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Decoding Creativity in the Digital Age: Blockchain Unveiled - Navigating Opportunities and Challenges in Copyright Protection

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Abstract

Introduction: *The advent of blockchain technology is heralded as a promising solution to address the challenges associated with digital copyright. Nevertheless, given the nascent stage of blockchain development, there exist a number of formidable challenges that necessitate resolution.*

Purposes of the Research: *This study endeavors to analyze the opportunities and challenges associated with the implementation of blockchain technology in safeguarding digital copyright.*

Methods of the Research: *This study employs the normative legal research method with a qualitative approach. The utilization of a qualitative approach in normative legal research allows for a nuanced exploration of legal principles and norms.*

Results of the Research: *The findings of the research underscore that blockchain technology, characterized by features such as decentralization, security, transparency, and immutability of data, presents opportunities for enhancing information transparency, detecting fraudulent claims, safeguarding the digital music industry, and automating license payments through smart contracts. Nevertheless, challenges must be addressed before blockchain can be widely implemented, including regulatory uncertainties and cybersecurity threats. Collaboration among government entities, academia, industry players, the private sector, and regulatory authorities is imperative to establish a clear and secure legal framework for the adoption of blockchain technology.*

Keywords: Blockchain Technology; Copyright Protection; Digital Era.

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INTRODUCTION

The advent of technology has driven the process of digitization, as evidenced by the shift from analog to digital technology, fostering advancements across various fields, including the realm of intellectual property[1]. Creators are no longer solely focused on producing physical works but also digital ones[2]. The utilization of the internet facilitates the sharing, distribution, and sale of creative works. However, this convenience does not always yield positive impacts. The internet is a virtual realm accessible to anyone, signifying that when creators share their works online, they relinquish control over them. This is because works

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[2] Ujang Badru Jaman, Galuh Ratna Putri, and Tiara Azzahra Anzani, "Urgensi Perlindungan Hukum Terhadap Hak Cipta Karya Digital," *Jurnal Rechten: Riset Hukum Dan Hak Asasi Manusia* 3, no. 1 (2021): 9–17, https://doi.org/10.52005/rechten.v3i1.22.

distributed on the internet can be stored by all internet users[3]. Issues arise when users who store these works engage in piracy by redistributing them online without permission and profiting from such actions[4]. Other actions, such as intentional modification, plagiarism, duplication, and falsely claiming to be the creator of a work, also constitute copyright infringement[5].

A lack of transparency regarding the copyright owner of a work is a common issue in the digital era[6]. When someone wishes to use copyrighted material, such as a song or photo, the question of who the original creator is often arises. This uncertainty stems from the unclear information about the original creators of digital works, with disparities in information scattered across various databases, making it challenging to determine the genuine creator[7]. This lack of information about ownership rights on the internet can result in significant losses for the original creators, as they may not receive compensation for the use of their work[8]. Moreover, it can have commercial implications, discouraging people from using the work due to the fear of getting involved in copyright infringement issues.

The emergence of blockchain technology is believed to offer a solution to the challenges of copyright in the digital era. Introduced in 2008 by Satoshi Nakamoto concurrently with Bitcoin[9], blockchain can be conceptually likened to a digital ledger that sequentially records all transactions[10]. Every transaction entering the blockchain network must undergo a verification process to ensure the security of the network. Once verified, these transactions are combined into a block, each with a unique identifier distinguishing it from other blocks, creating a chain connected to the preceding or succeeding block, forming a blockchain[11]. Blockchain employs a decentralized system, devoid of a central authority, ensuring that the verification process for incoming data adheres to the principles of a consensus mechanism[12]. Verified data entries utilize cryptographic mechanisms, making it challenging for unauthorized alterations, as any modification, no matter how minor, would impact other interconnected blocks[13].

With these features, blockchain is believed to serve as a secure digital database due to its transparency and high security. Countries such as Sweden, Singapore, the United States, Japan, and China have implemented blockchain across various industries, including

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[9] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System. Decentralized Business Review.," 2008.

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finance, healthcare, public services, supply chain, archiving, and real estate[14]. In Indonesia, blockchain implementation is primarily focused on the financial sector. Financial institutions like OJK and BI advocate that blockchain can be beneficial for digitally recording and storing transaction activities[15]. However, in the field of artificial intelligence (AI), no country has fully implemented blockchain, largely due to the challenges of adapting a still-developing technology within the legal frameworks of a nation[16].

