

**Ministry of Science and Higher Education of the
Republic of Kazakhstan
MAQSUT NARIKBAYEV UNIVERSITY**

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**Reevaluating Copyright Law: The Impact of Blockchain Technology
on Ownership Verification and Enforcement Mechanisms**

educational program 7M04210 - «Intellectual Property And Business
Law»

Dissertation for the academic degree of Master of Law

Astana, 2025

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«Admitted to the defense»
Program Manager/Coordinator
«_____» 2025 y.

MASTER'S DISSERTATION

**On the topic: "Reevaluating Copyright Law: The Impact of
Blockchain Technology on Ownership Verification and Enforcement
Mechanisms"**

according to the educational program 7M04210 - « Intellectual Property
And Business Law»

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Astana, 2025

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Program Manager/Coordinator
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TIMELINE FOR DISSERTATION COMPLETION

№	Stages	Deadlines	Status	Signature of a student
1.	Gathering information and reviewing literature for the dissertation study	20.09.2024 - 01.01.2025	100%	
2.	Examination of theoretical content	01.11.2024 - 30.11.2024	100%	
3.	Working out the methodology	01.12.2024 - 21.02.2025	100%	
4.	Data processing	01.12.2024 - 21.12.2024	100%	
5.	Analysis and implantations of the results	25.12.2024 - 10.01.2025	100%	
6.	Preparing the recommendation for thesis work, finishing Introduction	11.01.2025 - 01.02.2025	100%	
7.	Creating the dissertation's Chapter 1 and Chapter 2	01.02.2025 - 01.04.2025	100%	
8.	Creating the dissertation's Chapter 3 and Chapter 4	01.02.2025 - 01.04.2025	100%	
9.	Getting review by the supervisor	01.04.2025 - 01.05.2025	100%	

10.	Overall dissertation editing and revisions	01.04.2025 - 01.05.2025	100%	
11.	Preparing presentation and report for dissertation defence	01.05.2025 – 10.05.2025	100%	
12.	The dissertation defense	10.05.2025-31.05.2025	100%	

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Table of Content

List of abbreviations	8
Chapter I. The Legal Framework of Copyright and Blockchain Technology	18
1.1 Evolution of Copyright Law	18
1.1.2 International Instruments: Covering the Berne Convention, TRIPS Agreement, and WIPO Treaties.	20
1.1.3. National Copyright Frameworks: Exploring those in the EU, US, and selected other states.....	22
Chapter II. Blockchain Technology: A Legal and Technical Overview	26
2.1. Key Features: Discussing decentralization, immutability, and transparency.....	26
2.2. Blockchain in the Context of IP and Copyright	28
2.3. Blockchain Regulation and Policy Developments	30
2.3.1. Legal Status of Blockchain-based Proof in Courts	32
Chapter III. Legal and Enforcement Challenges in a Decentralized Copyright System.....	35
3.1 Centralized vs. Decentralized Enforcement Mechanisms	35
3.2 Blockchain-Specific Enforcement Challenges	39
3.2.1 Lack of Judicial Precedent and Admissibility	40
3.2.2 Absence of Dispute Resolution in Blockchain Systems.....	40
3.3 Comparative and Ethical Dimensions.....	42
Chapter IV: Conclusion, Findings and Suggestions	45
BIBLIOGRAPHY	48
Primary Sources	48
Treaties.....	48
Secondary Sources	48
Books.....	48
Articles	49
Official Documents and Webpages	50

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List of abbreviations

№	Abbreviation	Meaning
1.	AI	Artificial Intelligence
2.	BERNE	Berne Convention for the Protection of Literary and Artistic Works
3.	CJEU	Court of Justice of the European Union
4.	CIS	Commonwealth of Independent States
5.	CMO	Collective Management Organization
6.	CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
7.	DAO	Decentralized Autonomous Organization
8.	DLT	Distributed Ledger Technology
9.	DMCA	Digital Millennium Copyright Act
10.	DRM	Digital Rights Management
11.	EU	European Union
12.	EAEU	Eurasian Economic Union
13.	EUIPO	European Union Intellectual Property Office
14.	FRE	Federal Rules of Evidence
15.	GDPR	General Data Protection Regulation
16.	IP	Intellectual Property
17.	IPFS	InterPlanetary File System
18.	KIPO	Korean Intellectual Property Office
19.	MiCA	Markets in Crypto-Assets Regulation
20.	NFT	Non-Fungible Token
21.	SEC	Securities and Exchange Commission
22.	TPM	Technological Protection Measure
23.	TRIPS	Trade-Related Aspects of Intellectual Property Rights
24.	UKJT	UK Jurisdiction Taskforce
25.	USPTO	United States Patent and Trademark Office
26.	WCT	WIPO Copyright Treaty
27.	WIPO	World Intellectual Property Organization
28.	WPPT	Performances and Phonograms Treaty
29.	WTO	World Trade Organization

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Introduction

a) Relevance of the study

When technology is evolving so fast, creative expression has no choice but to change with it, and copyright law and technology have always been in such an evolving relationship, but especially now that could be argued is their relationship more important.

In the past several years, blockchain technology has ushered in a new age of this evolution—opportunity and challenge that it brings. It is consistent with the literature that Blockchain technology can potentially unlock huge opportunities in raising transparency and increase effectiveness of the Digital Rights Management system."¹

Decentralisation and immutability are inherent characteristics of blockchain that could be used for creating more efficient and transparent systems of managing copyright claims.

With this it remains that there are its own legal issues to the migration away from traditional, centralized digital rights management systems to more decentralized systems. Most existing centralized DRM systems mostly serve major publishers and labels without accounting for that of artists and consumers. In these systems, as in the case of most systems, there is emphasis on the fact that "These systems usually rely upon strict access controls, which can be harmful and do not close the business gap."² Such disparity in the allocation of rights, rewards and obligations in the creative process has to be reconciled, in order that creative rights are to be a more equitable order among all parties concerned.

Therefore, it is pressing that there is a need for legal reforms that takes into account the realities of the decentralized systems. This creates a necessity for such legislative reforms to address the systems in a decentralized form, further complicating enforcement of copies to new technologies (i.e. blockchain), disassociating the technology from legal well-known practice.³

b) Purpose of the study

This study claims to traverse these themes purposefully in an attempt to provide a meaningful contribution to the copyright discourse

¹ M Finck and V Moscon, 'Copyright Law on Blockchains: Between New Forms of Rights Administration and Digital Rights Management Systems' (2018) 50 IIC 77

² RF Ciriello, M Ek, and S Marchisio, 'Blockchain, Copyright and the Value Gap: An Interdisciplinary Perspective' (2023) 45 European Intellectual Property Review 4

³ M Finck and V Moscon, 'Copyright Law on Blockchains: Between New Forms of Rights Administration and Digital Rights Management Systems' (2018) 50 IIC 77

for a digital era. Besides enhancing knowledge of the theoretical groundings of copyright law for the purposes of digitalization, this will contribute to shaping future legislative frameworks in the fields of copyrights and blockchain adaptations. Each of the subsequent chapters hopes to be similarly dependent and to create a rational narrative which elucidates why copyright law needs to adjust to the technological reality, but both are informed by each other.

c) Literature Review

The problem of the intersection of copyright and blockchain technology rightly stays in the limelight and has become a subject of scholarly, legal, and industry attention alike. This chapter critically analyzes the existing literature on this subject with regard to existing theoretical frameworks and deficiencies of the legal structures and implications of digitalization of copyright on the enforcement of copyright.⁴ First, the status quo in current copyright law is analyzed by integrating blockchain innovations and many challenges of the digital ecosystem, with a view of providing a holistic background to understand these complexities.⁵

While existing theoretical frameworks of copyright law often deal with digitalization and evolution of intellectual property right practices, very little has been discussed on copyright jurisprudence in the context of economy of developed country or any developing country.⁶ The current copyright law is based on centralized institutions that need to register and enforce copyrights, however, this may not be possible when technologies such as the blockchain is used.⁷ Effectiveness of these frameworks must be considered in as it is able to deal with the dynamic nature of blockchain. For instance, “A decentralized model based on Ethereum smart contracts and IPFS is a superior solution compared to the current spatial data infrastructures in resolving copyright management problem and single points of failure in centralized systems”.⁸ This exposes a clear need for reform to these existing frameworks to work with the new technology.

Second, the literature has started to investigate broader consequences of digitalization for the traditional copyright system, given how many of the existing practices cease to be effective in the face of

⁴ Daniel J, Samadhiya A and Garza-Reyes JA (eds), *Blockchain Technology: Transforming Businesses and Shaping the Future* (Springer 2021).

⁵ *ibid*

⁶ Srokosz W, Lenio P and Sobieck G, *Blockchain Technology in Project Finance: A Legal and Practical Model for Financing Mega-Investments* (Routledge 2022).

⁷ Vyas S, Shukla VK, Gupta S and Prasad A (eds), *Blockchain Technology: Exploring Opportunities, Challenges, and Applications* (Springer 2022).

⁸ Z, Y., Tang, Z., Huang, J., Ding, Y., He, H., Xia, X., & Li, C. (2020). A Decentralized Model for Spatial Data Digital Rights Management

technological developments.⁹ Digital environment commodity challenges include increased incidences of copyright infringement and unauthorized use making it difficult for the rights holders to enforce such rights.¹⁰ However, in terms of copyright, a study found that "NFTs created a new shipping harbour for artists to profit from their creations, but the inaccuracy remains in copyright law, which needs clear licensing agreements or legal reforms of copyright law."¹¹ This indicates the need for an evolved concept of copyright more sensitive to the unique way in which blockchain technology provides new features.

Integration of blockchain into copyright registration must also be given special focus on the gaps in the legal and institutional frameworks that impede the chances of adopting blockchain technology.¹² Copyright enforcement is still hampered by a fragmentation of legal approaches among jurisdictions due to the cross border nature of blockchain applications and due to the fact that prevailing laws often don't recognize the notion of a cross border application. As for the scholarly work, "in the proposed model, GDRM-OM, Ethereum blockchain, smart contracts, and IPFS have been used for decentralized storage and made a great increase in functionality and security as compared to all the previous available blockchain based DRM systems".¹³ However, this model represents the possible added security and user control that blockchain technology can provide, yet depends on well-equipped legal frameworks.

An additional dimension to take into account is the empirical evidence of the requirement of harmonized international standards on blockchain related copyright enforcement.¹⁴ Blockchain technology exacerbates existing challenges in regards to jurisdictional diversity in the copyright laws. Potential roles of international collaborations in addressing such jurisdictional fragmentation issues are discussed in the literature.¹⁵ Activists and creators are asking for systemic changes to guarantee their rights when they are recognized and guaranteed in a non-centralized setting.¹⁶ "the blockchain has an opportunity to host diverse and diverse critical perspectives and, if it is to prevent its full

⁹ Santos C and Hachad NL, 'Deciphering Blockchain's Role in Danish Decision-Making: Evaluating Opportunities and Challenges Through the Prism of Due Process' (2021) 9(2) *European Journal of Law and Technology*.

¹⁰ Selvarajan S, Mohammad GB, Reddy SB and Balachandran PK (eds), *Big Data and Blockchain Technology for Secure IoT Applications* (Springer 2021).

¹¹ Caglayan Aksoy P and Uner Z O, 'NFTs and Copyright Challenges and Opportunities' (2021)

¹² Poncibò C, 'Distributed Ledger Technology and Property Registers: Displacement or Status Quo?' (2020) 9(1) *European Property Law Journal* 1.

¹³ Z, Y., Tang, Z., Huang, J., Ding, Y., He, H., Xia, X., & Li, C. (2020). A Decentralized Model for Spatial Data Digital Rights Management.

¹⁴ Bonadio E and Sganga C (eds), *NFTs, Creativity and the Law: Within and Beyond Copyright* (Routledge 2023).

¹⁵ Frosio G, 'Re-visiting Copyright: Is There a Way to Tackle Selective Enforcement and Non-Contextual Algorithmic Takedowns? A Discussion Through the Lens of Internet Meme Culture' (2022) 53(2) *International Review of Intellectual Property and Competition Law* 121.

