

# Towards Transparency and Security: An Analysis of The Application of Blockchain in Digital Journalism

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**Abstract:** Blockchain technology has been regarded as a disruptive new technology from its very beginning. Various blockchain platforms, such as one featuring a public chain, or a private chain, or an alliance chain, are built for the news industry. With its unique technological features, it helps the journalism industry rebuild a transparent production chain and solve the problems in news production. Finally, the incentive mechanism of crypto tokens creates a virtuous cycle of content output, source management and fact checking to protect copyrights and strengthen the accountability mechanism. However, the existing block technology is not mature. Due to technological demands, energy cost and potential economic bubbles in token trading, applications of blockchain in journalism require further technological tweaks and updates.

**Keywords:** Blockchain, Digital journalism, Industry hange, Journalistic security.

## 1. Introduction

Blockchain was first proposed by Satoshi Nakamoto in 2008 as the underlying technology in the data structure of Bitcoin and the encryption of transaction data [1]. It is seen as the most important innovation after the steam engine, the electricity and the Internet, starting the fifth industrial revolution. Blockchain includes a new decentralized network and computing method that uses a specific data structure to verify and store data, a distributed consensus algorithm to generate and update data, a cryptographic way of securing data transmission and access, and a smart contract consisting of automation scripts to process and control data.

Based on the above characteristics, blockchain technology has great potential for reshaping human collaboration, has been rapidly and widely used since its introduction, in banking and finance, government and public services, insurance and health services, media and entertainment, etc. Blockchain technology has evoked faith in a promising future of journalism in the sense of paradigm innovation. Like every industry, journalism has a crisis lurking somewhere in the future and blockchain technology is expected to be the savior [2].

## 2. Literature Review

The application of blockchain technology reanimates journalism, but compared to other fields, journalism witnessed relatively limited researches and applications of blockchain technology. So far, academic research has mainly focused on three aspects: technological possibilities, micro-level case analysis and journalism panorama.

The research orientation of technological possibilities is mainly about studying if it's technologically possible to imbed blockchain technology in news platforms, operations and products. For example, Kim & Yoon (2018) think that a news model based on shared space built by blockchain technology may solve the profitability problems in the news industry [3]. Azevedo et al. (2020) propose a decentralized new platform based on majority decision-making [4]. Jurado et al. (2020) propose that the traceability mechanism of

blockchain technology can be used for tracking the evolution of news reports [5].

Micro-level case analysis refers to case studies of influential blockchain news platforms, such as Civil in Al-Saqaf & Edwardsson (2019) which analyzes the advantages of a blockchain-based newsroom in improving news credibility [6]. Rong (2019) explores news practices on Civil and PressCoin, arguing that blockchain news platforms can diversify the traditional business model and reshape the ecology of news production [7].

Journalism panorama refers to the impact of blockchain technology on the entire journalism industry, including rumor management, copyright, regulation, etc. Ding (2020) believes that blockchain technology is able to help build a trustworthy Internet and construct the core network for national information infrastructure which aims to prevent and manage the spread of online rumors. Lin & Lin (2021) analyze the unique advantages of blockchain technology in copyright registration, trading and maintenance and discuss the possibility of an entire process of "confirming-using-maintaining" copyrights based on blockchain technology and multi-centered alliance chains used for the management and protection of news copyrights [8].

The extant researches show that the academia is relatively optimistic about applying blockchain technology to journalism while a critical perspective on news production is lacking, but the transition from complete optimism to cautious reflection has started. As the next stage of applications and their final outcomes are yet to be seen, imbedding this technology in journalism needs further research. Therefore, this essay will address the security and transparency issues of blockchain-based journalism from a future-oriented perspective after analyzing how blockchain contributes to journalism and its underlying mechanisms with the aim of offering technical insights into the improvement of journalism.

## 3. Blockchain in Journalism

Blockchain as an underlying technology and a paradigm innovator for journalism, has more potential than the Internet

for improving mass media. For the purpose of understanding the impact of blockchain technology on journalism, it is necessary to delve into the concept of blockchain and the existing applications of blockchain in journalism.

### 3.1. The concept of blockchain

In simple terms, blockchain technology at this stage refers to the technology of collectively maintaining a reliable database through decentralization and without the need for a trusted third party. Blockchain technology cleverly combines multiple existing technologies and databases, forming a new way of recording, transferring, storing and presenting data. The four core technologies are:

Distributed storage, such as peer-to-peer computing. In the past, people left the job of recording and storing data to a centralized network, and stored data across multiple independent devices, see Figure 1. Distributed storage, on the other hand, can do without a dedicated central server, using a distributed peer-to-peer network where each user is both a client and a server, see Figure 2.