The exploration of blockchain application in the field of Artificial Intelligence has been a subject of interest among researchers, as evidenced by prior studies delving into its potential implications, such as its role in patent protection[17]. Investigations have also been conducted on the mechanisms of implementing blockchain for the documentation of copyright for digital images[18]. Another study proposed the utilization of blockchain technology in the film sector, establishing a blockchain ecosystem to safeguard copyright interests[19]. Research has been dedicated to the use of blockchain in preventing digital piracy[20], as well as its integration with Intelligent Decision Support Systems (IDSS)/AI to create a comprehensive digital copyright protection system[21]. Considering that blockchain remains an evolving technology, there is substantial potential for scalability and significant benefits in the future. However, it is essential to acknowledge the potential challenges associated with its implementation. Thus, the research focus extends beyond exploring opportunities to include a comprehensive examination of the challenges that must be addressed in deploying blockchain as a form of copyright protection in the digital era.

METHOD

This study employs a normative legal research method that focuses on the analysis of norms within positive law. The aim is to interpret the application of blockchain technology in the context of copyright law, considering three fundamental legal principles[22]. The research approach encompasses the analysis of legislation and conceptual frameworks, relying on secondary data sources obtained through a literature review. Legal sources utilized include statutory regulations, such as Law Number 28 of 2014 concerning Copyright, as well as scholarly literature such as articles, journals, and books relevant to this study. The analyzed data will be presented in descriptive form through qualitative analysis employing both legal and conceptual approaches.

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RESULTS AND DISCUSSION

A. The Intersection of Copyright Concept and Blockchain Technology: A Paradigm of Innovation

The rapid advancement of technology has given rise to various technological innovations, harnessed by humans to enhance the efficiency and effectiveness of performance. One notable outcome of such innovation is blockchain technology. Introduced to the world by Satoshi Nakamoto in 2008 and implemented in 2009[23], blockchain was initially presented as the underlying technology for Bitcoin, a digital currency. Over time, it garnered widespread attention due to its valuable features[24]. Blockchain functions as a decentralized database, employing independent nodes for data storage and retrieval[25]. Information such as time, date, text, data size, and even computer code activating a specific action (smart contract) is stored and aggregated into a block[26]. Each block is accompanied by a unique digital signature as evidence of its authenticity. The addition of a block is identified by a hash, linking it to the preceding and succeeding blocks. The hash serves as a unique identifier by encrypting alphanumeric codes, comprising words, messages, or data against each block[27].

To approve and add a block to the blockchain network, a consensus among nodes is required. Nodes are users connected within the blockchain network with the responsibility of maintaining consensus among nodes and validating blocks for addition. While decentralized systems often face challenges in reaching unanimous agreement, blockchain has a mechanism to minimize such obstacles – the consensus mechanism. This mechanism activates when a node validates and adds a block to the blockchain network. If a new block fails to meet consensus requirements or is deemed invalid by a node, it will automatically be excluded from the blockchain network, while recorded blocks cannot be deleted or altered. Broadly speaking, consensus models can be categorized into two types: Proof-Based Consensus Models, employed in public blockchains, and Voting-Based Consensus Models, used in private blockchains[28].

Based on the functioning of Blockchain, it can be inferred that Blockchain technology possesses at least six advantages or features applicable to the field of digital copyright. These are: (a) Transparency, as information entered into the blockchain can be accessed by anyone within the network; (b) Decentralization, where the blockchain lacks a central authority holding full control over the network; (c) Immutability, making it difficult to alter/delete data added to the network due to the consensus required by the nodes; (d) Consensus, employing various consensus mechanisms to validate a block before addition; (e) Security, with complex consensus mechanisms, cryptography, and the absence of a centralized database, making it challenging for hackers to breach; (f) Smart contracts, involving self-

[23] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System. Decentralized Business Review."

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[28] Dodo Khan et al., "A Critical Review of Blockchain Consensus Model," *2020 3rd International Conference on Computing, Mathematics and Engineering Technologies: Idea to Innovation for Building the Knowledge Economy, ICoMET 2020*, 2020, 1–6, https://doi.org/10.1109/iCoMET48670.2020.9074107.

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executing contracts that operate automatically without the need for third parties when specific conditions are met[29].

