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The Impact of Blockchain Technology on Intellectual Property

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Abstract

The digital age has presented significant challenges to the protection of intellectual property (IP) rights. Traditional methods of registration and enforcement can be cumbersome and susceptible to fraud. However, the emergence of blockchain technology offers a potential paradigm shift in how we manage and safeguard IP assets. It has fundamentally reshaped how information is stored and secured across various industries. Blockchain is a secure and distributed digital ledger that records transactions chronologically and transparently. Each transaction is cryptographically linked to the previous one, creating an immutable chain of blocks that cannot be tampered with. This inherent security and transparency make blockchain a compelling tool for the protection of IP rights. This paper delves into the potential impact of blockchain technology on various aspects of IP management. The paper will explore existing proposals for leveraging blockchain to address copyright protection and industrial property rights. The research methodology employed in this paper utilizes a doctrinal research design, drawing on established legal principles and scholarly works. The paper analyses existing literature on both blockchain technology and intellectual property law. The findings of this paper suggest that blockchain presents itself as a promising frontier technology with the potential to transform how IP assets are managed and safeguarded. However, the IP community is still in the nascent stages of exploring and integrating blockchain technology. For this potential to be fully realized, concerted efforts are necessary to bridge the knowledge gap, establish a clear legal framework, and promote wider adoption within the IP community.

Keywords: Blockchain Technology, Intellectual Property Rights, IP Assets, Blockchain Transactions

1. Introduction

The internet's explosion in the mid-1990s fundamentally reshaped how we interact, fostering real-time communication and information access on a global scale.[1] However, its limitations in data privacy and identity management are increasingly apparent. Now, on the cusp of the Fourth Industrial Revolution (Industry 4.0), emerging technologies like blockchain are poised to

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[1] 'From ARPANET to ChatGPT: The phenomenal rise of the personlised internet' available at <https://www.historyskills.com/classroom/year-10/history-of-the-internet/>accessed 5 May 2024; 'The Internet: Revolutionizing Communication, Information Access, and Connectivity'<https://reinventers.com/the-internet-revolutionizing-communication-information-access-and-connectivity/>accessed 5 May 2024.

significantly impact how we operate. Industry 4.0 encompasses a suite of innovations, including artificial intelligence (AI), the Internet of Things (IoT), and robotics, all merging with human life to create a transformative shift. These technologies hold immense potential to revolutionize the innovation and creativity ecosystem by automating tasks with unprecedented capabilities.[2]

Recognizing this potential, the World Intellectual Property Organization (WIPO) established a Blockchain Task Force in 2018. This task force is exploring the use of blockchain technology to streamline Intellectual Property Rights (IPR) protection and information processing related to IP objects and their use. Their focus areas include investigating current industry standards, developing reference models for blockchain application in the IP field, and laying the groundwork for potential WIPO standards supporting blockchain integration within IP ecosystems.[3]

This initiative highlights the ongoing efforts to leverage cutting-edge technologies like blockchain to transform the world of intellectual property. However, significant challenges remain in terms of raising awareness and establishing robust legal and regulatory frameworks.

This paper delves into these issues, providing a foundational understanding of blockchain technology, its potential impact on the IP ecosystem, existing regulations, and challenges associated with its adoption for IP systems.

2. What is Blockchain Technology?

Blockchain technology has emerged as a transformative force in data management. In essence, it functions as a distributed ledger – a digital record of transactions that is replicated and maintained across a network of computers, rather than centralized in a single location. This decentralization offers a significant security advantage: any attempt to tamper with past entries would require modifying the record on every computer in the network, a near-impossible feat.[4] While different blockchain platforms, such as Ethereum and Hyperledger Fabric, have their own strengths and applications, they all share the fundamental features of decentralization, security, and tamper-proof record-keeping.

The core principle behind blockchain lies in its block structure. Transactions are grouped into these blocks, which are then cryptographically linked together in a chronological chain. Each block contains data about the transaction itself, as well as a unique code referencing the block before it. As new blocks are continuously added to the chain, modifying older data becomes increasingly difficult. This secure, tamper-proof record-keeping fosters trust and eliminates the need for intermediaries in transactions.[5]

The applications of blockchain technology extend far beyond its initial use in cryptocurrencies like Bitcoin. Its secure and distributed nature makes it valuable for managing digital identities, tracking the origin and ownership of goods (traceability), and automating agreements through the use of smart contracts. Additionally, the level of access and control within a blockchain network can be

[2] WIPO, 'Blockchain technologies and IP ecosystems: A WIPO white paper WIPO 2022.