¹⁶ Casey MJ and Vigna P, *The Truth Machine: The Blockchain and the Future of Everything* (Harper Business 2018).

realization as one more financial instrument, activists and artists are not the 'beneficiaries' of pseudo decentralized IP enforcement technologies,"¹⁷ so the assertion by Zilinger highlights how blockchain needs to be regarded as much as a platform to function as a tool or a powerhouse of artistic expression and enforce of rights.

However, as a general conclusion, what it stated is complex and shows the challenges of copyright law and blockchain.¹⁸ Blockchains are being considered as a tool for extending the rights of creators, the most important being the voluntary transfer of rights, and for rewriting copyright practice.¹⁹ A lack of specificity in research, however, has necessitated a means by which the divergence in interpretation, efficacy of current regulatory structures, and overall need for cooperation on crafting a cohesive international standard is addressed so blockchain could be a more fluid integration of the law of copyright.²⁰

d) Statement of the Problem

Since there is little to no supportive legal environment, many of the benefits of blockchain "including the inherent characteristics of blockchain, such as decentralization and immutability, can be used to help in creating more efficient and transparent systems for managing copyright claims"²¹ however, remain unrealised.

Blockchain can give opportunity for democratize this process – allowing creators to machine-sign their works using decentralized platforms. However, this change requires solid legal status of blockchain records as valid authentication of authorship and ownership, and legal framework is not ready for that.²²

The fragmentation arises because jurisdictional standards of recognition and enforcement of copyright vary. Because blockchain technologies, by their very nature as a decentralized technology, cross borders as they are exported by more creators, they find themselves repeatedly struggling to navigate a variety of often conflicting bodies of laws.²³ In particular, existing legal frameworks fall short in ensuring the reliability of evidence that is obtained from blockchain systems, without giving clear protocols, which basically means, there is no evidence, if no protocol exists.

¹⁷ Zeilinger M, 'Digital Art and Blockchain: Reflections on the Intersection of Aesthetics and Technology' (2018) 22(3) *Philosophy and Technology* 333, 336

¹⁸ Bashir I, *Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications* (2nd edn, Packt Publishing 2018).

¹⁹ Tapscott D and Tapscott A, *Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World* (Portfolio Penguin 2016).

²⁰ Antony Lewis, *The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them* (2nd edn, Mango Publishing 2018).

²¹ Caglayan Aksoy P and Uner Z O, 'NFTs and Copyright Challenges and Opportunities' (2021) p 10

²² Daniel Drescher, *The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-Based Projects* (Apress 2019).

²³ Melanie Swan, *Blockchain: Blueprint for a New Economy* (O'Reilly Media 2015).

The only centralized DRM systems today mainly serve the interests of the big publishers and the big labels and ignore the interests of artists and consumers.²⁴ As noted, "This is what the systems often are based on (sometimes very restrictive and quite counterproductive) access controls, as well as the inability to close the 'value gap' (the gap between the value taken by those online services and what is returned to the rights holders)."²⁵ Concretely, this chapter has gone through various core problems to be integrated blockchain in copyright law, the gaps of legal infrastructure, the fragmentation of jurisdiction, and the reforms of institution to support this transition.²⁶ In trying to answer these imperatives questions, we have an ambition to illuminate a way to a more just and open copyright system in the digital age.

e) Rationale of the Study

Integrating blockchain into the surrounding copyright law is significant for ownership display and registration processes. Today, the traditional copyright systems work on centrally modelled and inherently inefficient and vulnerable systems. As for example, "Decentralized data management using blockchain can help improve security and efficiency of digital rights management in use."²⁷ In a sense, blockchain has the potency to unbundle ownership to enable transaction per smart contract posturing the potential for reforming in accordance to modern technological development.

Additionally, fragmentation of standards of jurisdictional jurisdiction makes the systems of creating creators more complicated, given the use of blockchain technology. If we succeed in reigning in the digital domain, it will be on the basis of coping with such jurisdictional differences.²⁸ A second significant aspect of this study involves the importance of the international legal instruments in promoting the recognition of what is created in foreign jurisdictions of the blockchain derived copyright evidence. Currently, creators find themselves in difficulties as their works travel around the world and come across legal environments that differ greatly in the standards for copyright recognition and enforcement.²⁹

²⁴ Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018).

²⁵ Ciriello RF, Ek M and Marchisio S, 'Blockchain, Copyright and the Value Gap: An Interdisciplinary Perspective' (2023) 45 *European Intellectual Property Review* 4, 5.

²⁶ Bashir I, *Mastering Blockchain: Inner Workings of Blockchain, from Cryptography and Decentralized Identities to DeFi, NFTs and Web3* (4th edn, Packt Publishing 2023).

²⁷ Qureshi A and Megías Jiménez D, 'Blockchain-Based Multimedia Content Protection: Review and Open Challenges' (2021)

²⁸ Voulgaris N, *Blockchain and the Supply Chain: Concepts, Strategies and Practical Applications* (Kogan Page 2022).

²⁹ Kashyap R, *Blockchain and Web3: Building the Cryptocurrency, Privacy, and Security Foundations of the Metaverse* (Apress 2023).

"Benefits of using blockchain to protect copyright multimedia are that this will help in decentralization, security enhancement and transparency of transactions of the transaction itself."³⁰

Based on these arguments, it is clear that the motivation for this study is anchored in the idea that the best integration of blockchain technology into copyright law will pay off in significant rewards for creators and other players in the digital ecosystem.³¹

f) Research Objectives

The objective of first importance is to specify particular legal reform necessary to incorporate blockchain technology to copyright registration and verification processes. In other words, it entails reviewing current copyright systems to determine if blockchain-derived contents may be considered authentic proof of authorship. As mentioned by literature, "Blockchain technology has a great potential to improve the multimedia copyright protection through decentralization, transparency and strengthen of security".³² And this could enable creators to communicate together and streamline the registration system process.

A potential application for blockchain in copyright is to establish a decentralized model that delivers better results than what is being used today in the spatial data infrastructures. Example of such is a "model using Ethereum smart contracts and IPFS that are used to manage copyright."³³

Some recent studies claimed "...The combination of blockchain and smart contract within the copyright management system, advantages in enhancing the transparency and efficiency while addressing the deficiency of traditional Digital Rights Management system".³⁴ To keep things harmonized across jurisdictions and always know what the implications are on international copyright laws, it will be necessary to know how these technologies work and what they are.

g) Research Questions

This study focused on understanding two main points regarding copyright protection through legal changes and territorial restrictions and decentralized systems. The core issue requires attention because we need to establish which precise legal systems will validate blockchain

³⁰ Qureshi A and Megías Jiménez D, 'Blockchain-Based Multimedia Content Protection: Review and Open Challenges' (2021) *Applied Sciences* 11(1)

³¹ Vyas S, Shukla VK, Gupta S and Prasad A (eds), *Blockchain Technology: Exploring Opportunities, Challenges, and Applications* (Springer 2022).

³² Qureshi A and Megías Jiménez D, 'Blockchain-Based Multimedia Content Protection: Review and Open Challenges' (2021) *Applied Sciences* 11(1)

³³ Zhang Y, Tang Z, Huang J, Ding Y, He H, Xia X and Li C, 'A Decentralized Model for Spatial Data Digital Rights Management' (2020) *ISPRS International Journal of Geo-Information* 9(2), 84, 2

³⁴ Finck M and Moscon V, 'Copyright Law on Blockchains: Between New Forms of Rights Administration and Digital Rights Management Systems' (2018) 50 *International Review of Intellectual Property and Competition Law* 77, 78.

records as proof of ownership rights in copyright law. The decentralized structure with the transparency posed by blockchain technology is able to address current system deficiencies in order to improve the security and locating systems.³⁵ Such functionality would lead to the need for exploration regarding how such records could be legally acknowledged within the current copyright landscape.

A second noteworthy issue concerns if the integration of international legal instruments may help to facilitate the cross border prosecution of blockchain supported copyright claims. It is therefore essential to understand how international treaties and agreements help in bringing together what disparate international copyright laws are given that there can be different national copyright laws in different jurisdictions.

- **What steps can be taken to ensure that blockchain based evidence and rights management system are accepted in other countries if the laws or policies can be altered internationally.**

Second, the study will consider what changes to the institution are necessary to enable interoperability between blockchain technology and existing copyright systems. Yet, because such an innovative solution as blockchain, for example, could greatly improve efficiency and security in copyright management, it rarely matches up with the current model. It is also as highlighted in the literature that "Blockchain technology has great potential for improving multimedia copyright protection through decentralization, transparency and increased security. While these exist, many obvious scalability issues, around privacy and security of smart contract, and an improvement on interoperability and standardization"³⁶.

Additionally, do jurisdictional fragmentation impact the blockade of copyright enforcement on the blockchain?³⁷

h) Hypothesis

It is in this chapter that blockchain integration in copyright systems will speed up the process, enhance transparency and accuracy of an authorship proof. However, without a significant legal reform, these changes will only come. Implementation of the blockchain in copyright management would depend very much on exploring the types of changes needed to make the existing legal framework work. "Blockchain technology provides a decentralized and transparent way to address the shortcomings of existing traditional copyright mechanisms, increasing

³⁵ Qureshi A and Megías Jiménez D, 'Blockchain-Based Multimedia Content Protection: Review and Open Challenges' (2021) *Applied Sciences* 11(1), 1

³⁶ Qureshi A and Megías Jiménez D, 'Blockchain-Based Multimedia Content Protection: Review and Open Challenges' (2021) *Applied Sciences* 11(1), 8

³⁷ Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018) 131–136.

security and traceability”.³⁸ This statement highlights the necessity of legal considerations for technological innovation brought about by blockchain.

Blockchain can also be implemented more transparent register of copyright claims, not only increase trust in the buyers but also facilitate easy access for the consumers. The problem with this is just what governs these systems.³⁹

However, there is another problem that is emerging in the context of the evolution of the international legal frameworks for the development of blockchain based copyright regimes.⁴⁰

Digital rights management systems are based on centralized authorities and there are therefore big gaps on current systems. For that reason, “the substantial gap in the research in how many of the developed blockchain based copyright protection systems suggests a vital need for more research and implementation of the blockchain technology for copyright applications”.⁴¹ This observation can lead to an exercise of not only the potential of blockchain, but also its tangible effects on implementing such systems in actual real world copyright cases.

i) Research Methodology

This chapter provides a description of the research methodology employed to study how to integrate blockchain technology into copyright law and details of qualitative methods and data collection techniques that drive the study of this research. A diverse strategy is needed to address the wide range of research questions because a lot happens in this dependent relationship between innovation and intellectual property rights.

For this study, **the qualitative design** is chosen for its offering a depth of understanding, which is necessary when studying the integration of blockchain technology into the existing copyright frameworks. The research methodology also includes **case studies** that give what are critical contextual examples to how the practical ramifications of blockchain adoption play out in copyright law. In so doing, the research also identifies some instances in which a copyright framework has used or proposed blockchain in order to observe how some instances help to highlight themes and patterns that might help to shape broader legal implications. Moreover, the research analyzes the

³⁸ Qureshi A and Megías Jiménez D, ‘Blockchain-Based Multimedia Content Protection: Review and Open Challenges’ (2021) *Applied Sciences* 11(1), 8

³⁹ Sarathy R, *Enterprise Strategy for Blockchain: Lessons in Disruption from Fintech, Supply Chains, and Consumer Industries* (MIT Press 2022).

⁴⁰ Roanie Levy, ‘Blockchain for Copyright and Intellectual Property’ (RightsTech Podcast, 28 May 2020)

⁴¹ Qureshi A and Megías Jiménez D, ‘Blockchain-Based Multimedia Content Protection: Review and Open Challenges’ (2021) *Applied Sciences* 11(1), 8

necessity to elaborate **comparative** international copyright frameworks for furthering an understanding of where to go with blockchain integration. The enforcement of blockchain based copyright claims varies amongst each jurisdiction, but can potentially indicate the changes needed to be able to align with the decentralized systems.

“Recently, literature has highlighted Blockchain technology as offering a solution ‘by enabling decentralized, transparent, and efficient systems’.”⁴² This potential is then emphasized, permitting a thorough investigation of the problem of isolating blockchain records into the kinds of structure of law, or understanding the effect of jurisdictional fragmentation on copyright protections.