It is essential to note that not all types of blockchains possess these six features. The features within a blockchain depend on the type used. Generally, blockchains are divided into two types: Public Blockchain and Private Blockchain[30]. Public Blockchain is open to the public, allowing users to explore all recorded data, add data, and become validating nodes. Public blockchains implement a decentralized system with no central authority, prioritizing anonymity. User identities are encrypted to protect privacy, and the consensus results in highly secure recorded data that is challenging to alter. However, due to the need for strong consensus, transaction processing times are slower compared to private blockchains. Examples of platforms using public blockchains include Bitcoin and Ethereum[31].

Private Blockchain limits user access to the blockchain network. It does not implement a decentralized system, meaning there is a central authority controlling the blockchain. While maintaining security and data integrity through consensus mechanisms, validation is restricted to authorized users. Private Blockchains are further divided into Open Private Blockchain and Closed Private Blockchain. Both types have a central authority, but the difference lies in closed private blockchains not allowing external parties to join the network, limiting access to those already involved. In contrast, open private blockchains provide an opportunity for external parties to join, with restricted access to recorded data[32].

The European Commission asserts that the presence of blockchain is believed to contribute to achieving greater transparency and improved management of ownership rights data, particularly in the realm of copyright [33]. Examining the workings of blockchain, coupled with its inherent features, has demonstrated its potential in the field of digital copyright, specifically in the protection of digital assets. Blockchain can be utilized to record and authenticate digital copyrights by leveraging the hash and timestamp features of the blockchain. When new information is added, the hash functions to collect and encrypt the information into a block, linking it to the preceding or succeeding block, and this process continues iteratively. Simultaneously, upon the connection of a block to others, the blockchain activates a timestamp, which involves adding time and date information to a block added to the blockchain network[34]. The recorded information is then distributed to all nodes, allowing users to easily access the information if they wish to explore it.

The collaboration of the hash and timestamp mechanisms gives rise to two functions within the blockchain: Proof of Existence (PoE) and Proof of Provenance (PoP). PoE, aided by the timestamp providing information about when the data was added, serves as evidence that the creator produced their work at the specified time and date. Meanwhile, PoP in the blockchain verifies the origin of a work, enabling creators to encrypt the hash and input

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[31] Gamage, Weerasinghe, and Dias.

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metadata about the work, such as the title, commencement date, and creator information. Consequently, both mechanisms can be employed to authenticate digital copyright.

Moving forward, the utilization of smart contracts, with a simple analogy likened to a vending machine, adds another layer of functionality. Sellers in a vending machine set the products and prices, and when sufficient funds are inserted, the chosen product is dispensed automatically; otherwise, the money is refunded[35]. Similarly, smart contracts operate automatically when the pre-agreed conditions are met. In the context of copyright, smart contracts prove beneficial in distributing rewards or payments for creative works. As a result, creators can record the entire process of their work on the blockchain from its inception. The PoE and PoP features serve as complete ownership proof, coupled with the immutable feature ensuring that recorded data is authentic and cannot be altered, preserving the authenticity of information. Blockchain's high transparency, facilitated by a decentralized system, allows all users to easily explore recorded information, further complemented by the use of smart contracts for the automatic execution of compensation or royalties.

B. Blockchain Technology: A Transformative Solution for Safeguarding Digital Copyrights

In the realm of technological advancements, the blockchain presents itself as a formidable solution, particularly in the protection of digital copyrights. The effectiveness and efficiency of blockchain technology extend across various domains, including the field of Artificial Intelligence (AI). AI, as a manifestation of human intellect, generates works that contribute significantly to human life. As human thinking advances and reaches greater heights, the opportunities for creating new innovations and intellectual creations increase. The outcomes of such human endeavors require safeguarding and acknowledgment, and one such protection mechanism is copyright. Copyright, an inherent right that automatically arises upon the creation of a work, serves as a crucial shield for intellectual creations. While registration is not mandatory for protection, creators may choose to register their works under specific circumstances, providing formal documentation and evidence for potential legal disputes[36]. In Indonesia, copyright regulations are codified under Law Number 28 of 2014 (referred to as the Copyright Law). This legislation encompasses creations in the fields of science, art, literature, and computer software.

Despite the existence of regulations governing copyright, the digital era has witnessed numerous cases of copyright infringement. The internet's evolution has encouraged creators to produce digital works, which offer advantages in terms of distribution compared to traditional creations. However, these conveniences have also contributed to a surge in digital copyright violations. Factors such as the ease of exact replication, rapid virtual dissemination, and the ability to modify works, including removing or altering creator attributions, have intensified the challenges in protecting digital copyrights. As of now, the protection of digital copyrights faces suboptimal implementation due to the inadequacy of existing laws. Legal frameworks currently focus on visible works, leaving a regulatory gap

[35] Liya Luo, "Application of Blockchain Technology in Intellectual Property Protection," *Mathematical Problems in Engineering* 2022 (2022): 1–12, https://doi.org/10.1155/2022/4641559.