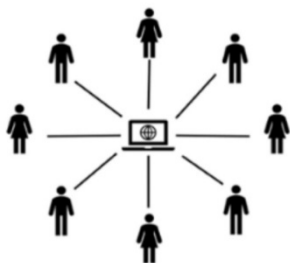


Figure 1. A centralized network with a central server.

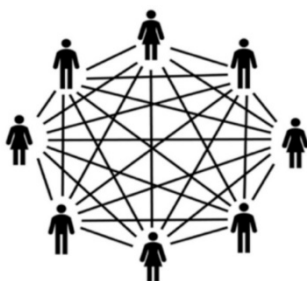


Figure 2. A peer-to-peer network without a central server.

Cryptography, among which the most famous is hash function and asymmetric cryptography, widely used to construct blocks and preserve the integrity of transactions. A hash function is a computational method that can map an indeterminate size of data into a fixed size of data. A cryptographic hash function uses one-way mathematical functions that are easy to calculate to generate a hash value from the input, but very difficult to reproduce the input by performing calculations on the generated hash, see Figure 3.

Asymmetric encryption. Unlike symmetric encryption, which uses the same secret key to encrypt and decrypt sensitive information, asymmetric encryption, also known as public-key cryptography or public-key encryption, uses mathematically linked public- and private-key pairs to encrypt and decrypt senders' and recipients' sensitive data, see Figure 4. Asymmetric cryptography techniques allow for extremely secure communication between two parties.

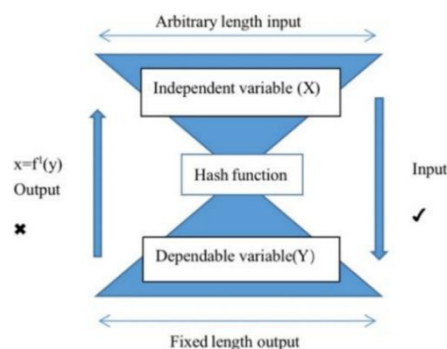


Figure 3. One-way hash function.

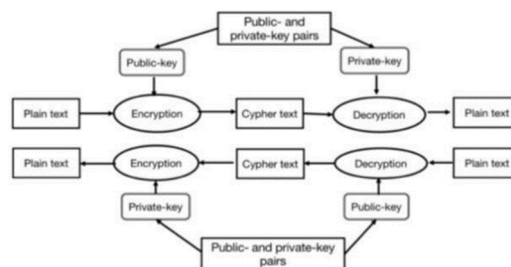


Figure 4. Flowchart of asymmetric-key cryptography.

Smart Contract, a computer protocol designed to disseminate, validate or enforce contracts automatically. Multiple users within the blockchain can jointly participate in the development of a smart contract which clearly defines the rights and obligations of both parties and gets delivered to each node through a self-organizing P2P network and deposited in the blockchain. The smart contract regularly performs an automated status check, validates transactions that meet the conditions, notifies the users once an agreement is reached and automatically executes it. Smart contracts allow for trusted transactions without a third party.

Consensus mechanism, based on various disciplines such as economics and game theory to ensure that each node in the blockchain can actively participate in managing the blockchain for its stability. Particular nodes can vote to decide the verification and validation of a transaction in a very short period of time. If a number of nodes with unrelated interests reach a consensus about the transaction, it's assumed that the whole network agrees about the transaction as well. Such consensus mechanism allows for efficient collaboration on a large scale without relying on a centralized authority.

### 3.2. Blockchain-based news media

Blockchain-based journalism has been around since 2016 and has developed different operational paths and diverse media forms. In terms of application scenarios and blockchain operating systems, blockchain-based news media can be broadly divided into the following three categories [9]:

News platforms of public chains. This category is completely decentralized, where tokens are traded between equal nodes according to consensus algorithms and news operation is open and transparent. For example, the news platform of Steemit combines social media with a cryptocurrency community, where nodes are free to publish news and earn tokens based on the number of likes. It provides a brand-new way to manage digital misinformation and reconstruct online trust [10].