[3] Committee on WIPO Standards (CWS) (2018). Sixth Session Geneva, October 15–19, 2018. <www.wipo.int/edocs/mdocs/classifications/en/cws_6/cws_6_4_rev.pdf>

[4] WIPO, 'Blockchain technologies and IP ecosystems: A WIPO white paper WIPO 2022.'<https://www.wipo.int/export/sites/www/cws/en/pdf/blockchain-for-ip-ecosystem-whitepaper.pdf>accessed 5May 2024.

[5] I Asghar *et al*, 'An Overview of Blockchain Technology for Intellectual Property Management' (United Kingdom, 2021) The Centre of Excellence in Mobile and Emerging Technologies<https://pure.southwales.ac.uk/ws/portalfiles/portal/10166641/Camera_Ready_Paper_91.pdf>accessed5 May 2024.

tailored to specific needs. Public blockchain allows open participation, while private blockchain limits access to authorized users.[6]

Within the realm of intellectual property (IP), blockchain presents a potential alternative to traditional, centralized management systems employed by patent offices. Researchers are actively exploring the use of blockchain-based algorithms to leverage this technology's inherent security for more effective IP protection.[7] The current state of the art, such as the i-Depot offered by the patent office in some European countries, provides a centralized solution.[8] This solution has not scratched the surface of the problem as it relies on an individual institution that has to serve as the sole administrator.

3. Potential Blockchain Application in IP

Blockchain technology boasts several features that make it highly attractive for intellectual property management. Its decentralized nature fosters transparency and immutability of records, enabling clear traceability of ownership and usage rights. This can be particularly beneficial for copyright protection, as it creates a secure and tamper-proof record of authorship. Additionally, the secure and transparent nature of blockchain can streamline licensing procedures and facilitate efficient royalty distribution. Here are some key areas where blockchain can be applied:

i. **Traceability and Proof of Ownership**: The immutable record-keeping feature blockchain possesses allows for secure tracking of the creation and ownership of intellectual property throughout its lifecycle.[9] This can be particularly beneficial in open innovation processes, where ideas and development stages need to be documented.

ii. **Secure Supply Chains and Licensing**: Blockchain can be used to establish secure and transparent supply chains for products with intellectual property rights. This can be achieved by storing production data and licensing agreements on the blockchain. Smart contracts, self-executing agreements stored on the blockchain, can automate royalty payments and ensure adherence to licensing terms.[10]

iii. **Copyright:** The creative industries stand to gain significant benefits from blockchain technology. Beyond just film scripts and titles, intellectual property in music, literature, and design can all be protected through blockchain registration. For instance, musicians could store their original compositions on the blockchain, creating an immutable record of creation. This timestamped record can be crucial in copyright disputes and royalty collection. Similarly, authors could register their literary works on the blockchain, establishing ownership and streamlining licensing processes for e-books or translations

iv. **Patents**: Defensive publications, a strategy to create prior art and prevent patent monopolies, can be facilitated by blockchain. Secure and transparent publication of

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[6] WIPO, 'Blockchain technologies and IP ecosystems: A WIPO white paper WIPO 2022.' <https://www.wipo.int/export/sites/www/cws/en/pdf/blockchain-for-ip-ecosystem-whitepaper.pdf> accessed 5 May 2024.

[7] X Lijun, *et al*, 'A Blockchain-Based Traceable IP Copyright Protection Algorithm' (2020) IEEE Access <https://ieeexplore.ieee.org/document/8972355> accessed 10 May 2024.

[8] D Modic, AHafner, N Damji, and L Cehovin Zajc, 'Innovations in Intellectual Property Rights Management: Their Potential Benefits and Limitations' (2019) EJMBE 12 <https://doi.org/10.1108/EJMBE-12-2018-0139> accessed 10May 2024.

[9] R Media, 'The Use of Blockchain in Intellectual Property Rights' (8th February 2024) <https://reintech.io/blog/blockchain-use-in-intellectual-property-rights> accessed 10May 2024.

