Research on the Application of Blockchain Technology in Collaborative Content Creation Scenarios for Broadcasting (Postprint)

Authors: Lan Luohaozhan, Zhang Weixuan, Jie Qing, Xiaofeng Chen

Date: 2023-10-08T00:00:00+00:00

Abstract

Blockchain technology holds significant research value for the innovative development of China' s broadcasting and television industry. To better enhance the collaborative content creation capabilities of the broadcasting and television industry and improve its dissemination power and influence, this paper analyzes the existing demands in collaborative content creation within the broadcasting and television sector, and further discusses how blockchain technology can meet these demands. It points out that leveraging blockchain' s trusted accounting and smart contract applications can effectively improve the efficiency of collaborative content creation and achieve mutual trust in collaboration. Finally, it proposes a system design concept for a consortium blockchain for collaborative content creation in the broadcasting and television industry.

Full Text

Preamble

Research on the Application of Blockchain Technology in Broadcast Television Content Collaborative Creation Scenarios

Authors: Lan Luohaozhan[1], Zhang Weixuan[2], Xie Qing[2], Chen Xiaofeng[2,3]*

[1] School of Law and Humanities, Wuhan University of Technology, Wuhan, Hubei 430070, China
[2] School of Computer Science and Artificial Intelligence, Wuhan University of Technology, Wuhan, Hubei 430070, China
[3] Editorial Department of *Science & Technology Progress and Policy*, Hubei Academy of Science and Technology Information, Wuhan, Hubei 430071, China

Abstract: Blockchain technology holds significant research value for the innovative development of China' s radio and television industry. To enhance

collaborative content creation capabilities and improve the dissemination power and influence of broadcast television, this paper analyzes existing needs in broadcast television content collaborative creation and discusses how blockchain technology can address these needs. It demonstrates that leveraging blockchain' s trusted accounting and smart contract applications can effectively improve collaborative creation efficiency and achieve mutual trust in cooperation. Finally, it proposes a system design concept for a broadcast television content collaborative creation consortium chain.

Keywords: blockchain; radio and television; collaborative creation; smart contract; consortium chain

Introduction

The Chinese government attaches great importance to the research and innovative application of blockchain technology [1], which has stimulated enthusiasm for blockchain research and application across academia and industry in various fields. The radio and television industry similarly recognizes the potential of blockchain technology in its domain. In 2020, to better guide and promote blockchain research and development in the broadcast television sector, the National Radio and Television Administration promptly issued a series of white papers on blockchain technology applications [2]. The "General Section" of this white paper series analyzed blockchain-enabled content collaborative creation scenarios in chapters such as "Converged Media Content Sharing and Collaboration" and "User Incentives," demonstrating that research on blockchain applications in broadcast television content collaborative creation holds positive practical significance.

Through a review of existing literature, studies on blockchain technology in the radio and television industry have primarily focused on copyright protection [3], smart broadcasting [4], and prospective applications of the technology [5]. However, research findings specifically addressing content collaborative creation remain relatively scarce, with relevant content dispersed across studies on other topics. Shen Yang et al. proposed that blockchain technology could solve data trust issues in the broadcast television industry, noting that reasonable incentive mechanisms are crucial for ensuring the sustainability of blockchain applications and concluding that consortium chains are the primary approach for blockchain deployment in the broadcast television sector [6]. Gao Xianchun suggested that blockchain technology could be used to build broadcast television content resource libraries and facilitate collaborative creation through smart contracts [7]. These studies provide important references for subsequent research: broadcast television content collaborative creation requires trusted data as the foundation for incentive mechanisms and collaborative creation and dissemination data analysis; to improve industry collaboration efficiency, building an industry platform for broadcast television content collaborative creation using consortium chains

is also practically significant; establishing blockchain-based broadcast television content resource libraries and implementing resource exchange and creation incentives through smart contracts can promote full resource utilization and drive content co-creation.

This study employs literature research and in-depth interviews as primary research methods. First, we retrieved and reviewed relevant research materials from domestic and international literature databases to establish a research foundation. Second, through in-depth interviews with several experts from the Hubei broadcast television industry, we gained insights into the actual needs for multi-party content collaborative creation, providing a practical basis for subsequent research. The contribution of this paper lies in its detailed analysis of the needs existing in broadcast television content collaborative creation, further discussion of how blockchain technology can meet these needs, and finally, the proposal of a system design concept for a broadcast television content collaborative creation consortium chain, which to some extent fills a gap in this research direction. It aims to provide a useful supplement to blockchain application research in the broadcast television industry and enhance the collaborative content creation capabilities and dissemination power of the broadcast television sector through blockchain technology.