[36] Hari Sutra Disemadi and Cindy Kang, "Tantangan Penegakan Hukum Hak Kekayaan Intelektual Dalam Pengembangan Ekonomi Kreatif Di Era Revolusi Industri 4.0," *Jurnal Komunikasi Hukum (JKH)* 7, no. 1 (2021): 54, https://doi.org/10.23887/jkh.v7i1.31457.

for internet-based protection[37]. To address these challenges comprehensively, the integration of blockchain technology emerges as a promising and transformative solution. Blockchain's decentralized and tamper-resistant nature can provide an immutable record of digital creations, ensuring transparent attribution and protection of intellectual property in the ever-evolving digital landscape.

In the optimization of digital copyright protection, the use of blockchain technology emerges as a compelling solution. Blockchain, with its inherent potential to enhance transparency and information availability regarding copyright ownership, serves as a robust foundation. Public blockchains, in particular, function as a type of blockchain suitable for establishing a digital database housing copyright ownership information. The incorporation of timestamps is a pivotal method in realizing the Proof of Existence (PoE) concept—a mechanism within blockchain designed to validate the existence of data at a specific point in time[38]. The introduction of PoE brings significant advantages in substantiating digital copyright claims. It aids in determining the legitimate creator of a work, providing a solid evidentiary tool in cases of ownership disputes. The immutable feature of blockchain ensures the difficulty of altering or erasing recorded data, thereby fortifying the credibility of information within the network.

Beyond PoE, there exists Proof of Provenance (PoP), the second mechanism within blockchain crucial for verifying the origin of a work[39]. Creators incorporate metadata about their creations—such as titles, creation dates, and creator information—into the blockchain network for documentation. This results in a network with a comprehensive history of the work, making fraudulent claims of ownership more challenging due to the recorded PoP evidence[40]. PoP is also instrumental in tracking version changes in a work, enabling users to access its historical information. Blockchain, functioning as a decentralized system with consensus mechanisms, produces a robust security infrastructure. The information undergoes verification through a consensus node before being added, ensuring the network's security. Following the consensus process, verified data records leverage cryptographic mechanisms, making modifications challenging. This characteristic positions blockchain as an effective system for safeguarding digital copyrights. Aligning with Article 53 of the Copyright Law, which mandates that creations utilizing technology-based data storage must adhere to specified rules and requirements, the use of blockchain aligns with the law's intent. The mentioned technology-based data storage involves the utilization of serial numbers and encryption, precisely as elucidated in the explanatory section. Consequently, the adoption of blockchain for digital copyright protection holds promising potential, leveraging encryption and serial numbers in user data and information storage.

On the flip side, blockchain presents significant opportunities in the realm of digital music. Digital music recorded on the blockchain network can safeguard its content using digital watermarking techniques[41]. Watermarked music is registered and stored within the

[37] Girindra, "Potensi Penggunaan Blockchain Dalam Manajemen Hak Kekayaan Intelektual Di Indonesia: Peluang Dan Hambatan."

[38] Gabriel Estevam et al., "Accurate and Decentralized Timestamping Using Smart Contracts on the Ethereum Blockchain," *Information Processing and Management* 58, no. 3 (2021): 102471, https://doi.org/10.1016/j.ipm.2020.102471.

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[41] Sijia Zhao and Donal O'Mahony, "BMCprotector: A Blockchain and Smart Contract Based Application for Music Copyright Protection," in *ACM International Conference Proceeding Series*, 2018, 1–5, https://doi.org/10.1145/3301403.3301404.

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blockchain, allowing for the tracking of every sale or usage of digital music in a project[42]. This feature proves invaluable for creators, enabling them to monitor and detect unauthorized use of their musical creations. Furthermore, the incorporation of smart contracts can automate royalty payments to copyright owners with each transaction, enhancing transparency in the music industry's royalty payment system[43]. The concepts of Proof of Fungibility (PoF) and Proof of Possession (PoP) serve as evidentiary tools in resolving disputes over music ownership rights.

