Research on the Application of Blockchain Technology in Digital Copyright Scenarios in the Broadcasting Industry: Postprint

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Abstract

As one of the foundational technologies transforming the digital era, blockchain technology holds significant importance for promoting innovative development in China' s radio and television industry. Digital copyright, as the core asset of the traditional radio and television industry, represents a key focus for future development. Through in-depth interviews with practitioners from relevant radio and television departments in Hubei Province, and by synthesizing the current development and technological status of digital copyright management and protection, this study summarizes the industry' s present needs in digital copyright management and protection. It constructs a systematic application scheme for blockchain technology in radio and television digital copyright management and protection across three dimensions: content on-chain for digital copyright, data distribution, and decentralized supervision. This scheme aims to address challenges such as high management costs, improper copyright allocation for collaborative works, and low commercial value, while also achieving the objective of enhancing public awareness of copyright protection.

Full Text

Research on the Application of Blockchain Technology in Digital Copyright Scenarios in the Broadcasting and Television Industry

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Abstract

As one of the foundational technologies transforming the digital era, blockchain holds significant importance for promoting innovative development in China' s broadcasting and television industry. Digital copyright, as a core asset of traditional broadcasting and television, represents a key focus for future development. Through in-depth interviews with practitioners from broadcasting and television departments in Hubei Province, and by examining the current state of digital copyright management and protection alongside existing technologies, this study summarizes the industry' s current demands for digital copyright management and protection. It constructs a systematic application framework for blockchain technology in broadcasting and television digital copyright management and protection across three dimensions: content registration on-chain, data distribution, and decentralized supervision. This framework aims to address issues of high management costs, improper copyright allocation for collaborative works, and low commercial value, while achieving the goal of enhancing public awareness of copyright protection.

Keywords: Broadcasting and Television; Blockchain; Digital Copyright; Application Scenarios

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As the broadcasting and television industry continues to advance its innovation and transformation, emerging technologies have become a crucial driving force for sector-wide reform. Blockchain, as a foundational technology, has continuously evolved since its inception, with "Blockchain+" penetrating numerous industries including the media sector. Meanwhile, applying blockchain technology to the creation, confirmation, protection, and transaction of digital copyright has remained a hot topic in industry research, as blockchain' s technical characteristics hold significant application value for digital copyright management and protection.

1. Demand Analysis for Digital Copyright Management and Protection in Broadcasting and Television

In the digital era, digital copyright represents one of the few remaining advantages for traditional broadcasting and television media. However, with the proliferation of self-media, infringement behaviors such as video piracy, content reprinting, and plagiarism have become both convenient and covert, leaving the current state of digital copyright management and protection in broadcasting and television less than optimistic.

1.1 Serious Infringement of Online Audiovisual Works with High Governance Difficulty

On April 28, 2021, over 500 artists and more than 70 film and television media organizations collectively issued an initiative addressing online short video infringement. The rise of short video social platforms has spawned a group of users who produce secondary-edited short videos using original film and television works as source material—often without authorization, and in some cases, obtaining video footage through improper channels. In an era of fragmented reading, users have grown accustomed to short video consumption, enabling these accounts to amass huge traffic volumes through video editing in short timeframes, thereby infringing upon the interests of film and television production teams. Some even manipulate editing techniques to distort the meaning of works, causing serious harm to creators and performers [2]. However, since most online audiovisual works consist of user-generated content, tracing video origins is difficult, and without unified management standards, most infringing videos were previously protected under the "safe harbor principle" before the joint initiative, making governance highly challenging.

Digital audio and video businesses have gradually become the main products in the broadcasting and television industry, with digital copyrights for images, short videos, and audiovisual products serving as the primary transaction content. The industry invests substantial funds annually in producing and purchasing these copyrights. Yet due to immature digital copyright management and protection technologies and incomplete systems, infringement costs the broadcasting and television industry tens of billions in losses each year [1]. Moreover, as short video production becomes more widespread, infringement and copyright disputes in online audiovisual works have increased, rendering traditional management models inadequate for current digital copyright management and protection needs.