News platforms of alliance chains, which are partially

decentralized and have some commonalities with a traditional communication model where multiple platforms are owned by a syndicate or a corporation and the consensus process is controlled by some predefined nodes or consensus algorithms. PressCoin, for example, is a cryptocurrency-based news aggregator that brings together a number of media outlets such as INSURGE, NextElection and Zolori. Users can read news on the platform and earn tokens by engaging in conversations and offering insights, thereby facilitating citizen participation in public discussion and interaction between audience and communicators.

News platforms of private chains, which basically borrows the overall structure of traditional news websites. It is built by a fully centralized blockchain characterized by a specific entity's control over data management. The write access is owned by the platform and read access is selectively given to the public, with tokens to incentivize news creation and public participation. For example, Civil is a blockchain-based platform mainly for media professionals (reporters, editors, photographers, fact checkers) , claiming to create a self-sufficient marketplace for journalism, free from advertising, fake news and external influences.

On the whole, blockchain-based news media are not completely immune to the current media and journalistic practices in terms of content production and dissemination, but blockchain technology in which a unique set of ideas are embedded provides new possibilities for the future of journalism in crisis.

## 4. A Complete Transformation of News Production and Dissemination

Due to the continuous improvement of blockchain technology, its applications in the news industry are in a wide and deep range, influencing all aspects of news production, dissemination and consumption, etc.

### 4.1. Transparency through the news production process

The traditional news production process is complex and time-consuming, including topic selection, interviewing, writing, editing, proofreading, printing and other indispensable steps, see Figure 5. Different news organizations tailor their production steps, standards and criterions. The entire news process is managed by news organizations, professionals, and experts while news readers are unaware of and have no control over most of the above steps.

The opaqueness in the news production process directly affects the mindset about truth in journalism, a problem that was not alleviated until the Internet era. The Internet gives the public the opportunity to know how biased news media's definition of truth is and how news media disguise deliberately misleading format, content and inter-organizational collaboration as objectivity. As a counteraction, some media have tried to expose the news production process to their audience by encouraging public participation in news selection and news production, releasing behind-the-scenes of interviews, etc., so as to make the news production process transparent and thus rebuild public trust. But these actions tend to be manipulation: "strategically choosing a limited space to reveal, which allows news media to appear transparent without giving up substantial power over the process" [11].

Fortunately, blockchain technology provides the technological possibility to solve the problem of opaqueness in the news production process by lucidly presenting the process to the readers. Recognized users can vote with tokens to select topics for media to report on, thus starting the process of interviewing, writing, and reviewing and editing, see Figure 6. Users' votes are an influencing factor in media's news selection, perspectives on truth and gate-keeping standards, free from economic, political manipulation and other malicious intentions.



Figure 5. Flow chart of traditional news production.

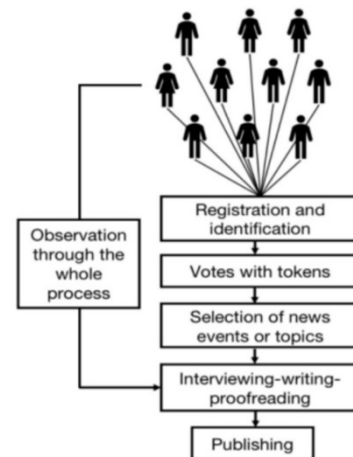


Figure 6. Flow chart of users' votes with tokens to influence news production.

News professionals may use a blockchain which structures the data of information source, how the information is collected, organized and used into chunks (blocks) that are strung together. When a block is filled, it is set in stone and becomes a part of this time line. Thanks to the irreversibility of blockchains, even changing a punctuation will lead to an inconsistent hash value, which means any change to the texts that have already been posted on the blockchain-based news platforms will leave a permanent record and any node can see how the modification is done and what is done. The user-oriented platform exhibits most of the news production process, which greatly clears any public doubts stemming from its opaqueness about whether the news is objective and reliable.

## 4.2. Crypto-token incentive mechanism to promote a virtuous content cycle

In the traditional model, the profit of news media mainly comes from two parts: subscription and advertising. Generally speaking, readers are charged a subscription fee so low that more readers' attention can be attracted and then news media can sell the scarce resource of audience's attention to advertisers, see Figure 7. Advertising revenue takes a major role in balancing the costs of content production, administration, distribution and publication. However, too many advertisements in the news section or news program may easily lead readers or viewers to question the credibility and objectivity of news, causing a crisis of trust in news media.