The blockchain includes smart contract features that serve as a means for automated license payment. A license is a contractual agreement between the copyright owner and user, specifying the terms of permission for using the owner's work, including the agreed-upon amount, duration, and method of royalty payment[44]. Smart contract features in blockchain can streamline the processing of licenses and royalty payments automatically. Generally, smart contracts operate on an "if-when" basis, requiring precise conditions to activate them. In the context of royalty payments, the smart contract activates once the license has been granted to the copyright user (the "if" condition). Once the "if" condition is met, the "when" condition triggers the distribution of royalties to the copyright owner. Agreements established within smart contracts are immutable, meaning they cannot be altered due to the blockchain's inherent characteristics. This supports the principle of *pacta sunt servanda* in contract law, ensuring that parties involved in the agreement through smart contracts cannot unilaterally cancel the agreement, thus achieving legal certainty[45].

The diverse features inherent in blockchain have presented opportunities to create a digital database that functions as a repository for information related to ownership rights or copyrights. This has the potential to enhance information transparency to the extent that a centralized database can provide detailed, precise, and accurate information, thus avoiding issues of ambiguity regarding copyright information. Furthermore, the utilization of blockchain in the realm of digital copyright protection can be fortified through the implementation of Proof of Existence (PoE) and Proof of Provenance (PoP), valuable in proving ownership by recording the time and date when data is entered and verifying the origin of a work. The use of smart contracts serves as a tool for automated payment of licenses and royalties. Blockchain, as a decentralized system leveraging cryptographic mechanisms such as serial numbers and encryption in information storage, along with its immutable features, makes recorded data resistant to alterations. This positions blockchain technology as a promising avenue for safeguarding digital copyright.

C. Challenges of Implementing Blockchain in Digital Copyright Protection

The rapid evolution of information technology has given rise to various innovations, significantly influencing legal developments. In the realm of progressive legal theory advocated by Satjipto Rahardjo, the law is not a finite scheme but an ever-progressing,

[42] Remzi Gürfidan and Mevlüt Ersoy, "Blockchain-Based Music Wallet for Copyright Protection in Audio Files," *Journal of Computer Science and Technology* 21, no. 1 (2021): 11–19, https://doi.org/10.24215/16666038.21.E2.

[43] Silvia A.Carretta, "Blockchain Challenges to Copyright: Revamping the Online Music Industry," *Stockholm University* (2019).

[44] Maya Jannah, "Perlindungan Hukum Hak Kekayaan Intelektual (Haki) Dalam Hak Cipta Di Indonesia," *Jurnal Ilmiah Advokasi* 6, no. 2 (2018): 55–72, https://doi.org/10.36987/jiad.v6i2.250.

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changing, and adapting entity that follows the dynamics of human life[46]. Legal reform must be progressive, meaning that the law should be continually explored and dissected through progressive efforts to achieve its objectives[47]. This emphasizes that despite technological advancements, the law must persist in providing certainty and legal protection. Therefore, the theoretical framework employed in analyzing the challenges of implementing blockchain in digital copyright protection is the progressive legal theory.

As a cutting-edge innovation, blockchain technology has demonstrated significant potential in safeguarding digital copyrights. Features such as decentralization, security, transparency, and immutability are crucial concepts working to optimize the functioning of a blockchain network. However, blockchain itself is still a developing technology with the potential for further advancements and the announcement of more sophisticated features. Consequently, challenges must be addressed before widespread blockchain implementation.

The tamper-resistant nature of the immutable blockchain feature, making changes difficult to execute, poses one of the primary challenges that must be resolved beforehand. This feature implies that the process of adding data must be meticulous and precise, as errors in data addition can have fatal consequences due to the difficulty of making alterations. Even if a record of a work has been made, it does not guarantee that disputes regarding ownership rights can be entirely avoided. Cases involving copyrighted works that have been recorded but not by their rightful owners highlight the need for legal recourse. Court decisions sometimes reveal that the party registering the work is not the legitimate owner, necessitating changes. Making changes within a blockchain network is not an insurmountable task, albeit it requires a considerable amount of time and a meticulous process contingent upon the type of blockchain in use. In the case of a public blockchain, achieving consensus among the available nodes is imperative. If these nodes collectively agree to enact a particular action, the proposed changes can be implemented. The crux of the issue lies in the time required to effect such alterations, particularly if the nodes lack an understanding of the issue at hand, or if there is a possibility of users spanning across borders. In such instances, the process may be protracted.

Conversely, utilizing a private blockchain facilitates easier modifications due to the full authority wielded by the blockchain's owner over the network. However, this approach gives rise to the emergence of super users, typically governmental entities. This phenomenon compromises the inherent features of blockchain, such as immutability (resistance to external alterations) and decentralization (elimination of third-party involvement in transactions). The primary objective of implementing blockchain is to enable public transparency and participation in its management. If changes are made by the government without public knowledge, the pivotal characteristic of transparency in blockchain is jeopardized.