[10] Ibid.

technical details on the blockchain can establish prior art where traditional databases might be impractical.

v. **Industrial Designs**: For fast-moving industries like fashion, where trends cycle quickly, traditional design registration might be cumbersome. Blockchain can provide a faster and more cost-effective way to establish ownership and creation timestamps for protecting unregistered designs used for shorter periods.

vi. **Trade Secrets**: Blockchain can assist in demonstrating compliance with trade secret protection laws. While the specifics of trade secrets cannot be stored publicly on the blockchain, the technology can still be useful. By encrypting trade secret information, timestamping it on the blockchain, and using zero-knowledge proofs for access control, blockchain can provide a secure and verifiable record of the steps taken to protect confidential information.

vii. **Open Innovation Platforms**: Blockchain can facilitate secure collaboration between different parties in the innovation process, such as SMEs or designers and manufacturers. NDAs (non-disclosure agreements) can be implemented as smart contracts, ensuring clear ownership and usage rights for intellectual property shared within a collaborative environment. For example, KodakOne leverages blockchain technology to empower photographers by enabling them to register their creative work, monitor its usage, and receive compensation. Similarly, Ascribe provides a platform for artists to register their digital art and efficiently manage its distribution.[11]

viii. **Product Development and Information Management**: Blockchain can be used to securely manage product development information and processes, including design data and technical specifications. A system using private blockchain could be developed to share and verify IP among designers, engineers, and stakeholders within an organization.[12]

ix. **Dispute Resolution**: Secure and tamper-proof blockchain records can serve as verifiable evidence in IP disputes. Dated and auditable documentation on the blockchain can significantly aid rights holders by creating a clear trail of ownership and use throughout an IP asset's lifecycle. This can be particularly valuable in trademark opposition or cancellation proceedings, demonstrating proof of use or acquired distinctiveness.

These are just a few examples of how the unique capabilities of blockchain can be harnessed to enhance intellectual property management across various categories. By offering secure, transparent, and immutable evidence trails, blockchain empowers creators and rights holders to navigate the IP landscape with greater confidence. As the technology evolves, we can expect even broader applications to emerge, fostering a more secure and efficient environment for innovation and creativity.

4. Regulatory Framework for Blockchain Technology

Despite the potential of blockchain technology being widely recognized, it is still coupled with a high level of legal uncertainty with regard to the technology. However, the fact that blockchain has the potential to fundamentally transform a wide range of industries and markets has led international and regional organizations to launch projects or adopt guidelines in the field. For

[11] Ibid

[12] V Hargaden, *et al*, 'The Role of Blockchain Technologies in Construction Engineering Project Management' (1st June 2019) International Conference on Engineering, Technology and Innovation<https://api.semanticscholar.org/CorpusID:199542773> accessed 10 May 2024.

example, the Global Blockchain Policy Forum of the Organisation for Economic Co-operation and Development (OECD),[13] where policy aspects, such as standardization and governance, are debated and information and opinions exchanged; the United Nations Conference on Trade and Development's (UNCTAD) paper on "Harnessing Blockchain for Sustainable Development: Prospects and Challenges";[14] the UN Joint Inspection Unit's (UNJIU) paper titled "Blockchain Applications in the United Nations System: Towards a State of Readiness,"[15] which contains eight recommendations for either the governing bodies or the executive heads of the UN system organizations; the United Nations Centre for Trade Facilitation and Electronic Business's (UN/CEFACT) Blockchain White Paper Project;[16] and the European Union (EU) Blockchain Observatory's aim to accelerate blockchain innovation and the development of the blockchain ecosystem within the EU.[17]

Initiatives in the private sector are also multiple, such as the International Chamber of Commerce (ICC) projects on blockchain-backed Incoterms and the creation of the International E-Registry of Ships (IERS), which is the world's first blockchain-backed digital shipping registration and renewal system.[18] These initiatives are leading the way on how societies will interact with the governing bodies.

While some of the above-mentioned projects focus on expanding the potential benefits of blockchain technologies to developing countries, certain developed economies are already implementing their own projects. This is the case of the UK government's project to use blockchain and other distributed ledger technologies (DLTs) to verify the provenance of goods; the project of the US Department of Agriculture to use blockchain to streamline the functioning of complex agricultural supply chains; or the case of Estonia, where citizens have full access to a suite of e-government services and fully interact digitally with public instances.

Furthermore, a number of governments around the globe have established blockchain guideline and roadmap documents that lead the way and benchmark considerations required of government entities prior to engaging in blockchain implementations or provision of service aided by blockchain technology. For example, in 2018 the National Institute of Standards and Technology of the US Department of Commerce published a Blockchain Technology Overview,[19] which serves as a comprehensive survey of blockchain technology. A well-defined regulatory

[13] OECD, 'Blockchain and Distributed Ledger Technology' Organisation for Economic Co-operation and Development <https://www.oecd.org/daf/blockchain/> accessed 10 May 2024.