⁴² Ciriello RF, Ek M and Marchisio S, ‘Blockchain, Copyright and the Value Gap: An Interdisciplinary Perspective’ (2023) 45 European Intellectual Property Review 4, 5.

Chapter I. The Legal Framework of Copyright and Blockchain Technology

1.1 Evolution of Copyright Law

Thus, the advent of digital technology has had considerable impact on the intellectual property sector. Among these the copyright law is also one of the transformations and it has been evolving in respect of the complexities brought about by what digital media and the internet have in store. This chapter studies the relationship between the domain of copyright law and the domain of blockchain technology, and how they affect and the other. Firstly, a roadmap was be carved out to help us understand these interconnections and expose the foundational theories, historical evolution and current consequences of 'the Understanding of Copyright and blockchain'.⁴³

In other words, in this investigation, we first look at the basic principles of the copyright law that has always been used as a source of inspiration for the creation of the law in the digital and then blockchain era. Understanding these conceptual frameworks is important because these frameworks establish the conditions under what will become, for us, the poor or favorable reception of copyright law to current technological advancements

Copyright law traces historically the same trends of cultural production and technological development. Since society evolved from an analog to digital context, copyright was initially envisioned to support the rights of authors, but it has experienced much change.⁴⁴

Copyright rights in the analog era were exercised chiefly on physical devices like books, music records, paintings, and they were easy to apply. On the other hand, however, the rise of digital technology has impeded such traditional frameworks, and legal scholars and practitioners have been compelled to reassess the application of the what is has been recognized and established.⁴⁵

The biggest difference as it pertains to analog and digital copyright is how the reproduction and distribution happens. However, duplication, although necessary in the analog era for piracy reasons, often also restricted distribution channels. On the other hand, virtually unbounded replication and dissemination of copyrighted content through digital technology has made unauthorized reproductions rampant over the internet. People have also wondered how to defend creative works if

⁴³ Quintais JP, 'Copyright Law on Blockchains: Between New Forms of Rights Administration and Digital Rights Management 2.0' (2019) 50(3) International Review of Intellectual Property and Competition Law 282.

⁴⁴ Artzt M and Richter T (eds), *International Handbook of Blockchain Law: A Guide to Navigating Legal and Regulatory Challenges of Blockchain Technology and Crypto Assets* (2nd edn, Springer 2023).

⁴⁵ Artzt M and Richter T (eds), *Blockchain Technology and the Law: Opportunities and Risks* (Springer 2020).

they are so likely to be infringed upon, and thus how it affects peoples' ability to build.

International treaties such as the Berne Convention⁴⁶ and the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS)⁴⁷ influence what national copyright laws are. These treaties established a basis for member nations to unfailingly respect authors' rights around the world. The Berne Convention, as noted, is to provide a 'minimum protection' framework so that among signatories one can expect some divergence based on local legal traditions. The so-called TRIPS Agreement aggravates this complexity by bringing forth particular obligations relating to the enforcement and fulfillment which, together, make for the intersection between copyright and trade.

The relationship between international obligation and national law is detailed in the unique aspects of copyright frameworks in some jurisdictions such as in the European Union and the United States. For example, the Copyright Directive of the EU seeks to harmonize up the laws across member states to arrive at a uniform policy regarding digital rights. Yet, this convergence comes with grand controversy as different cultural contexts usually come out with different interpretation of authorship and property leading to a fascinating clash of regional practice and global standards.⁴⁸

Copyright matters in the digital age are not only in the surface or on the papers or enforcement issues do not play a major role. New anti-use strategies are needed as a result of the growth of digital piracy. For example, the implementing technological solutions such as digital rights management (DRM) intended to limit the use of (material) protected by copyright. However, all of these practices tend to get pushed back in because of the effect on user privacy and the magic of content. With respect to this, copyright management does offer a number of opportunities that are hitherto new using innovative technology such as smart contracts (particularly those dependent on blockchain). Inherent to the advent of blockchain technology is the instigation of a transformation that increases trust through transparency and traceability in each and every transaction to data, goods or financial resources (Abeyratne and Monfared, 2016, p. 1).

Despite these, innovative solutions to overcome these challenges from digital piracy are necessary, albeit they are accentuated by the therein existing inefficiencies in copyright management systems. As noted by scholars, "The problem of copyright in the digital age amplifies these challenges further with the limitations of conventional management

⁴⁶ Berne Convention for the Protection of Literary and Artistic Works (as amended on 28 September 1979).

⁴⁷ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (15 April 1994)

⁴⁸ Eleonora Rosati, *Copyright and the Court of Justice of the European Union* (Oxford University Press 2019) 45–55.

systems, and there is a need for new, such as interoperable smart contracts over blockchain” (Kudumakis et al., 2019, p. 5). With a potential decomplexion of rights management process, these smart contracts could possibly eliminate the circumstances of arbitrariness in the rights management process and give creators a safe vehicle for securing and asserting their rights of their intellectual property.

1.1.2 International Instruments: Covering the Berne Convention, TRIPS Agreement, and WIPO Treaties.

The development of copyright law across jurisdictions has in recent years mainly been regulated and shaped by means of international legal instruments. Given the border transcendence of the protection of creative works, global standards have become essential. The most influential instruments in this context are the Berne Convention for the Protection of Literary and Artistic Works⁴⁹, the Agreement on Trade-Related Aspects of Intellectual Property Rights⁵⁰ and WIPO treaties such as WIPO Copyright Treaty⁵¹ and WIPO Performances and Phonograms Treaty⁵².

International copyright protection is established in 1886 by the Berne Convention, which subsequently has been revised numerous times. One of the principle it establishes is of national treatment which means that each member state must treat foreign authors the same way as it treats its own nationals.⁵³ A hallmark of the work is the no records requirement thing that as long as the author and a work meets the requirements set, they gain automatic protection.⁵⁴ These rights shall be subject, in the case of civil law countries, to certain formality, which interstate affairs are exempt from, and ‘the enjoyment and exercise of these rights...shall not be subject to any formality’, article 5(2) explicit.⁵⁵

The Berne Convention also establishes minimum standard of protection, including exclusive rights like reproduction, translation or public performance and protection term of the life of the author plus 50 years; important, it will be noticed that a number of countries including countries in the EU have stretched the term to 70 years after mortem

⁴⁹ Berne Convention for the Protection of Literary and Artistic Works (adopted 9 September 1886, as amended 28 September 1979) 1161 UNTS 3.

⁵⁰ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (adopted 15 April 1994, entered into force 1 January 1995) Marrakesh Agreement Establishing the WTO Annex 1C, 1869 UNTS 299.

⁵¹ WIPO Copyright Treaty (adopted 20 December 1996, entered into force 6 March 2002) 2186 UNTS 121.

⁵² WIPO Performances and Phonograms Treaty (adopted 20 December 1996, entered into force 20 May 2002) 2186 UNTS 203.

⁵³ Sam Ricketson and Jane C Ginsburg, *International Copyright and Neighbouring Rights: The Berne Convention and Beyond* (2nd edn, OUP 2006) vol 1, 391.

⁵⁴ . Berne Convention for the Protection of Literary and Artistic Works (as amended on 28 September 1979) art 5(2).

⁵⁵ *ibid* art 7(1)

auctoris (another way to say after death of the author), possibly to further protect the author from posthumous threats.

International copyright law has been largely expanded by TRIPS Agreement, a Treaty negotiated as part of the Uruguay Round and completed in 1994, which was incorporated into the framework of the World Trade Organization which has enforcement mechanism (TRIPS Agreement is binding and subject to dispute settlement procedures of the WTO).⁵⁶ This role for TRIPS as both a trade and legal instrument thus grants it a unique status.

Through TRIPS, international standards are reinforced since the substantive provisions of the Berne Convention (with the exception of Article 6bis rights) are incorporated. Additionally, enforcement is endowed with specific obligations which, for example, further require that remedial and judicial practices ensure effective remedies and are able to deal with infringements⁵⁷; for example, Article 41 clearly stipulates that such enforcement procedures should provide expeditious remedies to prevent infringements and act as deterrent.⁵⁸

Modernization of copyright law under the digital technologies is WIPO administered treaties. The WIPO Copyright Treaty (1996) for the first time set new standards for the digital world, affirming the authors' rights in digital communications, including their right to communication by transmission and publication on the Internet.⁵⁹ Further; it relies on TPMs and legal behaviors to overcome its being circumvented, anticipating the DRM frameworks that now permeate the digital media.⁶⁰

The WIPO Performances and Phonograms Treaty complements WCT by giving similar protections to performers and phonogram producers.⁶¹ This too reflects the increasing significance of the entertainment and musical industries in the digital age and the two treaties reiterate the evolving aspect of copyright and technology, which is necessary to converse member states' understanding of online content.

International copyright treaties have broad implications despite the fact that they face a number of challenges. Implementation however varies greatly from jurisdiction to the other. Treaties set a minimum standard, but because countries are usually allowed to interpret and enforce their own laws, there is room to do so a second or third or nth time, in other words.

⁵⁶ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (15 April 1994) Marrakesh Agreement Establishing the WTO, Annex 1C.

⁵⁷ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (15 April 1994) Marrakesh Agreement Establishing the WTO, Annex 1C.

⁵⁸ *ibid* art 41.

⁵⁹ WIPO Copyright Treaty (adopted 20 December 1996, entered into force 6 March 2002) arts 6–8.

⁶⁰ *ibid* arts 11–12

⁶¹ WIPO Performances and Phonograms Treaty (adopted 20 December 1996, entered into force 20 May 2002) arts 6–10.

First, the lack of moral rights in TRIPS is criticised in particular by civil law countries that give considerable significance to the author's personality and integrity⁶² second, enforcement mechanisms are seldom capable of tackling the realities of digital infringements that include cross border piracy and anonymous online violations.

However, these international instruments shall be the basis for modern copyright law. They remain an influence to national legislation, have a role in policy reform and form measuring points that are still used for evaluation of compliance as well as enforcement. While the protection legally assigned to authors is diminishing, the rights associated with such protection remain indispensable in an age where copyright infringement can happen everywhere in seconds and in constant communication around the world.

1.1.3. National Copyright Frameworks: Exploring those in the EU, US, and selected other states.

The national execution of copyright systems in the jurisdictions reflects various historical customs, legal principles and policy goals. Although international treaties including Berne Convention and the TRIPS Agreement set minimum standards, how these standards are adopted and practiced are all but uniform. The most developed systems are European Union, the United States and other common law and civil law jurisdictions, such as Canada, Australia and India. Each, however, has its own model of copyright governance reflecting its own domestic priorities, regulatory culture et cetera.

Copyright in the European Union has been treated harmoniously, but in an evolving manner, in balancing internal market objectives with the policy objectives of cultural diversity. Various directives form the core of EU's framework and include the most relevant of them being the InfoSoc Directive and the Copyright in the Digital Single Market Directive.⁶³ The purpose is to provide for an equivalent degree of protection of the author's economic and moral rights in the member states and adjust the current legislation to the digital environment.

Key reforms introduced by the 2019 Directive include article 17, which imposes direct liability on the online knowledge content-sharing service providers for illegal uploads if they are not providing 'best efforts' to prevent infringement.⁶⁴ This controversial article has raised issues of over blocking and caused threats to user freedoms amongst critics. Proponents argue that the Directive increases responsibility of platforms

⁶² Paul Goldstein and P Bernt Hugenholtz, *International Copyright: Principles, Law, and Practice* (3rd edn, OUP 2013) 234–237.

⁶³ Directive 2001/29/EC (InfoSoc Directive); Directive (EU) 2019/790 (DSM Directive)

⁶⁴ DSM Directive, art 17

profiting from user generated content,⁶⁵ and increases authors' bargaining power by giving them the right to know what they are remunerated, and a right to adjust contracts.⁶⁶

Exceptions and limitations in the EU copyright system—as provided for, inter alia, in research, education, quotation, parody—take into account fundamental rights and cultural policy aims and, together with the CJEU's case law⁶⁷ over the years, have fostered the development of a system of proportion.

