, but harmonization is lacking.

6. Challenges and Limitations

6.1 Technical Barriers

Scalability, high energy consumption (in Proof-of-Work systems), and interoperability across blockchains remain unresolved.

6.2 Privacy vs. Transparency Paradox

Blockchain's immutability conflicts with privacy laws such as the **EU's GDPR**, which guarantees a "right to be forgotten."

6.3 Legal Enforceability of Smart Contracts

Smart contracts raise questions about enforceability under contract law, particularly regarding consent, jurisdiction, and dispute resolution.

6.4 Jurisdictional Conflicts

Blockchain's decentralized nature challenges territorial copyright laws. A cross-border consensus is urgently needed.

6.5 Economic and Social Concerns

High implementation costs and lack of awareness among small creators may limit adoption, potentially deepening inequalities.

7. Future Directions and Policy Recommendations

1. **Legal Recognition of Blockchain Records:** National legislatures should explicitly recognize blockchain timestamps as evidence of authorship.

2. **Integration with Copyright Registries:** Governments and WIPO could establish blockchain-based IP databases interoperable across jurisdictions.

3. **Smart Contract Regulation:** Standardization of smart contract frameworks is essential for enforceability.

4. **Public–Private Partnerships:** Collaboration between governments, academia, and tech industries can foster cost-effective platforms.

5. **Awareness and Capacity Building:** Training for creators, legal professionals, and IP offices on blockchain use.

8. Conclusion

Blockchain technology represents a paradigm shift in copyright protection by providing immutable records, automated enforcement, and transparent royalty management. Its integration into IP law, however, is not without obstacles—legal enforceability, jurisdictional uncertainties, and technical barriers must be addressed through coordinated global action.

A hybrid model—where blockchain complements existing copyright frameworks—appears most viable in the near term. Policymakers, international organizations, and creators must collaborate to ensure blockchain strengthens rather than disrupts copyright systems. Ultimately,

blockchain offers not just technological innovation but a pathway toward equitable, transparent, and future-ready copyright governance.

References

1. Choi, S. (2021). *Blockchain and International Copyright Enforcement: A Legal Analysis.* Journal of Intellectual Property Law, 28(3), 121–149.

2. De Filippi, P., & Wright, A. (2018). *Blockchain and the Law: The Rule of Code.* Harvard University Press.

3. Finck, M., & Moscon, V. (2019). *Copyright Law on Blockchains: Between New Forms of Rights Administration and Digital Rights Management 2.0.* IIC—International Review of Intellectual Property and Competition Law, 50(1), 77–108.

4. Hangzhou Internet Court (2018). *Decision on Blockchain Evidence in Copyright Case.* China IP Review.

5. Swan, M. (2015). *Blockchain: Blueprint for a New Economy.* O'Reilly Media.

6. WIPO (2019). *Blockchain and Intellectual Property Rights.* Geneva: World Intellectual Property Organization.

7. World Trade Organization (1994). *Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).* Geneva.

8. Berne Convention for the Protection of Literary and Artistic Works (1886, as amended).

9. EUIPO (2021). *Blockchain Pilot Project Report.* European Union Intellectual Property Office.