[14] UNCTAD, 'Harnessing Blockchain for Sustainable Development: Prospects and Challenges' United Nations Conference on Trade and Development (2021) <https://unctad.org/system/files/official-document/dtlstict2021d3_en.pdf> accessed 10 May 2024.

[15] UNJIU. 'Blockchain applications in the United Nations System: Towards a State of Readiness.' United NationsJoint Inspection Unit (2020) <https://www.unjiu.org/news/blockchain-applications-united-nations-system-towards-state-readiness-jiurep20207> accessed 10 May 2024.

[16] UNECE White Paper, 'Blockchain in Trade Facilitation (ECE/TRADE/457)' United Nations Economic Commission for Europe (2020) <https://unece.org/DAM/trade/Publications/ECE-TRADE-457E_WPBlockchainTF.pdf > accessed 10 May 2024.

[17] EU, 'Blockchain Observatory and Forum' <https://blockchain-observatory.ec.europa.eu/index_en> accessed 10 May 2024.

[18] International Chamber of Commerce (ICC), 'Intercoms® 2020' (2020) <https://iccwbo.org/business-solutions/incoterms-rules/incoterms-2020/> accessed 10 May 2024.

[19] D Yaga, P Mell, N Roby and K Scarfone 'Blockchain Technology Overview' (October, 2018) National Institute of Standards and Technology and US Department of Commerce (NISTIR) <https://doi.org/10.6028/NIST.IR.8202 >accessed 10th May 2024.

environment can foster trust and encourage broader application of blockchain, including its potential to revolutionize intellectual property management.

The evolving nature of blockchain technology presents a challenge for creating a global regulatory framework. Nevertheless, ongoing discussions and pilot projects pave the way for future regulations that will address key areas like data privacy, security standards, and intellectual property rights in the context of blockchain.

5. Challenges of Using Blockchain for Intellectual Property

The Chamber of Digital Commerce, a world trade industrial representation for blockchain and digital assets, outlined an innovation guide to IP Strategy, protecting innovation and avoiding infringement. [20] The potential technical challenges/limitations to be resolved before using blockchain to manage the intellectual property from an operational perspective can be classified into authenticity, provenance and royalty.[21]

I. Authenticity Problem

A key challenge for using blockchain in IP management is ensuring the authenticity of information. While blockchain excels at creating a tamper-proof record of a digital fingerprint (hash) of the IP asset, additional details like ownership proof often rely on third-party services. These services, utilizing digital certificates and metadata protocols, aim to provide evidence of ownership.[22]

The crux of the issue lies in the potential for inaccurate information entering the system. Third-party verification introduces the possibility of "garbage in, garbage out," meaning incorrect ownership information, either deliberate (malicious actors) or accidental (human error), can be recorded. This raises concerns about resolving disputes in the absence of a trusted third party to validate information before it's added to the blockchain.

To address this challenge, some propose using permissioned blockchain networks. These require approval for adding information, offering a layer of control before permanent recordation on the blockchain. However, permissioned networks come with limitations on openness and decentralization, which are core strengths of blockchain technology.

Finding a solution that balances the need for secure and verifiable information with the benefits of open and decentralized blockchain systems remains an ongoing area of research.

II. Provenance Problem

Even if the authenticity of information is addressed, another hurdle for blockchain in IP management is tracking ownership history (provenance). This is particularly complex for creative works that often build upon existing works or have ownership that changes hands over time.[23] Blockchain excels at recording a single event, but capturing the entire chain of ownership can be challenging.

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[20] BIP Council, 'A Blockchain Innovator's Guide to IP Strategy, Protecting Innovation & Avoiding Infringement' <https://bravenewcoin.com/wp-content/uploads/2023/11/31eb5363-3e0e-44ca-90bb-395da184e89a.pdf> accessed 12 May 2024.

[21] K Ito and M O'Dair, 'A Critical Examination of the Application of Blockchain Technology to Intellectual Property Management',(2019) *Springer*, 317-335.

[22] Ibid.

[23] A Savelyev, 'Copyright in the blockchain era: Promises and challenges', (2018) 34 (3)*Computer law & security review*, 550-561

A core challenge is preventing "double spending" – essentially, claiming ownership of an IP asset in multiple places, both on and off the blockchain. For instance, transferring a physical asset like a painting without updating the blockchain record creates a discrepancy. Similarly, a bad actor with access to a private key could potentially claim ownership of a digital asset.