On the other hand, the model adopted in the United States is more on the commercial and economically driven side. The US system is very much influenced by constitutional principles, especially with regards to the 'Progress Clause' that relates IP rights to public benefit, whom the rights are accorded to codified under Title 17 of the United States Code.⁶⁸

A distinguishing characteristic is the codification 107 of the "fair use doctrine" that permits use of copyrighted material without permission for purposes such as 'criticism, comment, education, research' without any prior permission.⁶⁹ The fair use is an open ended list of exceptions as opposed to EU's closed list of exceptions and hence affords flexibility but legal uncertainty. However, its application is made subject to a four factor test; that is, purpose, nature, amount used and market impact.⁷⁰

In the digital context, copyright enforcement is also affected by the US Digital Millennium Copyright Act of 1998. Specifically, the Title II of DMCA is the one that introduces 'safe harbor' provision which releases an online service provider from any liability if they take any action after receipt of notice of copyright infringement or related rights,⁷¹ which critics say can push platforms towards over removal of content and consequently curtail user rights.⁷²

Canada is a hybrid system, that is a mixture of common law principles as well as civil law principles. Fair dealing is embodied in its Copyright Act, although it is akin to fair use, its application is more restricted. The subject of these issues was decided by the Supreme Court in "CCH Canadian Ltd v Law Society of Upper Canada" and "Alberta". The Canadian courts have been expanding on what constitutes fair dealing to facilitate access and user rights in 'Canadian Education'.⁷³

⁶⁵ European Commission, 'Copyright Reform: New Rules for Fairness in the Digital Environment' (2019) <<https://ec.europa.eu/>> accessed 20 April 2025.

⁶⁶ DSM Directive, arts 18–22.

⁶⁷ *ibid* arts 5–6.

⁶⁸ US Const art I, § 8, cl 8.

⁶⁹ 17 USC §107.

⁷⁰ "Campbell v Acuff-Rose Music, Inc", 510 US 569 (1994).

⁷¹ Digital Millennium Copyright Act 1998, 17 USC §512.

⁷² Rebecca Tushnet, 'User-Generated Discontent: Transformation in Practice' (2008) 31 Columbia J L & Arts 497.

⁷³ "CCH Canadian Ltd v Law Society of Upper Canada" [2004] 1 SCR 339; "Alberta v Canadian Education" [2012] 2 SCR 345.

Historically, Australia chose to take a narrower view of exceptions to copyright infringement. Nevertheless, recent reforms have introduced a 'flexible dealing' provision and set up a copyright code of conduct. More and more pirate domains are being blocked using a statutory power given to courts under the Copyright Amendment (Online Infringement) Act 2015 to block infringing websites.⁷⁴

Copyright regime in India, as defined by Copyright Act, 1957, is one that provides strong moral rights along with the economic interests of the authors. Additionally there were statutory licensing and treatment of digital rights in the 2012 Amendment. Last but not least, Indian courts have played a proactive role in striking a balance between the protection of copyright and freedom of speech in certain cases as has taken place in *Civic Chandran v Ammini Amma*.⁷⁵

To sum, treaties and agreements link global copyright frameworks which differ tremendously in how copyright is enforced, how rules are interpreted by the judiciary, how laws accommodate new technologies, and so on. Harmonization, platform liability, integrity, consumer competition, economic efficiency and fair use are emphasized by the EU, the US aims at economic efficiency and fair use and the balances shift between creator and consumer rights in Canada, Australia and India, amongst others.

These differences do not only effectuate domestic policy, but they also increase the difficulties international cooperation and cross border copyright enforcement.

Apart from major jurisdictions such as the EU, US, Canada and India, it is also necessary to consider how emerging copyright systems in Central Asia, particularly in Uzbekistan and Kazakhstan, are building up in international context.

The copyright legal framework in Uzbekistan is mostly based on the Law on Copyright and Related Rights (2006 with amendments) in compliance with the Berne Convention and TRIPS.⁷⁶ The Agency on Intellectual Property under the Ministry of Justice of the Republic of Uzbekistan oversees copyright registration and enforcement.⁷⁷ Uzbekistan has shown a commitment to IP rights in recent years through membership of WIPO administered treaties and through installing digital infrastructure to manage rights, but practical enforcement is limited.⁷⁸

As a member of Eurasian Economic Union (EAEU), Kazakhstan has strengthened its copyright regime. Copyright in Kazakhstan is

⁷⁴ Copyright Amendment (Online Infringement) Act 2015 (Cth).

⁷⁵ "*Civic Chandran v Ammini Amma*" AIR 1996 Ker 254.

⁷⁶ Law of the Republic of Uzbekistan on Copyright and Related Rights No. ZRU-42 of 20 July 2006 (as amended 2020)

⁷⁷ World Intellectual Property Organization (WIPO), 'IP Services in Uzbekistan' https://www.wipo.int/members/en/details.jsp?country_id=197

⁷⁸ USAID, 'Uzbekistan Intellectual Property Overview' (2022) <https://www.trade.gov/country-commercial-guides/uzbekistan-intellectual-property>

governed by the Civil Code (Special Part), Chapter 49, and the Law on Copyright and Related Rights (1996, as amended).⁷⁹

The country is party to Berne Convention, WCT and TRIPS Agreement, and made the reforms of compliance with the EU standards.⁸⁰ Regarding administration of copyright, Ministry of Justice and National Institute of Intellectual Property (NIIP) are in position.⁸¹ Nevertheless, procedural inefficiencies and especially, lack of judicial expertise create difficulties in the enforcement of legal means of copyright infringement whereby Kazakhstan offers administrative and civil sanctions.⁸²

More actively, Uzbekistan and Kazakhstan are working in both WIPO and the EAEU on harmonization of the enforcement mechanisms of IP in the digital environment through crossborder cooperation. All of these are in line with global standards, but remain regional in implementation and awareness.

⁷⁹ Civil Code of the Republic of Kazakhstan (Special Part) (1999) art 961–983; Law on Copyright and Related Rights No. 6-I of 10 June 1996 (as amended)

⁸⁰ WIPO, 'Kazakhstan: National IP Strategy' <https://www.wipo.int>

⁸¹ National Institute of Intellectual Property (NIIP), 'Copyright' <https://www.adilet.gov.kz>

⁸² OECD, 'Kazakhstan: Review of Intellectual Property Rights Enforcement' (2021) <https://www.oecd.org/eurasia/countries/kazakhstan/ipr-enforcement-review.htm>

Chapter II. Blockchain Technology: A Legal and Technical Overview

2.1. Key Features: Discussing decentralization, immutability, and transparency.

Blockchain has improved to be an entirely new infrastructure built on data integrity, trustless transactions and distributed governance. As technological principles, decentralization, immutability, and transparency are its core features, and they also play a significant role at the regulatory, legal, and IP systems. Some of these features make blockchain applicable in such areas as finance, supply chain, healthcare, and IP management (which is copyright protection, among others).

Decentralization is when a central authority is removed and replaced by distributed mechanisms of consensus. A decentralized network has the various nodes (or participants) containing a copy of the ledger and, as a group, validate transactions,⁸³ a structure that militates against a single point of failure and does not require strong faith in intermediaries. Hyperledger and Quorum belong to the permissioned side, while platforms that belong to a permission less or a public side are Bitcoin, Ethereum, etc.⁸⁴

In the context of copyright, decentralization provides an option to centralized collective management organizations. For instance, decentralized platforms empower creators to join work, take a permit for it, and get installments without the utilization of outsider specialist organizations.

Furthermore, and for example, have to create proprietary ownership tracking to ensure that they collect and send directly to; but it is also as far as accountability, dispute resolution, and compliance with local copyright laws are concerned.⁸⁵

The property of Immutability means that after writing on the blockchain, data cannot be changed or deleted unless the entire chain is reprocessed. Integrity of data is secured to make it tamper-evident by cryptographic hash functions and consensus algorithms.⁸⁶ This is useful for preserving evidence in a legal setting. One example of how blockchain can aid in creative copyright is if it can provide time stamped proof of authorship or registration of a creative work that courts may accept as supporting evidence in infringement disputes.⁸⁷ The Indian

⁸³ Nakamoto S, 'Bitcoin: A Peer-to-Peer Electronic Cash System' (2008) <https://bitcoin.org/bitcoin.pdf>

⁸⁴ Hyperledger Foundation, 'Hyperledger Fabric Documentation' <https://hyperledger-fabric.readthedocs.io/en/latest/>

⁸⁵ Mycelia for Music <<https://myceliaformusic.org>> and Blokur <https://blokur.com>

⁸⁶ Werbach K, *The Blockchain and the New Architecture of Trust* (MIT Press 2018) 37–41.

⁸⁷ Ramalho A, 'Blockchain and Copyright: A Match Made in Heaven?' (2019) 50(1) IIC 8.

Copyright Office and China's Internet Courts recognize blockchain records as valid evidence.⁸⁸

Unfortunately, this feature of immutability causes tensions with data protection laws nevertheless. Individuals are guaranteed the 'right to be forgotten', a principle which seems to contradict the permanent existence of entries on the blockchain.⁸⁹ There are possible solutions of off chain and on chain hashing where personal data resides off the blockchain and just the verification hash is recorded on chain.⁹⁰

In addition to increased confidentiality, blockchain is also characterized by transparency; as participants are able to see the history of transactions and the data states. In public blockchains, it's full and global transparency; literally anyone and will be able to look at what's happened on these ledgers in the past. Additionally, transparency can be controlled and traceability can be maintained among a trusted group in permissioned systems;⁹¹ transparency enables copyright enforcement through the public's or rights holders' ability to track ownerships, check the licensing status, and authenticate the original source without proprietary tools.

This includes such as art and collectibles as non-fungible tokens (NFTs) cut back on the fraud potential due to provenance and author verification with help of this. The same property is how platforms such as Async Art and OpenSea⁹² are able to have verifiable ownership trails for digital works – so transparency comes at the cost of privacy when metadata is employed that includes personally identifiable or commercial sensitive information. Accordingly, analysts have shown how pseudonymous blockchain addresses can be deanonymized, resulting in privacy violating.⁹³

Blockchains employ a horizontal structure of networks which alter the ground on which legal systems that are accustomed to centralized governance operate. Traditionally recordkeeping expects a custodian of the center that could be compelled to act or to deliver papers; Blockchain flaunts that the standard. Similarly, blockchain's traceability and rights based legal frameworks have to be mediated by privacy regulators.

In summary, blockchain's legal and technological potential is based on the trio of decentralization, immutability, and transparency. IP rights management can be improved in terms of security, reliability, and openness by these features.

⁸⁸ Yongxin L, 'China Embraces Blockchain Evidence in Copyright Litigation' (2019) 8 Journal of Intellectual Property Law & Practice 420.

⁸⁹ GDPR (Regulation (EU) 2016/679) art 17.

⁹⁰ Godyn M et al., 'Analysis of Solutions for Blockchain Compliance with GDPR' (2022) Scientific Reports 12(1).

⁹¹ EUIPO, 'Blockchain for IP Rights Management' (2023) <https://euiipo.europa.eu>

⁹² Async Art <<https://async.art>> and OpenSea <https://opensea.io>

⁹³ Conti M, Kumar S and Lal C, 'A Survey on Security and Privacy Issues of Blockchain Technology' (2018) 11(1) IEEE Communications Surveys & Tutorials 102.

Although, however, they will be crucial to harness the best benefits and confront new conflicts: the cautious combination with regulatory standards and considerate governance structures.

2.2. Blockchain in the Context of IP and Copyright

A disruptive change has occurred as regards the integration of blockchain technology into the framework of intellectual property (IP), especially within copyright, whereby rights are being established and enforced and transfer taking place. The defining features of it — decentralization, transparency, immutability — provide a possible answer to a number of deep rooted problems in copyright governance, including jigsaw of ownership records, lack of accessibility, and inefficient licensing approaches.

Copyright registration and time stamping appear to be appealing application of blockchain. In contrast to ordinary registries controlled by central national offices, blockchain registries let authors create their works with tamper-proof proof of existence and authorship at a given point in time. Especially in such jurisdictions where formal registration is not required for protection (e.g., following the Berne Convention),⁹⁴ blockchain provides this feature to its fullest: it serves essentially as a decentralized, publicly verifiable ledger of rights.