This work was supported by the 2020 Special Research Project of China (Hubei) Radio and Television Media Convergence Development Innovation Center, "Research on Application Scenarios of Blockchain Technology in the Radio and Television Industry" (Project No. HBZSXWHCG-2020-9).

*Corresponding author

1.1 Trusted Accounting Needed for Broadcast Television Content Collaborative Creation Incentives

Effective collaboration among multiple parties in broadcast television content creation helps improve production efficiency and content quality, thereby achieving better dissemination effects. The key to fostering effective multi-party collaboration lies in how to effectively incentivize each participant to ensure they receive due returns for their contributions. Therefore, establishing an incentive mechanism is necessary to ensure all parties are willing to participate in collaborative development while also recognizing the legitimacy of this mechanism.

Our investigation revealed that Hubei Radio and Television Network already employs a points system that can be exchanged for various broadcast television resources to incentivize cooperation among different media organizations. This mechanism forms an operational alliance with multiple media participants, where accumulated points can be used to exchange for various broadcast television content resources. For instance, if a county-level cooperative media organization needs to promote a live event, it can use points to obtain promotional

resources from other cooperative media. Thus, effective incentive mechanisms already exist in multi-party collaborative development of broadcast television content. However, a prominent issue with this system is that all point transactions are recorded and confirmed manually. While manual point accounting may work in small-scale, low-complexity scenarios, as the alliance continues to admit new members and expand its service scope, the complexity of various scenarios increases accordingly, placing high demands on accounting efficiency and accuracy. Therefore, manual accounting methods are unsuitable under such conditions. When applying blockchain to incentives in broadcast television content collaborative development, the actual problem to solve is not how to rebuild an incentive system but rather to achieve trusted accounting for point transactions and improve accounting efficiency in high-complexity scenarios.

In broadcast television content collaborative creation incentive scenarios, by reasonably leveraging blockchain' s security advantages in accounting for cryptocurrency transactions, the original manual point accounting method can be transformed into intelligent programmatic accounting, thereby improving accounting efficiency and accuracy in high-complexity scenarios. In broadcast television content resource reuse scenarios, establishing a similar incentive mechanism can provide certain point rewards to material contributors, thereby promoting the circulation and reuse of existing content resources and improving collaborative creation efficiency.

1.2 Broadcast Television Content Resources Need Improved Reuse Rates

Two situations in broadcast television content resource usage and management warrant attention. First, raw program content materials filmed by local television stations for program production are typically not retained after being processed into complete programs. No local television station specifically preserves filmed materials for subsequent use by other stations. Therefore, broadcast television content resources in this situation have little opportunity for reuse. The second situation demonstrates that content resources can be reused twice or even multiple times under specific circumstances. On the converged media platform "Changjiang Cloud," various county-level media organizations within Hubei Province can share news materials collected by the platform' s news teams, enabling multiple uses of news content materials across different media. Alternatively, new media editors can access news video resources from the platform' s public cloud, such as obtaining video files of news programs that have already been produced and broadcast on the same day, then perform point-based editing and secondary clipping in a quick editing system to form independent video news pieces, thereby achieving repeated use of broadcast television content resources. The difference between these two situations lies in whether used content materials are retained and whether a complete reuse process has been formed.

The need that blockchain technology should address is promoting the full utilization of broadcast television content resources. By providing smart contracts for content resource providers and users, blockchain can help establish content collaboration trust among two or multiple parties, improve the standardization of broadcast television content material usage management, and supplement this with certain incentive measures to encourage material contributors. This can promote the full utilization of existing content resources across various parties, improve content resource reuse rates, and drive multi-party content co-creation.

