Postprint of "Research on a Blockchain-Based Mechanism for Online Public Opinion Regulation"

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Abstract

The rapid development and widespread application of Internet technologies have not only increased the speed at which people obtain information in their daily lives and broadened the channels through which information is accessed, but have also accelerated the dissemination of online public opinion, thereby introducing certain difficulties and challenges for the supervision and governance of public opinion. This paper takes blockchain as its technical background and aims to integrate the unique properties of blockchain with the work of public opinion supervision and governance, in the hope of providing practical and feasible approaches for the supervision and governance of online public opinion.

Full Text

Preamble

Research on Blockchain-based Online Public Opinion Supervision Mechanisms

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Abstract: The rapid development and widespread application of internet technology have not only accelerated the speed of information access and broadened channels for obtaining information, but also increased the velocity of online public opinion dissemination, posing new difficulties and challenges for supervision and governance. This paper, set against the technical backdrop of blockchain, aims to integrate blockchain' s unique properties with public opinion monitoring and governance, hoping to provide practical and feasible solutions for online public opinion supervision and management.

Keywords: blockchain; internet technology; online public opinion; opinion supervision; integrated media

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With the rapid advancement of internet technology, the ways people obtain information have fundamentally changed. As individuals receive and publish information, public opinion simultaneously emerges through their usage. While internet technology provides tremendous convenience for accessing information, new technologies and complex network environments also create fresh pressures and challenges for supervision and governance. In the integrated media environment, online public opinion spreads faster and has broader impact. Major social events, if not properly guided in a timely manner, may generate numerous adverse social effects. Blockchain technology opens new pathways for online public opinion supervision and governance. Among blockchain' s many characteristics, features such as immutability, smart contracts, and traceability can provide effective assistance for monitoring and identifying public opinion, efficiently solving problems in blockchain-based opinion supervision and governance.

1.1 Definition of Online Public Opinion

Current literature shows that there is still no universally accepted definition of online public opinion. Some scholars believe that online public opinion refers to a concentrated expression of emotions and attitudes held by the public toward a specific social event, phenomenon, or entity within a particular time period on internet platforms [1]. Others argue that online public opinion is a special reflection of social sentiment on the internet, representing a concentrated response from the masses regarding national economy, politics, culture, social development, and hot-button issues across all sectors. In summary, online public opinion refers to public views or opinions on social events in the network environment, representing a component of popular sentiment and a means for the public to convey perspectives.

Online public opinion exhibits several characteristics: First, it possesses freedom. People experience a "disinhibition effect" when communicating online. Unlike face-to-face communication, individuals can express themselves more authentically and frankly in digital spaces, enabling online public opinion to reflect mass thinking relatively objectively. However, this simultaneously leads to reduced self-regulation, making people more likely to become unscrupulous. Second, online public opinion is sudden. With the aid of network channels, public at-

tention to a particular event may explode exponentially. For instance, trending topics on Weibo spread rapidly through forwarding and commenting, making them difficult to control or predict. Third, online public opinion is fluid. Like other content disseminated on network platforms, it breaks temporal and spatial constraints, allowing people to comment and forward across different content threads, enabling rapid event propagation. Moreover, current public opinion content on social platforms is also interactive, with both netizens and official accounts able to exchange different viewpoints in comment sections. Fourth, online public opinion involves massive content volumes, making manual supervision difficult and disproportionately costly. Fifth, online public opinion may deviate from actual events. As social incidents spread and ferment online, public opinion may lack theoretical support and become detached from the event itself, creating distortions. Sixth, online public opinion forms are complex and diverse. With continuous network technology development and innovation, both the subjects and carriers of public opinion dissemination have diversified, evolving from text to images and videos, increasing supervision difficulty [2].

1.2 Generation and Propagation of Online Public Opinion

As internet technology continues developing, public opinion carriers have shifted from traditional media to new media platforms built upon internet technology. According to the 49th "China Statistical Report on Internet Development" released by the China Internet Network Information Center (CNNIC), by December 2021, China' s internet user base reached 1.032 billion, an increase of 42.96 million from December 2020, with internet penetration reaching 73.0%. This massive user base and growing penetration provide necessary conditions for generating and spreading online public opinion.

Information technology development has also fundamentally transformed the public opinion dissemination environment. In addition to emerging internet companies and media platforms, some traditional media have expanded into new media business models while maintaining their operations, gradually strengthening user stickiness. The accelerated pace of life has led to fragmented reading habits, causing netizens to prioritize spiritual understanding over factual truth, resulting in lost authenticity and reliability in content dissemination. Since internet access has no threshold restrictions, netizens' educational levels and personal qualities vary significantly. Some netizens cannot objectively evaluate or rationally filter received information, instead preferring to comment on events from subjective perspectives before publishing and forwarding personal viewpoints, thereby forming false information dissemination that deviates from reality [3].