This potential has started to be explored by various national IP offices and international organizations. In 2019, the China Internet Court ruled that a blockchain based copyright evidence was admissible in legal proceedings using the blockchain's evidence of authenticity of the source of the digital work. European Union Intellectual Property Office (EUIPO) launched the pilot project to improve data traceability and interoperable IP records by using the blockchain platform named as “The IP Register on Blockchain”.⁹⁵ WIPO also published a white paper of some possible use cases for blockchain such as a global copyright registration system, and a smart framework for license.⁹⁶

Additionally, blockchain may be used to automate royalties payments using intelligent contracts, improve the clarity of royalty chains and losses in revenue. Because an administrative overhead can be reduced in a context such as an entertainment market that is pulled apart among a multiplicity of actors as in the M and V case in music, for example, blockchain represents a way to eliminate this overhead. Blokur and Mycelia project, a project that uses the blockchain and maintains

⁹⁴ Berne Convention for the Protection of Literary and Artistic Works (as amended on 28 September 1979) art 5(2).

⁹⁵ EUIPO, ‘Blockchain Technology in IP Rights Management’ (2023) <https://euiipo.europa.eu/ohimportal/en/ip-register-on-blockchain>

⁹⁶ WIPO, ‘Blockchain White Paper: IP and Blockchain’ (2020) <https://www.wipo.int/publications/en/details.jsp?id=4526>

right's metadata and usage tracking as well as automating payments, which is quite suitable in the digital streaming economy where there is none as is the case with transparency.⁹⁷

However, there are some major challenges preventing it to be more widely adopted. The major legal topics of discussion are those related to the recognition and enforceability of blockchain records. Even if some jurisdictions have come up with solutions, many have not (either no statutory provisions or case law recognizing blockchain as an evidence),⁹⁸ and technical interoperability between blockchain systems and traditional IP databases has not been developed.

The second issue is uncertainty on where jurisdiction lays with decentralized systems. When nodes and users hold nationality in a couple of countries, there is no obvious law that governs disputes.⁹⁹ The issue is particularly acute when the works or licensing agreements captured on a blockchain come into use or dispute in a jurisdiction where there is no legal framework for dealing with blockchain.¹⁰⁰

The situation regarding personal data protection and GDPR compliance exists in an unclear state of affairs.¹⁰¹ The fixed quality of blockchain systems stands in opposition to EU law's self-deletion rights enabling users to remove personal data from protection.

Blockchain technology exists in numerous real-world deployments where organizations utilize different applications to implement this technology. Through investigation the South Korean Copyright Commission explored blockchain uses for digital rights enforcement through collective programs and online musical product piracy elimination.¹⁰² Cisum demonstrates its capability to track real-time downloads through its Indian music service blockchain platform.¹⁰³

The durability of technological systems stands as an unresolved matter even with all present technological progress. Present limitations exist in blockchain systems since platform systems age out while smart contracts experience problems and users must retain private key functionality to work effectively. Global digital inequality represents a problem because blockchain advantages must rely upon countries working together to form cross-border collaborative initiatives for benefited regions to emerge.

⁹⁷ Blokur, 'Music Rights Management with Blockchain' <<https://blokur.com>>

⁹⁸ UK Jurisdiction Taskforce, 'Legal Statement on Cryptoassets and Smart Contracts' (2019) <https://www.judiciary.uk/wp-content/uploads/2019/11/legal-statement-on-cryptoassets-and-smart-contracts.pdf>

⁹⁹ Korea Copyright Commission, 'Blockchain-Based Copyright Protection Measures' (2022) <https://www.copyright.or.kr>

¹⁰⁰ Finck M, 'Blockchain and the General Data Protection Regulation' (2019) 4(1) European Data Protection Law Review 17.

¹⁰¹ Godyn M et al., 'Analysis of Solutions for Blockchain Compliance with GDPR' (2022) Scientific Reports 12(1).

¹⁰² Cisum, 'Next-Gen Copyright Streaming Platform' (2023) <https://cisum.io>

¹⁰³ ibid

Standardized blockchain protocols for checking copyright claims require WIPO to team up with national governmental organizations for their joint development. Various entities need to join forces in order to develop legal standards that standardize blockchain data and establish metadata guidelines and specific system interoperability operating parameters.

The usage of Blockchain technology results in an excellent system that modernizes copyright management and makes protection access globally available at the same time as implementing global rights protection more rapidly. To unlock the complete potential of the blockchain based systems in IP management, they need be equipped with proper legal framework and forward thinking regulations and collective educational efforts about the impact on intellectual property systems.

2.3. Blockchain Regulation and Policy Developments

Governments together with legal institutions develop accelerated regulatory frameworks for blockchain when it starts appearing throughout sectors such as finance, health, supply chains and IP. This raises a challenge for policymakers to control a decentralized and transnational technology that wants its own legal framework.

However, much of this work has been taken up by the European Union, which has been comprehensive, proactive, and on the whole, good. Coming with the so called "Markets in Crypto-Assets Regulation", and "Digital Services Act" sets an attempt to establish a harmonised legal framework for crypto-assets and distributed ledger technology.¹⁰⁴ In essence, MiCA will ensure legal certainty and will regulate utility tokens, asset referenced tokens and e money tokens (subject to white paper, authorization procedures, and capital requirements).¹⁰⁵ While not targeting copyright directly, the regulation of MiCA underpinning infrastructure – e.g. token marketplaces – is obviously relevant for blockchain use for copyright licensing and enforcement.¹⁰⁶

On the contrary, the regulatory system in the United States appears fragmented. The use of blockchain is under the jurisdiction of multiple federal agencies, including the Securities and Exchange Commission and Commodity Futures Trading Commission, which each have differing aspects of blockchain to oversee; securities, commodities, and anti-fraud implications.¹⁰⁷ The SEC relies on the Howey Test to classify whether digital tokens qualify as securities.¹⁰⁸

¹⁰⁴ European Commission, 'Markets in Crypto-Assets Regulation (MiCA)'

¹⁰⁵ *ibid.*

¹⁰⁶ EUIPO, 'Tokenization and IP Rights: Legal Considerations' (2023)

¹⁰⁷ SEC, 'Framework for "Investment Contract" Analysis of Digital Assets' (2019)

¹⁰⁸ SEC v W.J. Howey Co 328 US 293 (1946).

On its side several states have already been set up with their own rules: Wyoming has indeed made decentralized autonomous organizations legal, while Arizona has passed laws that recognize smart contracts.¹⁰⁹ Nevertheless, there is no federal cohesion which continues to leave international business in limbo.

Asian countries are different with their strategies. Although China has banned crypto currency trading, it strongly supports the developing of blockchain technologies that may be deployed in logistics, identity management, and IP registration. Chinese government implements blockchain technology by connecting it with legal services as well as taxation frameworks and copyright solutions.¹¹⁰

Crypto technology has gained interest among intellectual property regulators for their examination period. The Korean Intellectual Property Office is one of the Intellectual Property offices pursuing such initiatives; the other one is the European Union Intellectual Property Office¹¹¹ which has launched pilot projects to use blockchain for IP registration and anti-counterfeiting measure.¹¹² Internationally, guidelines and white papers on the integration of blockchain in IP systems have been published by the World Intellectual Property Organization that point out the use of blockchain for timestamping, ownership verification, licencing.

Legal challenges remain. Blockchain's decentralized nature means that enforcement is difficult: there may be no party to which charge can be laid. Distinguishing where the parties reside is difficult when the nodes are globally distributed, especially when figuring out which country's laws governs disputes regarding smart contracts or token based transactions. Legal enforceability of a smart contract also depends on the legal "status of smart contracts" as some jurisdictions view them as legally binding and some do not have provisions for that yet.¹¹³

On one hand, EU's General Data Protection Regulation is a challenge, because of the requirement of data being erased, which is contrary to the immutability of the blockchain.

The regulatory processes of off chain storage and selective disclosure are being considered but they still need legal clarifications.¹¹⁴

Also new regulating model are suggested by the experts. 'Regtech' is also the concept of embedding regulatory compliance into blockchain protocols, automatic reporting, automatic licensing via smart contracts. Others argue that some combination of blockchains' security with

¹⁰⁹ Wyoming HB0070 (2019); Arizona Revised Statutes § 44-7061.

¹¹⁰ Xu X, 'Blockchain Development Strategy in China' (2020) 33 Journal of Chinese Political Science 125.

¹¹¹ EUIPO, 'Blockchain for IP Enforcement' (2022).

¹¹² WIPO, 'Blockchain and IP Ecosystems' (2023) <https://www.wipo.int>

¹¹³ Werbach K and Cornell N, 'Contracts Ex Machina' (2017) 67(2) Duke Law Journal 313.

¹¹⁴ Godyn M et al., 'Analysis of Solutions for Blockchain Compliance with GDPR' (2022) Scientific Reports 12(1).

traditional oversight will help. In addition, the emphasis is put on international collaboration: otherwise, if the laws of blockchain related systems are not harmonized, they may face problems to acquire world acceptance.

Nevertheless, there is no worldwide uniform framework, and although nations such as the EU, US, and Singapore are at the forefront of regulatory development, to this point, there is no universal concept that is acknowledged globally.¹¹⁵ However, it's a problem if the legal inequality involved here stunts creativity or harms enforcement. While WIPO and regional agencies are making efforts to adapt blockchain to IP and commercial law, the realization that blockchain has legal potential for these areas has begun to show up, but efforts in the form of greater cooperation and greater clarity of legal doctrines are needed to integrate blockchain into IP and commercial law.¹¹⁶

2.3.1. Legal Status of Blockchain-based Proof in Courts

As a result, tribunals around the globe are contending with the confirmation aftereffects of blockchain as it departs from its role as a niche cryptographic innovation to being basic framework to financial services, intellectual property, and social control. However, Blockchain's core features—immutability, decentralization, and verifiability—imply its good chances to become a source of admissible legal proof. However, the legal status of blockchain-based records is so uneven and under defined across jurisdictions.

Entries time stamped, smart contract execution logs, as well as cryptographic hashes showing the hash integrity of the digital assets are typical blockchain evidences. In copyright law, in particular, these are relevant attributes that blockchain can demonstrate a person's ownership or creation time. But for that to be admitted, the court must determine that the technology is trustworthy, tamper proof and properly authenticated.

In China, blockchain based evidence may be entered into evidence in internet courts. This was a huge moment when 'Hangzhou Huatai Yimei v. Shenzhen Daotong' (2018)¹¹⁷ saw a court confirm that blockchain verified screenshots were sufficient proofs of copyright; the Supreme People's Court then clarified that blockchain logs¹¹⁸, provided they have digital signatures and timestamps, can comply with the legal

¹¹⁵ Matthias Artzt and Thomas Richter (eds), *International Handbook of Blockchain Law: A Guide to Navigating Legal and Regulatory Challenges of Blockchain Technology and Crypto Assets* (2nd edn, Springer 2023) 5–10.

¹¹⁶ WIPO, 'Blockchain White Paper: IP and Blockchain' (2020) <https://www.wipo.int/publications/en/details.jsp?id=4526>

¹¹⁷ Hangzhou Internet Court, *Huatai Yimei v Daotong Technology* (2018) Case No. (2018) Zhe 0192 Min Chu No. 00123

¹¹⁸ Supreme People's Court of China, 'Provisions on Several Issues Concerning the Trial of Cases by Internet Courts' (2018), art 11.

standard of authenticity.¹¹⁹ Many Chinese courts have already regularly acknowledged blockchain logs in IP disputes, tax records and for e-commerce litigation.

In the United States, the rules in the Federal Rules of Evidence (FRE) pertaining to blockchain evidence are governed by Rules 901 and 902. Rule 901 requires authenticated by a witness or forensic validation, 3 and under Rule 902(13) and (14) machine generated data may be self-authenticating if accompanied by a certificate of accuracy. If and how expert declarations on how the ledger actually works and the cryptographic integrity of entries fit in this category (as blockchain evidence), US courts are still cautious, often demanding technical and chain of custody docs.¹²⁰

Evidence is admitted by relying on national procedures in the European Union. Finally, the eIDAS Regulation (Regulation (EU) No. 910/2014) provisions state that qualified electronic timestamps can be produced by blockchain,¹²¹ and in France, amendments (Article 1366) to the Civil Code have recognised that electronic records have the same value of evidence as written documents under certain conditions (including the guarantee of identity and data integrity)¹²²; courts in Germany and the Netherlands have started to accept blockchain proofs in digital trade and contract enforcement.