2.2 Providing Content Resource Smart Contracts to Strengthen Collaborative Trust Relationships

By providing content resource smart contracts for parties engaged in collaborative creation, we can construct collaborative trust relationships for multi-party content co-creation. Smart contracts are "event-driven, stateful computer programs deployed on shared distributed databases···When a predetermined condition is triggered, the smart contract executes corresponding contract terms" [9]. Due to their characteristics of decentralization, real-time execution, and low cost, smart contracts can significantly improve transaction efficiency and security, offering good development prospects in business cooperation. For example, when a merchant needs to place product promotions on a blockchain media platform, the merchant and the media can jointly sign a smart contract to achieve precise recording of product sales with transparent visibility and real-time settlement of fees [10].

In broadcast television content collaborative creation incentive scenarios, member units within the same operational alliance can use their accumulated points to exchange promotional resources from other media organizations when assistance is needed. In such cases, a content resource smart contract with predefined event logic, contract terms, and trigger conditions can be invoked to exchange promotional resources. The points paid are authentic and trustworthy due to blockchain technology protection, while smart contracts improve collaboration efficiency and save substantial time and labor costs, thereby efficiently establishing multi-party collaborative trust relationships. In broadcast television content resource reuse scenarios, content resources will be uploaded to the chain in metadata format for selection by those in need, who can then obtain resource access permissions through smart contracts. Additionally, reputation evaluation of content contributors can be conducted through publicly transparent content resource exchange records on the chain. Media organizations that actively provide content resources can receive positive incentives, effectively promoting the sharing of broadcast television content resources among multiple parties. Resource demanders also obtain a basis for assessing provider credibility, helping collaborative creation parties establish good collaborative trust relationships.

3.1 Building a Broadcast Television Content Collaborative Creation Consortium Chain

Blockchain technology can provide a creation incentive mechanism with trusted accounting functionality for multi-party collaborative creation in broadcast television. Blockchain was originally developed as the underlying supporting technology for the cryptocurrency Bitcoin, representing "a theoretically absolutely secure currency system that does not require intermediary maintenance"[8]. Due to its technical characteristics of decentralization, transparency, and immutability, it functions as "a super distributed ledger implemented using high-level programming languages" [11]. Consortium chains are "permissioned, scalable blockchains for business processing" [11]. Only members with authorized permission can access consortium chains, which also feature functions for certifying member qualifications and identities, better ensuring the credibility of members within the alliance. The broadcast television industry has already made attempts to build consortium chains, such as the Nanjing Radio and Television Group initiating and constructing a "blockchain-based media content copyright registration and trading platform," which will invite broadcast television organizations from other regions to join the consortium chain as organizational nodes [12]. The chain can provide services such as broadcast television point incentives and exchanges, and resource trading smart contracts.

The value of building a broadcast television content collaborative creation media consortium chain lies in achieving collaborative trust among multiple parties in the broadcast television industry, improving collaboration efficiency and standards, and thereby helping form a multi-party collaboration mechanism for broadcast television based on blockchain technology featuring information sharing, resource sharing, content co-creation, and product co-building. The role of the broadcast television content collaborative creation consortium chain is to provide a service platform for communication and cooperation in broadcast television content collaborative creation. Based on fully absorbing existing broadcast television media collaboration mechanisms, blockchain technology can empower them technologically to achieve further improvement in content creation productivity.

3.2 Broadcast Television Collaborative Creation Consortium Chain System Design

In the broadcast television content collaborative creation consortium chain system design, the system functions are primarily designed with four modules, as shown in Figure 1 [Figure 1: see original paper]: the login module, user module, token management module, and content module. In the user module, participants in this consortium chain are mainly designed as ordinary users, media users, and advertisers, with different permissions granted to different entities in the user module. Since ordinary users do not belong to member units of the

consortium chain, they do not participate in on-chain bookkeeping nor can they access the complete user data ledger. Media organizations and advertisers, as consortium chain member units, have the right to participate in bookkeeping and access the ledger.

To construct a positive feedback process that unifies user incentives and platform incentives and achieve trusted accounting for creation incentives, a complete and reasonable token management module needs to be designed. This module includes a voting system, a token reward system (building user pools to reward user behaviors), and an exchange system (such as the aforementioned advertiser users using system tokens to exchange for promotional resources from alliance member units, or ordinary users exchanging for physical goods or services). Consortium chain members can exchange media resources within the alliance chain. If a media user undertakes a business commission from an advertiser, both parties need to invoke a smart contract in the exchange system of the token management module to complete contract signing. Upon transaction completion, the media user places promotional information designated by the advertiser in the content module. After confirmation by the advertiser, the advertising placement system will conduct trustworthy recording of the placement data for the designated advertising content, and the content distribution system will be responsible for bundling media content with promotional information for distribution to ordinary users. The profits obtained by media users through completing commissions are automatically distributed through smart contract execution, thereby ensuring equal benefits when multiple parties participate jointly.