1.2 High Costs and Difficulties in Anti-Piracy Rights Protection

High anti-piracy rights protection costs mean that even for low-cost original works, copyright holders with strong legal awareness often abandon 维权 (rights protection) due to the high litigation costs and lengthy timeframes, making the process economically unviable and effectively tolerating frequent infringement and piracy. The difficulties in anti-piracy rights protection stem from two main aspects: limited authority of regulatory departments and insufficient legal penalties. Limited regulatory authority means no single functional department currently has direct oversight power in digital copyright protection, requiring multi-agency joint enforcement. For instance, in March 2019, during Jiangsu Province' s centralized crackdown on online infringement, Nanjing' s cultural market law enforcement brigade investigated Nanjing Leke Network Technology Co., Ltd. for providing unauthorized online streaming of 88 film and television works through its "Korean Drama TV" App and profiting from advertisements. In September 2019, the brigade imposed an administrative penalty of over 20,000

RMB in confiscated illegal gains and a fine of 839,000 RMB. The Korean Drama TV case, listed as one of the top ten infringement cases, demonstrates how even large platforms knowingly engage in infringement, reflecting insufficient regulatory enforcement in daily supervision. This insufficient enforcement primarily results from limited departmental authority, preventing direct oversight and penalties and necessitating joint law enforcement operations, which allows infringement to proliferate. Furthermore, for such major infringement cases, only administrative penalties were imposed on responsible persons, with fines representing a mere fraction of profits. Whether through spontaneous infringement claims or government-initiated investigations, the cumbersome governance process involving multiple management departments with unclear division of responsibilities makes evidence collection and rights protection extremely difficult.

1.3 Overall Digital Copyright Protection Awareness Needs Improvement with Value-Driven Protection

During research interviews, experts identified two perspectives on copyright protection: high-value copyrights generate strong protection demand and enforcement, while low-value copyrights receive minimal protection demand and enforcement. For high-value industries like film and television, existing technologies—including encryption, watermarking, and big data/AI-powered piracy monitoring—already meet basic needs, making the necessity of new technology integration debatable. However, for most user-generated content in the online audiovisual field, copyright value is relatively low due to low production costs and limited traffic. Combined with high rights protection costs and difficulties, most users have minimal protection demand for such copyrights, leading to frequent infringement. For low-value digital copyrights, the key to new technology application lies in providing low-cost protection while preserving the interests of small-scale copyrights.

2. Current Application Status of Blockchain in Digital Copyright Management and Protection for Broadcasting and Television

Since 2015, scholars have proposed applying blockchain to digital copyright protection, utilizing its decentralized distributed storage to address data loss and tampering issues in traditional centralized multimedia digital copyright information storage. Subsequent research increasingly explored potential blockchain application pathways, focusing primarily on registrable digital copyrights. In 2017, DBK, China' s first-generation blockchain-based digital music application service provider, was officially established, marking blockchain' s transition from conceptual frameworks to substantive application in digital copyright management and protection [3]. Following the 2018 judicial recognition of blockchain evidence in China' s legal system, blockchain was widely adopted by integrated media platforms across provinces and cities for digital copyright confirmation, becoming a hot research topic.

As blockchain technology penetrated various industries, blockchain-based media platforms such as Civil, PUBLIQ, PressCoin, and Po.et emerged in the journalism sector, drawing significant scholarly attention to blockchain' s application in digital copyright management and protection. Some scholars began designing digital copyright protection system architectures and analyzing their principles [4], while others expressed skepticism, arguing that current blockchain applications in digital copyright management and protection face dilemmas and challenges, representing an overly idealistic technology with limited widespread applicability and high implementation difficulty [5]. While blockchain' s decentralization, traceability, and tamper-resistance features can ensure data authenticity and security, they cannot immediately resolve the persistent challenges of copyright confirmation and rights protection.