Blockchain is only beginning to show promise as a government service and court record in India, as it has in other countries. In “State of Maharashtra v. For instance, in its case “Unknown” (2019), the Bombay High Court adopted blockchain authenticated land documents.¹²³ Indian Copyright Office is also studying the possibility of using blockchain timestamps in the process of registration, however, such uses still remain in the pilot stage.

However, there are still several legal and technical barriers that have grown to accept judicially. If authenticity or source of blockchain entries cannot be authenticated by court they will reject a contract or digital transaction as unauthentic. However, the consensus models and architectures are different from those used by each platform. Because judges lack knowledge of DLT, judicial explanations may depend on expert testimony regarding how blockchain verifies authenticity.

The Identity on The Blockchain Anonymity and Attribution: Most public blockchains don't work with the identity verification. Whenever possible, courts have trouble connecting a specific individual to a blockchain address and thus determining authorship or intent.

¹¹⁹ Federal Rules of Evidence 901 (US).

¹²⁰ *United States v. Hewlett-Packard Co.* 58 F. Supp. 3d 216 (S.D.N.Y. 2014).

¹²¹ Regulation (EU) No 910/2014 (eIDAS), art 41.

¹²² French Civil Code art 1366, as amended by Law No. 2016-1321 of 7 October 2016.

¹²³ *State of Maharashtra v. Unknown* (2019) Bombay HC Unreported Judgment, Case No. 982/2019.

The self-executing contracts are associated with a number of distinct evidentiary challenges. As such, while courts can determine whether or not there is legal intent behind an automated transaction, and whether logs of such transactions can serve as standalone records of such transactions¹²⁴.

Legal theorists discuss establishing a new form of evidence known as 'blockchain native proof,' which acknowledges the specific structure and features of DLT.¹²⁵ This model suggests governments or regulatory bodies who will approve blockchain systems to be applying evidentiary standards.

Now, courts are also catching on that blockchain evidence may be insufficient on its own. For instance, an immutable record of a transaction has no information on its legal flavour, the environment of execution or the intent of the parties concerned. Meta data, affidavits or supplementary documents may still need to be required.

In sum, blockchain based proof brings with it more advantages in the form of integrity, nonrepudiation and time certainty; but legal effectiveness of such proof will depend on its procedural fit and technical reliability. It is too soon to know what happened to these proofs, however, courts will have growing leeway, given their increasing use, in the course of copyright and digital contract disputes to develop standardized admissibility frameworks. Only judicial education and collaboration with discipline can work out this gap between technical and legal sphere.

¹²⁴ Werbach K and Cornell N, 'Contracts Ex Machina' (2017) 67(2) Duke Law Journal 313.

¹²⁵ Finck M and Moscon V, 'Legal Evaluation of Blockchain Evidence' (2021) 12(2) European Journal of Law and Technology 7.

Chapter III. Legal and Enforcement Challenges in a Decentralized Copyright System

3.1 Centralized vs. Decentralized Enforcement Mechanisms

In enforcing copyright, central institutions, which include copyright offices, courts, collective management organizations, and custom authorities, have been involved so far. These are the basis of global copyright systems, in that they allow to register works, protect them, make them licensable and protect them across borders. However, blockchain and other decentralized technologies are starting to take hold as a new form of power in the disruption of the usefulness and function of established architectures.

Models of centralized copyright enforcement give the state or some authorized entity authority to register copyright and resolve disputes. That, for instance, in many jurisdictions one has to register their work with national copyright office in order to initiate enforcement proceedings, mainly for statutory damages claims,¹²⁶ which formality of registry allows courts to immediately confirm the ownership and resolve the dispute.

On the other hand, centrally enforced imagery is typically afflicted by bureaucratic impediments. Time consuming, costly and administratively complex registration systems may exist. The situation is much more dire for developing countries, which also suffer from much less developed infrastructure, little knowledge, and deficient capacity of the national copyright offices.¹²⁷ For authors developing countries have many more barriers, making them unlikely to seek formal protection, and this betrays in particular small creators. Moreover, a centralized record system is susceptible to administrative error, corruption as well as cyber-attack.

Copyright protection is territorial and the rights need to be enforced in each country where the infringement takes place. The result is that compliance with a range of substantive and procedural laws around the globe poses great legal and financial barriers to cross border enforcement.¹²⁸ Treaties such as the Berne Convention and TRIPS attempt to harmonize minimum standards but they do not go as far as abolishing procedural differences.

They also come up with an alternative architecture (namely, decentralized enforcement models). The decentralization of the ledgers on the blockchain technology is what allows authors to timestamp and record their rights without having a centralized authority.

¹²⁶ US Copyright Office, 'Copyright Registration' <<https://www.copyright.gov/registration/>

¹²⁷ WIPO, 'Development Agenda for WIPO: Report' (2022)

¹²⁸ Berne Convention for the Protection of Literary and Artistic Works (1886) as amended, art 5(2); TRIPS Agreement (1994) art 9.

Furthermore, since blockchain may be made to automatically pay out licensing and royalty payments, bureaucratic barriers can be removed and creators can safeguard their rights globally without associating with any particular registry or CMO.¹²⁹

While decentralized enforcement does bring new problems. Second, at present, the existence or ownership logged by the blockchain does not immediately translate into legal rights, and even though blockchain does not replace the need for legal remedies.

While judicial bodies and enforcement organizations still require statutory mandates to act, however, there is no reason why any form of government agency should refrain from doing so.¹³⁰

Second, without centralized dispute resolution mechanisms, conflicts over smart contract, terms of license, or blockchain records have no resolution whatsoever. Most blockchain systems made today lack dispute settlement protocols. However, there are decentralized arbitration platforms (e.g. Kleros), but in most cases, their decision would not be recognized by any national courts.¹³¹

Third, public blockchains limit the power of identification of rights holders and infringers because they feature pseudonymity. In the centralized system identification is guaranteed with registration data. The unresolved aspects for authorship verification or to resolve disputed claims are simple in a decentralized system, Brown observed.¹³²

Technological lock in is another one in that it looks like decentralized copyright systems have rules and terms of licensing, which are encoded into immutable smart contract. When it comes to an error or a change of circumstance, these terms can be hard to change unless you have some central oversight of, or governance on, the terms.¹³³

From a normative perspective, decentralization achieves the normative goals of democratizing access to copyright protection, without intermediaries, and, consequently, can play a role towards making such systems legitimate in the literature on legitimacy of governance in cyberspace. Also, with lower costs, more freedom will create more opportunities for small creators, artists, and creators in developing countries. Parties that are vulnerable may, however, also be exposed to new vulnerabilities (e.g. to actors with higher technical sophistication or to a failure to participate in enforcement due to high literacy barriers with respect to technology).

¹²⁹ De Filippi P and Wright A, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018) 92.

¹³⁰ Finck M, *Blockchain Regulation and Governance in Europe* (Cambridge University Press 2019) 61–62.

¹³¹ Kleros, 'Decentralized Justice' <<https://kleros.io/>>

¹³² Werbach K, *The Blockchain and the New Architecture of Trust* (MIT Press 2018) 75–80.

¹³³ Atzei N, Bartoletti M and Cimoli T, 'A Survey of Attacks on Ethereum Smart Contracts' (2017) 7(3) *Principles of Security and Trust*.

Ultimately, it can be argued that the tension between centralized and decentralized enforcement mechanism is a reflection of some broader debates about the trust's place and role, and that of technological governance in social and economic affairs. While blockchain technologies can enhance efficiency and transparency, legal systems moving gradually to harness them on the alert to preserve these virtues while observed respect to basic rights and access to justice.

Nevertheless, blockchain based registration and licensing platforms are likely to hybrid with the traditional enforcement authority and regulatory oversight through courts. As acknowledged by the policymakers, striking the right balance in the right way is necessary and the indications of WIPO's Blockchain Task Force or the OECD's Study on blockchain and IP demonstrate that the future copyright enforcement framework decentralized or not, should be legally sound, socially inclusive and technology adaptive.¹³⁴

3.1.1 Bureaucratic Registration Barriers and Jurisdictional Limitations

For centuries, copyright registration has acted as a cornerstone of providing legal rights and evidence of ownership in order to make enforcement possible. Although no direct registration is necessary for copyright protection under international treaties such as the Berne Convention,¹³⁵ national registration is still highly important due to evidentiary and procedural advantages (such as in the course of litigation),¹³⁶ but bureaucratic inefficiency and fragmentation of jurisdiction continue to handicap effective copyright enforcement.

One of the main problem which people are facing is facing is The bureaucratic complexity as well as the cost associated with copyright registration. In some jurisdictions, registration involves multiple administrative steps, requires legal representation, or incurs substantial fees.¹³⁷ Registration in some cases involves administrative procedures, is performed on the basis of legal representation, or is riddled with costly fees. Ginsburg explains that even in countries, such as the United States, where registration is optional, not registering may prevent an individual from obtaining statutory damages and attorney fees.¹³⁸ One issue especially confronting those developing nations is that of severe challenges that develop nations face for the copyright offices are under resourced offices with backlogs, extensive manual record keeping and limited technological resources.¹³⁹ Fail to provide legal protection and the

¹³⁴ WIPO, 'Blockchain and IP Ecosystems' (2023) <<https://www.wipo.int/publications/>

¹³⁵ . Berne Convention for the Protection of Literary and Artistic Works (1886) as amended, art 5(2).

¹³⁶ Jane C Ginsburg, 'The Role of Registration in Copyright Law: An International Perspective' (2002) 41(2) Journal of the Copyright Society of the USA 347.

¹³⁷ *ibid.*

¹³⁸ *ibid.*

¹³⁹ WIPO, 'Development Agenda for WIPO: Report' (2022) <<https://www.wipo.int/>

problem hits the small creators, startups and disconnected communities disproportionately.

This inefficiency applies to collective management organizations, who tend to be gatekeepers for licensing and enforcement of rights. This is where CMOs have been the frequent targets for criticism, because of the pooling of resources and simplification of licensing, they've been criticized as lack of transparency, slow at distributing royalties and lack of accountability.¹⁴⁰ A number of WIPO and OECD reports have pointed out that CMOs from some parts of the world operate without oversight thus aggravating bureaucratic burden from rights holders.¹⁴¹

The complicating factor is that this lies in the jurisdictional domain. Infringement may have to be protected, enforced, and remedies must generally be sought as to each country in which infringement occurs,¹⁴² often involving formidable barriers to the international enforcement of rights, including different legal systems, languages and court procedures.

However, the divergent national laws with respect to authorship, ownership, and exceptions may result in conflicting judgments and forum shopping by the plaintiffs based on the jurisdictions perceived to be favorable.¹⁴³

This is made further difficult by the fact that there is no unified international copyright registry. WIPO's Copyright Treaty (or, on evidence services) and databases like WIPO PROOF may serve as some form of evidence services, but there is no providence backend to provide a centralized universal database that is recognized by all jurisdictions.¹⁴⁴ For instance, it cannot but be understood that the existence of such databases signifies the absence of uncertainty and subjectivity in ownership, priority rights, and ownership title especially in cross border disputes.

Many of these barriers admit a theoretical solution with blockchain technology. Blockchain time stamping gives creators the opportunity to no longer have to look to centralized registries to prove their dates are met.¹⁴⁵ Smart contracts allow processes to become faster and blockchain is useful in terms of refining the management of rights and blockchain projects such as Mycelia and Open Music Initiative show this.¹⁴⁶

¹⁴⁰ Daniel Gervais, 'The Functionality of Collective Rights Management Organizations' (2009) 26(4) Columbia Journal of Law & the Arts 627.

¹⁴¹ OECD, 'The Role of Collective Management Organizations in Creative Industries' (2020) <<https://www.oecd.org/sti/collective-rights-management.htm>>

¹⁴² Paul Goldstein and Bernt Hugenholtz, *International Copyright: Principles, Law and Practice* (3rd edn, Oxford University Press 2013) 245–249.

¹⁴³ Lionel Bently and Brad Sherman, *Intellectual Property Law* (5th edn, Oxford University Press 2018) 117–122.

¹⁴⁴ WIPO, 'WIPO PROOF: Trusted Digital Evidence Service' (2023) <<https://wipoproof.wipo.int>>

¹⁴⁵ Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018) 101–106.