Acknowledgments

This paper proposes a blockchain-based broadcast television content collaborative creation consortium chain system design concept according to actual industry needs identified through investigation. The design offers certain application prospects and value in improving broadcast television collaborative creation efficiency and enhancing multi-party mutual trust. Subsequent research will focus on repeatedly verifying this design through experiments and further refining and modifying it based on experimental results, striving to gradually transform preliminary ideas into reality and create genuine value for the broadcast television industry.

During the preliminary investigation, we received support and assistance from experts including Jiang Weichao from the Media Convergence Development Department of Hubei Provincial Radio and Television Bureau, Zou Liang from the Technical Department of Changjiang Cloud New Media Group, and Deng Guohui from the Converged Media News Center of Hubei Radio and Television Station, who provided extensive first-hand information about broadcast television content collaborative creation. We express our sincere gratitude to

them.

References

[1] Xi Jinping. Speech at the 18th Central Politburo Collective Study Session [EB/OL]. [2019-10-25]. http://www.gov.cn/xinwen/2019-10/25/content_{5444957}.htm.

[2] Notice of the General Office of the National Radio and Television Administration on Issuing the Blockchain Technology Application Series White Papers [EB/OL]. [2020-11-06]. http://www.nrta.gov.cn/art/2020/11/6/art_{{{113}}_{{53699}}}.html.

[3] Shen Yang, Zhang Naiguang, Xu Bangbao. Design of a Copyright Registration and Trading Scheme Based on Blockchain Technology [J]. Radio & Television Information, 2019(3): 70-74.

[4] Li Beijia, Lin Baocheng, Chen Yi, Shen Yan, Xu Ziyu. Discussion on the Application of Blockchain Technology in Smart Broadcasting Construction [J]. Cable TV Technology, 2019(6): 45-48.

[5] Du Guozhu, Zhu Peijiang, Shen Yang, Zhao He. Prospects for Blockchain Applications in the Radio and Television Industry [J]. Radio & Television Technology, 2020(4): 12-15.

[6] Shen Yang, Xu Bangbao, Zhang Naiguang. Considerations on Blockchain Technology Applications in the Radio and Television Field [J]. Radio & Television Information, 2019(S1): 63-66.

[7] Gao Xianchun. Technology First, Experience-Based: Analysis of Application Trends of Blockchain Technology in Radio and Television Media [J]. TV Research, 2020(2): 20-23.

[8] Tian Fan. Research on Development Trends and Policy Directions of Cryptocurrency from an Economic Perspective [J]. Macroeconomics, 2020(6): 42-48.

[9] He Haiwu, Yan An, Chen Zehua. A Survey of Smart Contract Technology and Applications Based on Blockchain [J]. Journal of Computer Research and Development, 2018(11): 2452-2466.

[10] Gao Jing, Zhang Xiaolin. Research on Media Applications of Blockchain to Explore Innovative Operating Models [J]. Journal of News Research, 2020(24): 11-12.

[11] Leng Jidong, Lü Xueqiang, Jiang Yang, Li Guolin. A Survey of Consortium Chain Consensus Mechanisms [J]. Data Analysis and Knowledge Discovery, 2021(1): 56-65.

[12] Jin Jian, Wang Wanquan, Dong Wei. Design and Construction of a Blockchain-based Digital Media Copyright Management Platform for Broadcasting [J]. Radio & Television Technology, 2020(10): 30-36.

Author Biographies

Lan Luohaozhan (1997-), male, from Hechi, Guangxi, Master' s student, research direction: digital publishing.

Zhang Weixuan (1997-), male, from Changji, Xinjiang, Master' s student, research direction: blockchain.

Xie Qing (1986-), male, from Wuhan, Hubei, Associate Professor, research direction: machine learning, big data technology.

Chen Xiaofeng (1983-), male, from Wuhan, Hubei, Associate Researcher, Ph.D. student, research direction: digital publishing and communication, open science, blockchain, digital transformation.

(Responsible Editor: Li Jing)

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