Furthermore, some new media and self-media outlets, competing for first-mover advantage in content publishing to capture headline traffic, neglect content authenticity, leading to dissemination of unverified information. Official accounts, requiring multi-level approval to publish factual content, consequently suffer from lag. Therefore, supervising news information published by personal and

non-official accounts represents an important component of online public opinion governance.

2. Difficulties in Online Public Opinion Supervision in China

2.1 Rapid Spread and Complex Supervision Environment

The internet era provides convenient ways to rapidly obtain information, but this is a double-edged sword. Additionally, network anonymity protection technologies create a "disinhibition effect" during platform communication, freeing users from real-world face-to-face constraints. The virtual environment provides space for releasing work and life pressures, making online communication more candid. However, while this relaxed environment facilitates expression, it also leads to subjective rather than objective factual expression, lacking evidence verification and self-supervision, creating supervision difficulties.

Some profit-driven marketing accounts and non-official accounts upload false, unverified information or publish attacking remarks to gain traffic, misleading the public and triggering cyber violence, negatively impacting society. Marketing and personal accounts have low industry entry barriers, with no restrictions on netizens' cultural levels or personal qualities, making unified standards difficult to achieve compared to official media.

2.2 Difficult to Trace Origins and Severe Impacts

Currently, China' s social consumption structure and interest relationships continuously change, with accelerated life pace and increased work pressure. This generates negative, adverse, and irrational emotions that are wantonly vented online, constantly impacting the online public opinion environment. Network technology popularization has made people dependent on the internet for information, with social platforms like Weibo and WeChat becoming important channels for receiving real-time information and venting emotions. However, the freedom to publish online information also allows netizens with malicious intentions to exploit this vulnerability to incite crowds and spread rumors, while some netizens easily lose rational thinking when using social platforms, becoming agitated by rumors and creating adverse social impacts [5].

Current public opinion spreads so rapidly in such complex environments that tracing its origins becomes difficult. Once public opinion emerges, identifying the initial dissemination account is challenging.

2.3 Netizens Following Opinion Leaders, Difficulty Distinguishing Truth

Thanks to the internet environment, people obtain information quickly, and correspondingly, public opinion ferments rapidly. During information dissemination, some netizens with strong information acquisition abilities and social

platform expression skills become opinion leaders. These leaders bridge cognitive gaps among netizens of different ages and literacy levels, but their presence also triggers the "spiral of silence." When people discover content aligning with personal views being approved or recognized, they actively join the discussion; otherwise, they remain silent. This cycle forms the "spiral of silence." Combined with rapid network dissemination, identifying who first published negative opinions becomes difficult. Other netizens obtain information through opinion leaders, forming dependency and imitation phenomena, demonstrating that opinion leaders significantly influence public opinion fermentation.

Internet popularization has diversified netizen composition, with increasing numbers of elderly and minors joining. However, in terms of judging information accuracy, official media content may lag due to multi-level verification, while profit-driven marketing and non-official personal accounts may publish unverified or fabricated content in advance, using clickbait titles to attract clicks. Users receiving such information cannot judge authenticity, especially among elderly and minors who, after subjective judgment, may spread content to others, leading to false public opinion dissemination.

3. How Blockchain Technology Breaks Through Difficulties in Online Public Opinion Supervision and Governance

As a novel technical approach, blockchain primarily features decentralization, openness, anonymity, immutability, and independence. Blockchain has brought new turning points to industry operation models and created more possibilities for internet public opinion supervision and governance.

3.1 Advantages of Blockchain for Online Public Opinion Supervision

The most significant advantage of applying blockchain to online public opinion supervision is its immutability. Blockchain' s decentralized structure enables investigation of different accounts' publishing records at any time, with content that cannot be altered, avoiding human deletion or modification. This ensures information authenticity and reliability, eliminating attempts to evade punishment by altering previously published harmful statements. In blockchain, combining information traceability, content assessment, and multi-node verification can form a reliable supervision mechanism. Blockchain can also integrate with big data, cloud computing, and other technologies to efficiently categorize information, establish keyword and similar content screening mechanisms, conduct comprehensive public opinion traceability and analysis, improve classification and identification efficiency, and reduce costs.

3.2.1 Blockchain-Based Public Opinion Monitoring Public opinion monitoring generally refers to using technical means to capture, classify, and intelligently process massive amounts of internet information. Through monitoring, vast information can be categorized by type to achieve information

Figure 1

Figure 1: Figure 1

tracking. Blockchain' s decentralized nature can effectively achieve public opinion monitoring goals. Traditional public opinion monitoring generates chart reports and other analysis results after tracking and processing information, providing data support and analytical basis for governments to comprehensively understand social and mass thinking trends and guide correct social opinion orientation. Manual public opinion monitoring faces many problems, such as incomplete collection, untimely discovery, inaccurate analysis, and inconvenient information utilization. Current public opinion monitoring needs can be divided into four aspects: comprehensive information, real-time supervision, precise analysis, and convenient information usage. Blockchain' s distributed decentralized structure can achieve comprehensive information collection.