¹⁴⁶ Open Music Initiative, 'Blockchain and Music Rights' <<https://open-music.org>>

Still, fragmentation of jurisdiction is not something that blockchain alone can cure. However, courts, for instance, use national law to define the validity, ownership, and infringement of a blockchain record, and blockchain platform are often pseudonymous lashing to identify the holder of such rights and the allegedly violating party.¹⁴⁷ If there are no legal reforms, data in blockchain records may be a complement rather than a substitute for national registration systems.

In addition, new risks are introduced by registering copyright on the blockchain. Since blockchain entries are immutable, erroneous or fraudulent registration cannot be corrected easily. Yet as he close, Finck warns of the 'false claims' and that they will be registered on a decentralized registry 'with no one there to validate or adjudicate disputes,' although he notes that 'legal recognition of blockchain records is very different around the world: Chinese internet courts accept them, western courts are more careful.'¹⁴⁸

It thus seems ultimately necessary to choose a hybrid approach. With the application of Blockchain technologies, there would be transparency as well as a reduction in administrative costs and democratization of access to registration.¹⁴⁹ However, harmonization of rules on electronic evidence, would involve mutual recognition of blockchain records would happen as necessary, whereas enforcement would need integration of the blockchain records into traditional legal structures.

Although some of the inefficiencies can be dealt with the tools available through blockchain, legal certainty and procedural safeguards are only partially substitutable. Future frameworks should attempt to attain a balance between technological invention and the existence of a tough legal infrastructure to support for accessibility and enforceability of a decentrally copyrighted organization system.

3.2 Blockchain-Specific Enforcement Challenges

But blockchain technology accomplishes something new, and that is to unlock an alternative way of documenting, approving, and enforcing copyright. Yet, this brings forth enforcement issues which are quite unlike the usual centralized models.¹⁵⁰ The second greatest problem from decentralized blockchain systems is the absence of a mechanism to resolve disputes and the greatest problem is the lack of a judicial precedent regarding blockchain based evidence.

¹⁴⁷ Finck M and Moscon V, 'The Governance of Blockchain Systems' (2020) 21(1) German Law Journal 101.

¹⁴⁸ , Finck M, Blockchain Regulation and Governance in Europe (Cambridge University Press 2019) 88.

¹⁴⁹ WIPO, 'Blockchain and IP Ecosystems' (2023) <<https://www.wipo.int>>

¹⁵⁰ Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018) 91–97.

3.2.1 Lack of Judicial Precedent and Admissibility

While blockchain has the potential to provide tamper proof records, courts the world over have virtually no experience with blockchain based evidence. Thus, centralized evidence systems traditionally formed the basis of judicial system, including notarized documents and official registries. Blockchain departs with court assumptions that Blockchain is decentralized and pseudonymous, and therefore deviates from authorship, authenticity and probative value.¹⁵¹

An important difficulty is to authenticate on blockchain entries. Even though blockchain data structures provide cryptographic proof of data integrity, courts still need human witnesses to testify about data chain of custody and transaction. In the absence of technical standards for blockchain verification, the methodologies of expert witnesses will be instrumental when relying on the issues in court rulings, which may be inconsistent.

In addition, blockchain evidence is admitted on a jurisdictional basis. For example, in China, since 2018, blockchain based copyright evidence have been accepted by Hangzhou Internet Court.¹⁵² On the other hand, in common law countries like the US¹⁵³ and the UK¹⁵⁴, courts have yet to standardize procedures to authenticate entries on the blockchain as said to be the rules of evidence. There are also dangers in placing too much weight on private and unaudited blockchain platforms because their privacy from outside scrutiny also means that they can be tampered with. If there are no regulations on private blockchains, flawed or manipulated records could be embedded in private blockchains, rendering blockchain evidence inadmissible as well¹⁵⁵; hence, scholars such as Finck call for certification standards for admissibility of blockchain evidence.¹⁵⁶

Then, until such uniform legal standards do apply, litigants remain uncertain as to whether blockchain evidence will be admissible in judicial proceedings and what the weight will carry.

3.2.2 Absence of Dispute Resolution in Blockchain Systems

¹⁵¹ Finck M, 'Blockchain and the General Data Protection Regulation' (2019) 4(1) European Data Protection Law Review 17.

¹⁵² Hangzhou Internet Court, Huatai Yimei v Daotong Technology (2018) Case No. (2018) Zhe 0192 Min Chu No. 00123.

¹⁵³ Federal Rules of Evidence 901–902 (US)

¹⁵⁴ Civil Evidence Act 1995 (UK).

¹⁵⁵ De Filippi P and Wright A, Blockchain and the Law: The Rule of Code (Harvard University Press 2018) 114.

¹⁵⁶ Finck M and Moscon V, 'Legal Evaluation of Blockchain Evidence' (2021) 12(2) European Journal of Law and Technology 7.

The traditional copyright disputes are resolved by recognized authorities such as lawsuits, arbitrations or mediations, etc. By and large, public and permissionless blockchain systems do not come with built in legal dispute resolution frameworks. Smart contracts tend to be irreversible once executed. There is no recourse to a court or tribunal for irreversible outcomes including because of mistakes, fraudulent inputs, or unexpected circumstances.¹⁵⁷

Where copyright licensing or registration is involved, the challenge is even more pressing since there are no integrated remedies available for decentralized autonomous organizations and decentralized applications. Lacking clear governance structures leads to the disputes related to ownership, unclear payment, or confused smart contracts to degrade, as there is no internal adjudication available.¹⁵⁸

Decentralized attempts at building dispute resolution systems have been created. For e.g. the projects like Kleros also suggest using the juror pools based on the blockchain with proof of stake and voting for resolving the disputes¹⁵⁹ but like any other decentralized arbitration, this is not formally recognized in the majority of the national juridical systems and will suffer from the enforcement issues.

In this regard, online dispute resolution requires swift, inexpensive mechanisms of resolving disputes, which could easily be adapted to blockchain contexts¹⁶⁰ but which are still adapting slowly.

Finally, it is queried whether smart contracts themselves are indeed enforceable agreements under contract law. Some jurisdictions such as the US states of Arizona and Wyoming already have legislations that view smart contracts as a legally binding contract.¹⁶¹ Others view smart contracts as evidence of agreement, which will be enforceable upon the analysis of the law.

However, while the existence of blockchain technology forces parties to enter into the legal enforcement space of decentralised platforms, they will continue to do so, unless legal systems are redesigned to incorporate dispute resolution frameworks fit for blockchain technologies.

Finally, blockchain provides promising technological capabilities for the copyright enforcement, but is vulnerable with legal issues. The problem with blockchain systems can be traced from the very fact of their uniqueness; however, they do not have the judicial precedent, authentication of blockchain evidence is impossible, and the lack of internal dispute mechanisms is also vulnerable. So as blockchain applications keep expanding, the courts, regulators and international

¹⁵⁷ Werbach K and Cornell N, 'Contracts Ex Machina' (2017) 67(2) Duke Law Journal 313.

¹⁵⁸ Zetsche DA, Buckley RP and Arner DW, 'Decentralized Autonomous Organizations: Concept, Legal Status, and Governance' (2020) 65(5) Business Lawyer 1081.

¹⁵⁹ Kleros, 'Decentralized Justice' <<https://kleros.io>>

¹⁶⁰ UNCITRAL, 'Technical Notes on Online Dispute Resolution' (2017)

¹⁶¹ Arizona Revised Statutes § 44-7061; Wyoming HB0070 (2019).

bodies need to work together to develop legal standards that allow enforceability, reliability of blockchain, and fairness.

3.3 Comparative and Ethical Dimensions

On one hand, blockchain might ease efficiency, transparency and autonomy of copyright law but on the other hand, it creates a legal and ethical predicament. Such an approach involves national governance options and ethical reflection into a comparative review aimed at achieving a balance between technological innovation and basic legal and societal values.

As for regulatory experimentation it is here in the European Union. For blockchain based assets such as NFTs and the decentralized apps, a growing legal framework is proposed, the so called “Markets in Crypto-Assets Regulation” along with the “Digital Services Act” and “Data Governance Act”.¹⁶² However, when it comes to enforcing the copyright on the blockchain, it remains in its infancy.¹⁶³ While the United States has a fragmented landscape, they are unified in that they have the power and ability to find things on the earth's surface. Although federal agencies like the SEC and CFTC supervise blockchain in financial industry, sectorial and market driven copyright integration has not gone beyond sectorial.¹⁶⁴ To this end, in 2020, the US Copyright Office began studying how new tools will affect the rights management, and emphasized that without change through Congress, blockchain cannot replace statutory registration. Yet, state level experiments, like Wyoming's acknowledgement of the use of different blockchain structures of governance for companies, showcase creativity while continuing illicit interstate variance in law.¹⁶⁵ State-level experiments, such as Wyoming's acknowledgment of blockchain-based corporate governance structures, reveal creativity but accentuate interstate legal inconsistencies.¹⁶⁶

China follows a government-focused prototype. National plans such as 'Blockchain Service Network' are fairly promoting blockchain development. In Hangzhou, Guangzhou, and Beijing, internet courts accept blockchain evidence for license enforcement and other IP claims,¹⁶⁷ but China's permissioned blockchain ecosystems – as with all

¹⁶² European Commission, 'Markets in Crypto-Assets Regulation (MiCA)'

¹⁶³ EUIPO, 'Blockchain for IP Enforcement' (2022)

¹⁶⁴ SEC, 'Framework for "Investment Contract" Analysis of Digital Assets' (2019)

¹⁶⁵ US Copyright Office, 'Copyright and Emerging Technologies' (2020)

¹⁶⁶ Arizona Revised Statutes § 44-7061; Wyoming HB0070 (2019).

¹⁶⁷ Hangzhou Internet Court, Huatai Yimei v Daotong Technology (2018) Case No. (2018) Zhe 0192 Min Chu No. 00123.

blockchain ecosystems operated in the country – are also closely monitored for surveillance and censorship risks.¹⁶⁸

Japan provides a balanced model. Japan dabbles in technological innovation on the blockchain and smart contract field, whilst respecting strict consumer rights norms, recognising smart contracts and blockchain registries for some civil affair transactions,¹⁶⁹ while Singapore's "Monetary Authority of Singapore" adopts the use of the regulatory sandbox in that it encourages blockchain adoption without financial integrity and IP enforcement norms abdicated.¹⁷⁰

From under blockchain's decentralization narrative, democratization of copyright protection will be taking place. However, there are several risks that have been subject to ethical scrutiny.

Initially, the **"digital divide"** continues to exist. It is however high in transaction costs (gas fees), complex to operate technically and does not have good infrastructure in lower income regions leading to inequality in participation.¹⁷¹ Unless measures are taken to cure the above problem, blockchain adoption is predicted to amplify the inequalities rather than reducing them.

Second, there always remains the risk of **"monopoly capture."** Blockchain standard, metadata format and smart contract template may be dominated by private platform. In this argument, Lessig posits that 'code is law': the normative choices of who has power in the technological frameworks will continue to take place without internal controls, could thereby create or amplify imbalances of power on the Web 2.0 market.¹⁷²

Third, blockchain's 'immutability principle' contradicts evolving norms such as 'right to be forgotten' under the GDPR : errors, fraud entries or outdated licenses entered immutably in blockchain string that cannot be easily removed or amended by the way the Internet isn't.¹⁷³

Finally, one of the rhetorical problems that emerge is **"algorithmic bias."** Creating a platform based around smart contract platforms without different stakeholders contribution may inadvertently put holes in the system that hurts the marginalized creator. The value in fairness and justice is necessary to create ethical design principles for public governance participation in blockchain infrastructures.¹⁷⁴

Policy organizations have increasingly drawn the attention to these strains globally. According to WIPO's 2020 Blockchain White Paper,¹⁷⁵

¹⁶⁸ Xu X, 'Blockchain Development Strategy in China' (2020) 33 Journal of Chinese Political Science 125.

¹⁶⁹ Japanese Ministry of Economy, Trade and Industry, 'Blockchain White Paper' (2021)

¹⁷⁰ Monetary Authority of Singapore, 'Fintech Regulatory Sandbox Guidelines' (2022)

¹⁷¹ WIPO, 'Blockchain White Paper: IP and Blockchain' (2020)

¹⁷² Lawrence Lessig, Code and Other Laws of Cyberspace (2nd edn, Basic Books 2006) 89–92.