In the context of legal systems, the incorporation of blockchain necessitates a legal foundation to support its usage and implementation. However, regulatory uncertainty

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regarding blockchain implementation remains a significant challenge[48]. Presently, there is no explicit regulation governing blockchain implementation in Indonesia. Nonetheless, two regulations can serve as benchmarks for operationalizing blockchain: Bank Indonesia Regulation Number 19/12/PBI of 2017 concerning the Implementation of Financial Technology and the Financial Services Authority Regulation Number 37/POJK.04/2018 concerning Fundraising Services through Equity Crowdfunding Based on Information Technology. While the Bank Indonesia Regulation focuses solely on the use of blockchain as a platform underlying financial technology, especially in payment systems, the Financial Services Authority Regulation addresses blockchain as a supporter of the quality of crowdfunding services. However, the presence of these two legal sources is insufficient as a foundational legal basis for blockchain implementation in various sectors, especially considering their lack of standing as fundamental legislative regulations. This legal ambiguity contributes to uncertainties in the application of blockchain technology.

In the implementation of technology, vigilance against the risks and threats of cybersecurity is imperative. While the likelihood of hacker attacks in blockchain technology is small due to its robust consensus mechanism, there are several cybersecurity threats that must be anticipated. These include: (1) the 51% Attack, an event where two or more nodes working on block addition acquire more than 50% ownership of the total hashing power in the network, potentially leading to transaction manipulation and the creation of two different chains causing network chaos; (2) Double-Spending, an action where cryptocurrency is used twice by sending false transactions to the blockchain network, with the risk heightened in the event of a 51% Attack; (3) Sybil Attack, a type of attack where one node creates numerous fake nodes to control the network, providing an opportunity for transaction manipulation[49]. Operating a public blockchain requires node activity for block addition, necessitating continuous node engagement to maintain real-time network functionality[50]. Nodes must consistently execute the consensus mechanism for each block addition, leading to a perpetual process that results in ongoing energy consumption. This energy usage not only poses a risk of energy wastage for individual computers or node users but also indirectly contributes to climate change[51].

Regarding the use of smart contracts in the realm of licensing agreement activation, it opens the door to cryptocurrency utilization. However, it's important to note that Indonesia does not recognize cryptocurrency as a valid means of payment[52]. Laws such as Law No. 7 of 2011 on Currency and Law No. 23 of 1999 on Bank Indonesia state that the Rupiah is the official and government-recognized means of payment. This complicates the realization of smart contracts when using cryptocurrency. Additionally, if a public blockchain is implemented, transactions within the blockchain become decentralized and anonymous. Due to these characteristics, blockchain has the potential to be exploited for money

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laundering and illicit financial activities, as government oversight of public transactions becomes challenging[53].

Due to its intricate operational mechanisms, blockchain technology is currently in a developmental phase, rendering its complete adoption as a replacement for existing systems challenging. The transfer of data from legacy systems necessitates substantial costs and efforts. Factors such as risk management calculations, implementation costs, maintenance, development, and the availability of human resources must be meticulously considered. The immutability of blockchain, touted as its strength, can transform into a weakness when errors occur, coupled with various cyber threats that demand vigilance. The most formidable challenge lies in addressing the regulatory issues surrounding blockchain and cryptocurrencies, an ongoing debate globally, including in Indonesia, where a comprehensive regulatory framework for blockchain implementation is still lacking. In light of the limited overall implementation of blockchain, particularly in the realm of digital copyright, collaboration between the government, academia, industry players, private entities, and regulatory authorities is imperative to realize a legally certain blockchain.

CONCLUSION

The rapid evolution of information technology has spawned various innovations, with blockchain technology being a prominent example. The six recognized features of blockchain demonstrate its substantial potential for application across various domains, including intellectual property, especially in the realm of digital copyright. Blockchain holds significant promise as a solution to issues like digital copyright infringement, offering transparency, counterfeit claim detection, and protection in the digital music domain, including automated payment licensing through smart contracts. However, before implementing blockchain, challenges such as data immutability, regulatory uncertainties, cyber threats, and the organizational and cost-related aspects must be addressed. Overcoming these challenges necessitates collaboration between the government, academia, industry players, private entities, and regulatory authorities to establish a legally certain blockchain.

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