Currently, solutions to ensure reliable provenance often involve trusted third parties. This could involve issuing transferable certificates where ownership rights are verified by a government body, or embedding legal contracts within the blockchain record that can be used for dispute resolution in court.[24]

Researchers are also exploring hybrid blockchain models that combine elements of public and private networks. These models could offer a solution for managing complex ownership histories while still leveraging the benefits of decentralization.

Addressing the challenge of accurately tracking ownership history is crucial for ensuring the reliability and effectiveness of blockchain in IP management. Hybrid models and the integration of trusted third-party verification are promising areas for further development.[25]

III. Royalty Stability Problem

Even if challenges like authentication and ownership tracking are addressed, another hurdle for using blockchain in IP management is ensuring stable royalty payments. Traditionally, trusted third parties manage royalty collection for physical and digital IP assets. However, their services often come with high fees, reducing the actual payout to IP owners.

Blockchain offers an alternative by directly connecting creators with consumers. Services built on platforms like Ethereum (DAapps) can automate royalty collection and user tracking. This approach is gaining traction in the music industry with services like Ujo Music and Peertracks.[26]

However, a major challenge remains – the volatility of cryptocurrencies used for transactions on these platforms. The fluctuating value of crypto makes it difficult to set a fixed price or value for royalties on the blockchain.

For widespread adoption, IP owners and consumers will need to find a balance between the efficiency and transparency offered by blockchain and the stability of traditional payment methods. This might involve a shift towards more stable crypto currencies or the integration of fiat currency options within blockchain-based royalty management systems.

6. Conclusion

Blockchain technology offers a glimpse into a future of intellectual property (IP) management that is more secure, transparent, and efficient. By providing tamper-proof records and streamlining processes, blockchain has the potential to empower creators and rights holders, while deterring counterfeiting and simplifying dispute resolution.

However, significant challenges remain before widespread adoption can be achieved. Data storage limitations necessitate creative solutions for handling large files associated with IP assets.

[24] Ito andO'Dair, (n21).

[25] ZA Halloush and Q Yaseen,'A blockchain model for preserving intellectual property', in Editor (Ed.)^(Eds.): 'Book A blockchain model for preserving intellectual property' (2019,edn.), pp. 1-5.

[26] V Gatteschi, 'To blockchain or not to blockchain: That is the question',(2018) 20 (2)*IT Professional*, 62-74.

Establishing a robust legal and regulatory framework is crucial for ensuring the enforceability of blockchain-based evidence and ownership claims. Addressing these challenges will require ongoing research, development, and collaboration among stakeholders, including technology developers, policymakers, legal professionals, and IP rights holders.

Despite these hurdles, the potential benefits of blockchain for IP management are undeniable. As the technology matures and a supportive regulatory environment is established, we can expect to see broader adoption across various industries. Blockchain has the potential to usher in a new era of innovation and a more secure environment for intellectual property creation, protection, and commercialization. This technological revolution holds the promise of a more just and equitable landscape where creators are fairly rewarded for their contributions, and consumers have greater confidence in the authenticity of the products they acquire.

7. Recommendations

From the foregoing, it can be seen that the introduction of blockchain in IP management has its advantages, it also possesses some challenges that must be addressed before the solution can be effective for IP management. Some of these challenges include where the actual copyright work will be stored (either on the Blockchain or a decentralised cloud storage platform). Numerous design constraints exist with the available Blockchain architectures for storing a large digital file. Storing data or files on the Blockchain can slow down the network because of the proof of work mechanism for validating a transaction, making the whole process of large file-sharing or storage on the network a non-starter.

Appropriate use of the Blockchain will entail storing items that can only be captured in small text like the document hash. Hence, there are two potential solutions to adopting Blockchain for IP management workflow. The first requires a secure data-base to store the encrypted IP documents and embed the cryptographic hash and metadata in Blockchain. The second approach involves using file sharing solutions that mimic the decentralised and cryptographic properties of blockchain (StorJ, Filecoin, and The Interplanetary Files System (IPFS), etc.) for file storage. Then, the hash of the document is stored in the blockchain.

Another factor that must be considered before a successful use of blockchain for IP system is the establishment of a legal and regulatory framework and the creation of awareness to all stakeholders concerned. For example, the legal weight of evidence stored on blockchain and the enforceability of blockchain-based ownership claims need to be clarified through established legal frameworks.

Despite these challenges, ongoing development and collaboration can pave the way for effective integration of blockchain into IP management. Addressing data storage limitations and establishing a robust legal framework will be essential for unlocking the full potential of this technology in the intellectual property landscape.