¹⁷³ GDPR (Regulation (EU) 2016/679) art 17.

¹⁷⁴ De Filippi P and Wright A, Blockchain and the Law: The Rule of Code (Harvard University Press 2018) 178–183.

¹⁷⁵ WIPO, 'Blockchain White Paper: IP and Blockchain' (2020).

blockchain's implementation in IP systems must compensate against exclusion, fraud and monopolization, while recommending that governments enable blockchain evidentiary and licensing functions with legal frameworks and cross border inter-operability standards which protect authors' rights.

In addition, OECD's Blockchain Policy Principles require 'technology neutral regulation' that should be driven by outcomes (e.g. security, fairness, accountability) rather than technology specifics, suggest multi-stakeholder governance, open standards and being responsive to dynamic applications of new blockchain.¹⁷⁶

While created prior to the rise of blockchain, UNCITRAL's Technical Notes on Online Dispute Resolution¹⁷⁷ provides models for decentralized dispute resolution mechanisms that might help to support blockchain ecosystems as they focus on the expeditious, fair and enforceable digital dispute settlements.

Blockchain is not neutral from legal or ethical perspective. Such social and political choices are reflected in its architectures, its permission models, and its smart contract templates. De Filippi and Wright argue that blockchain becomes a means by which governance can be democratized or reinforced as new hierarchies, based on its parameters of design and law.¹⁷⁸

Therefore, regulatory models should rise above the idea that 'decentralized good, centralised bad'. As a balance, blockchain governance in copyright needs to be mingled with oversight, human rights protections with innovation, and potential remedies with technical freedom.

Comparative analysis reveals that in the circumstances, blockchain may be integrated into copyright systems, but dependent on jurisdiction, and that it is morally complex. The quest entailed by the EU, US, China and Japan poses common challenges to manage innovation with right protection, deal with inequities, and ensure accountability.¹⁷⁹ Such principled governance frameworks are issues upon which WIPO, the OECD, and UNCITRAL have all spent significant amounts of resources advocating international efforts, and they are right to do so. Until the deployment of the blockchain technology is global, its potential for copyright law will be held not by technical capabilities alone, but the ethical and legal choices baked into that deployment.

¹⁷⁶ OECD, 'Blockchain Policy Principles' (2022) <<https://www.oecd.org>>

¹⁷⁷ UNCITRAL, 'Technical Notes on Online Dispute Resolution' (2017)

¹⁷⁸ De Filippi P and Wright A, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018).

¹⁷⁹ Matthias Artzt and Thomas Richter (eds), *International Handbook of Blockchain Law: A Guide to Navigating Legal and Regulatory Challenges of Blockchain Technology and Crypto Assets* (2nd edn, Springer 2023) 12–18.

Chapter IV: Conclusion, Findings and Suggestions

This dissertation completely examined the rising interconnection of blockchain with copyright law by scrutinizing systems of ownership verification as well as copyright enforcement in the era of worldwide digital and decentralized development. This study shows blockchain offers exciting opportunities, but it also presents hard legal, procedural, and ethical issues in its adoption alongside the hope that blockchain will serve to make good on broken promises to fix inefficiencies in the long standing traditional copyright system. In the end, the introduction of blockchain into copyright governance can only be achieved through an analysis incorporating a careful balancing of legal traditions, the protection of fundamental rights, along with an open approach toward technological progress.

The immutability, decentralization and transparency of Blockchain is very much suited for the validation of copyright owners and implementation of copyright licensing terms. Is verifiable, tamper proof that offers decentralized, self-executing smart contracts, and due to this removes the centralized intermediaries, decreases transaction costs, and allows creator to direct control of works. As this dissertation has shown however, without significant reform in law and the practice of courts along with the underlying governance structures, most of blockchain's potential remains simply theoretical. If there is no standard procedures for evidentiary admission through adoption across jurisdictions and framework in place for dispute resolution, blockchain remains nothing but an elegant, but legally inert technology.

Hence a blend of cautious optimism and critical realism has been used to answer the primary research questions posed by this study. While Blockchain can make it easier to verify ownership as compared to the supposed superiority of centralized systems, the adaptation of enforcement mechanisms with Blockchain is reliant on judicial and administrative procedures.

Nevertheless, there are legal, regulatory and ethical concerns like jurisdiction inconsistencies, privacy and exclusion risks from technology, which prevent blockchain acceptance. For this reason, neither can the national and international legal frameworks deliberately embrace decentralized technologies naively or dismiss them too quickly.

However, in order to attain blockchain's full potential, we would also require a coordinated and holistic reform agenda on top to benefit from execution. Blockchain entries must be recognized as lawful evidence in legislative reforms, standards for enforceability of smart contracts must be specified, and permanence of blockchain should be reconciled with privacy obligations under implementations like GDPR. Therefore, it is necessary for any judicial reform focused on resolving blockchain related disputes to provide capacity building initiatives

necessary for courts to competently interpret, and assess any such disputes. On the institutional level, a hybrid registry that merges the old registration system while using also the blockchain certification can be used to complement the old with the new. Overall, ethical governance frameworks to ensure that blockchain initiatives are accessible, clear and responsible need to be implemented by blockchain initiatives themselves.

Suggestions:

Several concrete policy recommendations are presented to policy makers, courts and industry stakeholders in this dissertation.

- Legislation must be changed at the national level to reflect that time stamps from blockchain are presumption of time of authorship and ownership, subject to judicial review.

- By invoking the dispute resolution clauses and fallback mechanisms that will be embedded in smart contracts to facilitate copyright licensing, irreversible harm cannot be imposed by human errors or a malicious attack.

- Flexibility on technical solutions, such as off-chain storage, or zero knowledge proof, must be allowed in the realm of privacy regulations to maintain integrity of Blockchain without having to sacrifice rights as data erasure.

- Whereas, we must create rules on how to authenticate blockchain evidence such as what to use to verify a cryptographic hash and also inspecting smart contract operations.

- From the point of view of judges and lawyers, the judges and lawyers need to be technologically literate; specialized training programs need to be conducted to cultivate judges' and lawyers' technological literacy and procedural fairness. In addition, courts should also experiment with the recognition of blockchain mediated online dispute resolution (ODR) platforms, so long as such mechanisms meet the principles of impartiality, due process, transparency, et cetera.

- The blockchain verification of timestamp authenticity is suggested to be incorporated into the copyright offices as a part of the institutional level.

- The regulatory models should allow for experimentation of the decentralized copyright management models under supervised conditions.

- Efforts should be made by WIPO and other international bodies to develop cross-border interoperability standards for blockchain authenticated rights (i.e., interoperability of blockchains) with the means that these blockchain authenticated rights are cross border protected and enforceable.

- The development of blockchain copyright solutions should not be considered without properly considering the aspect of ethical governance. They have to be open, and open participation in governance processes is required, and require regular audits for algorithmic bias.

However, it will not be a technological capability alone that will decide the copyright of the future in a decentralized world of digital value. The answer will be dependent upon how each and all of these groups of people choose to answer. Given that copyright always described principles underpinning it—creativity needs to be recognized and rewarded, access to knowledge must be equitable, and human dignity preserved—blockchain can only be paired with it if the principles remain somewhere at the heart of legal systems.

However, we have to realize that careful stewardship, critical engagement; unwavering commitment to justice, all must be realized. If integrated properly, blockchain could play a part in the formation of a copyright system we never knew before, more effective, more transparent, more just, and more accessible. Thus it is not guarded against being abused, overlooked, or neglected on behalf of private monopolies that would turn it into just another mechanism of alienation in a more and more unequal digital society.

This dissertation does a good job of describing what worked and what did not, but ultimately, humbly, needs to admonish us to be mindful of technological change. Law cannot fetishize innovation nor should it reject it out of hand. Instead, it needs to explore an avenue that creates for blockchain the conditions in which it can operate effectively while preserving the spirit of the values on which copyright law is founded, not as a tool for control, but as celebration.

BIBLIOGRAPHY

Primary Sources

Treaties

1. Berne Convention for the Protection of Literary and Artistic Works (adopted 9 September 1886, as amended 28 September 1979) 1161 UNTS 3.
2. Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (adopted 15 April 1994, entered into force 1 January 1995) Marrakesh Agreement Establishing the WTO Annex 1C, 1869 UNTS 299.
3. WIPO Copyright Treaty (adopted 20 December 1996, entered into force 6 March 2002) 2186 UNTS 121.
4. WIPO Performances and Phonograms Treaty (adopted 20 December 1996, entered into force 20 May 2002) 2186 UNTS 203.

Secondary Sources

Books

1. Primavera De Filippi and Aaron Wright, "Blockchain and the Law: The Rule of Code" (Harvard University Press 2018).
2. Michael J Casey and Paul Vigna, "The Truth Machine: The Blockchain and the Future of Everything" (Harper Business 2018).
3. Imran Bashir, "Mastering Blockchain: Inner Workings of Blockchain, from Cryptography and Decentralized Identities to DeFi, NFTs and Web3" (4th edn, Packt Publishing 2023).
4. Don Tapscott and Alex Tapscott, "Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World" (Portfolio Penguin 2016).
5. Antony Lewis, "The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them" (2nd edn, Mango Publishing 2018).
6. Daniel Drescher, "The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-Based Projects" (Apress 2019).
7. Melanie Swan, 'Blockchain: Blueprint for a New Economy' (O'Reilly Media 2015).

8. Enrico Bonadio and Caterina Sganga (eds), "NFTs, Creativity and the Law: Within and Beyond Copyright" (Routledge 2023).
9. Matthias Artzt and Thomas Richter (eds), "International Handbook of Blockchain Law: A Guide to Navigating Legal and Regulatory Challenges of Blockchain Technology and Crypto Assets" (2nd edn, Springer 2023).
10. Matthias Artzt and Thomas Richter (eds), "Blockchain Technology and the Law: Opportunities and Risks" (Springer 2020).
11. Paul Goldstein and Bernt Hugenholtz, "International Copyright: Principles, Law and Practice" (3rd edn, Oxford University Press 2019).
12. Ravi Sarathy, "Enterprise Strategy for Blockchain: Lessons in Disruption from Fintech, Supply Chains, and Consumer Industries" (MIT Press 2022).
13. Nick Voulgaris, "Blockchain and the Supply Chain: Concepts, Strategies and Practical Applications" (Kogan Page 2022).
14. Syed Agha Hassnain Mohsan, Amr Tolba and Kashif Naseer Qureshi (eds), "Blockchain Principles and Applications in IoT" (Springer 2023).
15. Rajan Kashyap, "Blockchain and Web3: Building the Cryptocurrency, Privacy, and Security Foundations of the Metaverse" (Apress 2023).

Articles

1. João Pedro Quintais, 'Copyright Law on Blockchains: Between New Forms of Rights Administration and Digital Rights Management 2.0' (2019) 50(3) "International Review of Intellectual Property and Competition Law" 282.
2. Giancarlo Frosio, 'Re-visiting Copyright: Is There a Way to Tackle Selective Enforcement and Non-Contextual Algorithmic Takedowns? A Discussion Through the Lens of Internet Meme Culture' (2022) 53(2) "International Review of Intellectual Property and Competition Law" 121.
3. Cristiana Santos and Nadine L Hachad, 'Deciphering Blockchain's Role in Danish Decision-Making: Evaluating Opportunities and Challenges Through the Prism of Due Process' (2021) 9(2) "European Journal of Law and Technology".

4. Cristina Poncibò, 'Distributed Ledger Technology and Property Registers: Displacement or Status Quo?' (2020) 9(1) "European Property Law Journal" 1.

Official Documents and Webpages

1. WIPO, 'Blockchain White Paper: IP and Blockchain' (2020) <<https://www.wipo.int/publications/en/details.jsp?id=4526>> accessed 20 April 2025.

2. Cisum, 'Next-Gen Copyright Streaming Platform' (Cisum.io, 2023) <<https://cisum.io>> accessed 20 April 2025.

3. RightsTech Podcast, Roanie Levy, 'Blockchain for Copyright and Intellectual Property' (28 May 2020) <<https://rightstech.com/2020/05/rightstech-podcast-roanie-levy-on-blockchain-and-copyright/>> accessed 20 April 2025.