Blockchain-based Public Opinion Information Release Interception Flowchart

Figure 1 shows the interception flowchart before public opinion information release, starting with information submission, adding intelligent identification and screening systems, including image and audio-video content recognition, and identifying text details such as homophones, pinyin, and synonyms to prevent problems like inverted images, undetectable pinyin or video content that previously occurred on social networks. Using blockchain technology, random sequences are added at each link of content release, and timestamps are affixed before content publication to facilitate traceability during subsequent investigations. This process can also partially serve as a public opinion risk early warning and handling mechanism. After identification, classification, and screening, information content is graded, with personalized response plans and mechanisms developed for different content types. Random sequences are added to each link to make them traceable and tamper-proof, thereby addressing adverse social impacts caused by public opinion content, shortening reaction mechanism processing flows, and efficiently responding to public opinion incidents.

3.2.2 Blockchain-Based Public Opinion Risk Early Warning
Blockchain technology can help predict public opinion risks and break through management bottlenecks. Although traditional public opinion management methods can address some predictable risks and threats, the network environment is full of uncertainties, making individual control of each piece of public opinion prohibitively costly and difficult, with high uncertainty and risk. The purpose of public opinion risk management is to promptly identify potential risks, select appropriate response methods, and minimize risks to controllable or acceptable levels [8]. The constituent elements of blockchain-based online public opinion risk management primarily include technical capabilities, information governance perception, and individual users. At the technical capability level, social network public opinion risk management platforms

utilize blockchain technology to form new public opinion dissemination media, supporting user production, consumption, transmission, and decomposition of public opinion information [7]. Additionally, blockchain can provide smart contracts and consensus mechanisms for supervision entities, with traceable and tamper-proof information ensuring authenticity during dissemination and verification under trusted conditions.

3.3 Breakthroughs Over Traditional Supervision and Governance Methods

3.3.1 Enhanced Precision of Public Opinion Supervision and Early Warning Mechanisms Blockchain' s decentralization and openness principles allow affixing timestamps to information before release, leaving marks at every stage of the entire dissemination process to facilitate traceability and problem identification, avoiding non-official human manipulation of public opinion. With blockchain technology support, supervision entities can track public opinion dissemination targets in real-time, comprehensively grasp dissemination paths and methods, understand public sentiment through these paths and content, and better comprehend public opinion changes and dissemination patterns based on factors like occurrence region, generation time, and impact degree, thereby gaining experience for subsequent early warning and emergency preparation. Leveraging blockchain, supervision entities can more accurately and rapidly capture public opinion generation and dynamic changes, timely remedying information biases and correcting event accuracy.

3.3.2 Improved Effectiveness of Social Network Public Opinion Guidance The internet environment changes rapidly, and people' s online application scenarios become more diverse, presenting new challenges for public opinion guidance. To prevent adverse social impacts caused by rapid public opinion spread, guidance work becomes particularly important. With blockchain technology, the entire process from public opinion generation through publication to dissemination can be tracked, enabling rapid and efficient identification of original publishers, investigation of their experiences and backgrounds, and understanding of publication motivations. Different measures should be taken for different individuals based on background investigations. Additionally, according to audience structures on different platforms and guidance targets, customized and intelligent guidance plans can be formulated through user tags to strengthen mainstream ideology' s influence, laying a solid foundation for public opinion guidance.

3.3.3 Enhanced Efficiency of Public Opinion Processing Mechanisms The rapid development of internet technology and popularization of network usage have caused information generation and dissemination speeds to grow geometrically. Blockchain' s distributed, tamper-proof, and traceable characteristics can help supervision entities clearly and detailedly record every node

and specific content of public opinion emergence and dissemination, greatly saving traditional supervision processing cycles. This enables efficient and precise identification of information sources, using blockchain' s distributed features for point-to-point communication to faster resolve problems caused by online public opinion, improving processing efficiency and reducing harm from continuous online fermentation.

Public opinion supervision and governance remain in developmental stages, and online public opinion represents a form of popular sentiment. Therefore, guidance remains the primary management approach. To effectively minimize negative impacts, relevant departments must appropriately integrate new technologies to enhance supervision efficiency, enabling timely and effective responses to different types of online public opinion. Future blockchain-based public opinion supervision should focus more on accurate judgment of public opinion content, resolving weaknesses in identifying similar words, synonyms, and homophone replacements. With its distributed and tamper-proof advantages, blockchain will lay a solid foundation for future public opinion supervision, improving identification precision, breaking through traditional supervision difficulties, implementing timely and effective control measures, and providing healthy development space for networks.

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