In 2019, blockchain-based digital copyright protection solutions began deployment on Beijing Cloud' s municipal integrated media platform. Beijing Cloud' s framework focused on three aspects: digital copyright confirmation, network-wide monitoring, and one-click rights protection. Although the platform developed a systematic technical architecture and planned a two-phase implementation, only the copyright registration and confirmation function was realized, with one-click litigation and network-wide monitoring still under development. As an integrated media platform serving the public with diverse digital copyright content, full implementation remains highly challenging. Scholars realized that while blockchain' s advantages in digital copyright management and protection are undeniable, current technology remains immature and cannot solve all macro-level problems. Approaches should leverage business thinking from a market perspective, using technology to gradually solve problems and serve society, thereby driving technological maturation [6].

After 2020, research on blockchain applications in digital copyright management and protection from a commercial dimension gained momentum, with scholars shifting focus from macro-level digital copyrights to more targeted applications in images, audio, books, and copyright transactions. However, as foreign blockchain media platforms collapsed one after another, innovative transformations in traditional industries exposed numerous problems. New technology applications must address fundamental issues in digital copyright management and protection through top-level design that transforms entire production, transaction, and management processes, rather than focusing on isolated 环节 (links). Although blockchain enables electronic copyright confirmation, its application targets primarily original, complete videos or artistic works, with limited supervision and protection for reposted, plagiarized, or secondary-edited content published on other platforms [7].

3. Application Scheme of Blockchain Technology in Digital Copyright Management and Protection for Broadcasting and Television

Among current digital copyright management and protection issues in broadcasting and television, online audiovisual work infringement is particularly severe, seriously harming creators' interests, especially for film and television producers whose expected revenues are impacted by secondary content editing. Blockchain features—including distributed ledgers, timestamps, consensus mechanisms, smart contracts, and tamper-resistance—can be applied to broadcasting and television digital copyright management and protection through an official platform, effectively curbing online audiovisual work infringement from the source. The official platform comprises three main components: content identification on-chain, distribution data on-chain, and decentralized supervision.

3.1 Content Identification on Chain: Transparent and Tamper-Resistant Information

Within the official broadcasting and television digital copyright management and protection platform, all audio and video content must first undergo review and authorization by the official platform within the consortium chain before content can be registered on-chain for transactions. The content review process focuses on whether content can be disseminated, how it should be disseminated, and how dissemination profits should be allocated. Legally distributable content receives timestamps and digital fingerprints for later data traceability and evidence preservation during transactions [8]. For video source material in the online audiovisual field, copyright holders (such as film or television distributors) write smart contracts specifying dissemination scope and profit distribution. The platform registers metadata of authorized use transactions on-chain, and after content review approval, packages and uploads the content for content producers to trade and download. Since video content is officially authorized, this provides content producers with a legal usage channel, eliminating infringement at the source—particularly for secondary-edited film and television content. As the entire copyright transaction authorization process is recorded on-chain, suspected infringement can be verified simply by checking whether the content producer has an authorized transaction record on-chain. Content lacking digital fingerprints and transaction records can be directly identified as infringing or pirated in judicial practice.

Building an official platform can transform traditional business models, particularly regarding copyright confirmation for collaborative works. In traditional models, collaborative work copyright confirmation has relied on mutual agreements among creators or third-party institutions, a process that is cumbersome, often lacks objectivity, and frequently triggers copyright disputes. Registering content information on-chain can completely resolve copyright transaction is-

sues for collaborative works. For film, television, and audio-visual content with complex creative entities, copyright can be split and traded. While traditional business models struggle with copyright confirmation for such works, blockchain' s features—transaction data on-chain, decentralized management, and tamper-resistance—can effectively address these challenges. Once a digital copyright management and protection ecosystem platform is established, collaborative work copyright transaction issues can be easily resolved.

3.2 Distribution Data on Chain: Unified Dissemination and Protection Standards

Within the official digital copyright management and protection platform, all user or platform transaction behaviors and information on the public chain are recorded throughout the entire process via smart contracts, enabling supervision of a copyright content' s distribution path. Each time a user or platform node trades or downloads content, its digital fingerprint is extended and updated. For specific online audiovisual works, authorized dissemination scope and timeframes are limited. For example, if a work is authorized for dissemination only on a particular social media platform, that platform assumes responsibility for ensuring proper dissemination after trading and downloading the work. In cases of early leakage or unauthorized broadcasting, distribution data can be traced from the pirated or leaked video content to identify responsible platforms or users for legal accountability. Since the entire transaction process and information are transparent, each distribution node' s rights and responsibilities are clearly defined, and dissemination protection standards are unified, enabling timely attribution when problems arise. In judicial practice, distribution data can serve directly as evaluation criteria for determining infringement compensation amounts.

During this process, blockchain smart contract technology can improve digital copyright transaction efficiency and reduce rights damage to both copyright holders and content producers. First, system operations enhance efficiency. Applying blockchain smart contracts for supervision not only makes copyright transaction data more accurate but also effectively maintains the fair use principle and balances interests between copyright holders and audiences. Second, smart contracts flexibly constrain transaction content. Secondary market transactions of digital works balance digital copyright interest distribution, as users employ digital copyrights within scopes specified by copyright holders, protecting both parties' interests while avoiding later disputes. This transaction model, relying on smart contracts, increases digital work usage transfer income for publishers while clearly and efficiently allocating digital copyright interests at each level through flexible secondary market pricing, reducing payment costs for transaction users. By breaking traditional business models, this approach not only rapidly responds to transaction demands at each node but also ensures data transparency, safeguarding digital copyright interest distribution—especially for collaborative works and multi-transaction copyrighted content [10].

3.3 Decentralized Supervision: Eliminating Short Video Infringement Chaos

As the entire management and protection platform is open to all users, broadcasting and television departments serve as review gatekeepers that do not hinder user production but rather provide a legal environment for it. By eliminating third-party intermediaries, digital content distributors can directly transfer rights and responsibilities to users, who can then avoid infringement caused by unclear rights constraints during secondary editing or dissemination, thereby enhancing copyright protection awareness at the source. Additionally, since copyright authorization transaction data is transparent, other users can directly report or provide feedback when they detect suspected infringement, enabling infringed parties to initiate traceability verification immediately and curb ongoing infringement. Through supervision and constraints during the dissemination process, digital content infringement—especially short video piracy—will be significantly reduced, providing an effective regulatory mechanism for the healthy development of the online audiovisual field.

Content producers can download or purchase officially authorized video material on the official platform. Each video material undergoes review and registration by the official platform within the consortium chain, with all content registered for authorized dissemination scope, methods, usage rules, and profit distribution. Registration is self-authored through smart contracts, and after approval, timestamps and digital fingerprints are applied. Once all data is packaged on-chain, users must comply with usage regulations, and infringement can be promptly traced with legal accountability. In this process, broadcasting and television departments serve an audit and supervisory role, and the official platform effectively solves online audiovisual infringement issues by providing legally compliant materials to users in need, enabling original creators to obtain deserved benefits [11].

While broadcasting and television industry digital copyright management and protection can address some issues through technology, technological management and protection are not absolutely stable. The proposed application scheme primarily targets online audiovisual work infringement and suits the current broadcasting and television industry. If the industry's functional nature changes in the future, the solution will require readjustment. Moreover, in the digital copyright domain, content review and copyright attribution issues involved in copyright management cannot be entirely defined through technology and require human assistance. Once smart contracts or on-chain review processes encounter problems requiring activity reversal, blockchain' s immutability becomes a barrier to digital copyright management. Therefore, technological innovation must be viewed objectively—not to replace professions but to assist and guide them. Only through rational technology utilization can problems be truly solved.

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Note: Figure translations are in progress. See original paper for figures.