In the Internet era, traditional news media's subscription and advertising revenues have been greatly declined. As a counteraction, some traditional media have tried to take advantage of the Internet by setting up news websites or mobile apps and adopting a "free content and advertising" profit model. However, Internet users are used to visiting news aggregators, so compared with social media and news aggregator websites, websites of traditional news media have troubles attracting visitors and therefore have a very limited share in the advertising market. In addition, copyrights on the internet are not well protected so after spending high costs creating quality news, traditional media are normally unable to get the well-deserved profits due to appropriation, plagiarism and poaching, which undoubtedly adds more difficulty to revenue-strapped websites of traditional news media.

Applications of blockchain in the news industry disrupt the original news model because cryptocurrency and decentralization transform the original business model of selling readers' attention into one that focuses on content production [12]. Tokens can be used to directly reward journalists and other users for completing specific tasks without intermediaries of news media, search engines and content distribution platforms [13]. See Figure 8.

Therefore, journalists are no longer restricted by news agencies, search engines, distribution platforms or under the influence of the rich and powerful. Autonomy and objectiveness are regained. Media professionals set their own journalistic guidelines, decide which news stories to report and pricing strategies, get profits from writing columns. Moreover, token-based voting empowers the consumers to rank the quality of news content so that those journalists guilty of bad behavior can be disciplined or even removed from the community to ensure journalistic professionalism and the health of the news community. Blockchain technology establishes a direct link and value exchange mechanism between journalists and readers, satisfying both the latter's needs for news content and the former's needs for profit.

## 4.3. Source management and fact checking to enforce copyrights and consolidate the accountability mechanism

The high cost of news production and the extremely low marginal cost make the news media attach great importance to copyright. However, while rapidly developing Internet technology has brought about a tremendous increase in the speed and scope of communication, it has also led to obstacles to protecting copyrights of journalistic works. Web editors can easily reproduce original news created by news media on

their websites without obtaining copyright permission, and can even use software to automatically crawl and upload news to the great detriment of the news industry.

Meanwhile, with the help of the Internet, fake news and misinformation have become common all around the world. Related international public opinion is an important issue in national governance and international relations [14]. The free and open Internet causes news media a huge cost to find the source of a fake news story. Fake news creates a filter bubble where commonly held wrong opinions, beliefs and emotions replace facts and logic as the determining factor in decision making, exacerbating the crisis of trust in journalism.

Blockchain technology creates a new mechanism to track and evaluate the credibility of news, which includes source evaluation, multi-node authentication. Thanks to the mechanism, it's possible to access a ledger that keeps track of changes within the chain to find the news source, view and clarify the identity of the publisher, and judge the credibility of a news story [15], which greatly ensures the immutability of news content and avoids inaccuracy caused by later tampering, and also effectively identifies the culprit responsible for misinformation.

In addition, blockchain technology, specifically consensus mechanism, facilitates news verification because everyone can participate in fact checking and any behavior of changing blocks will provide references for participants. Only when a sufficient number of nodes agree that the content is true and credible can the news be published. In this way, the news credibility and accuracy of the content is verified, news creators enjoy copyrights while news consumers' rights are equally protected in the dissemination process. Blockchain technology enforces copyrights and consolidates the accountability mechanism on a technical level.

## 5. Development Limits of Blockchain-Based Journalism

Applications of blockchain technology in journalism give us the opportunity to imagine a different world and operation mechanism for journalism. However, blockchain technology cannot fully help the industry build an ideal world, and there are still some problems in the development of blockchain-based journalism.

### 5.1. Technological and energy requirements

Blockchain technology helps build public trust cost-efficiently, provides a low-cost business model with high profit potential and solves the problem of high operating expenses for the news industry. However, technological and resource requirements hamper the realization of these expected benefits.

Blockchain projects depend on the participation of a large number of users, which means blockchain-based news platforms need to cultivate user trust in blockchain and user habit of using it. However, it's not that easy to change their preferences for traditional media, such as the New York Times and the Washington Post. In addition, protection of users' rights is still flawed. Blockchain-based communities are still in progress with a number of speculators disrupting the order, making it impossible to effectively guarantee the users' rights. Finally, a high level of literacy in the use of blockchain technology is required.

Blockchain requires a lot of computational resources. The decentralized distribution and consensus mechanisms of

blockchain mean that all data has to be repeatedly verified several times, and each verification needs to be recorded in the block. As stored news increase, related data will also increase, which puts a strain on the storage space. Moreover, the increase of data challenges the computational accuracy and efficiency before the need for upgrading computer equipment arises. Huge costs of equipment, electricity and maintenance to enhance storage capacity and computational power limit many blockchain-based media to small-scale development.

### 5.2. The risk of economic bubbles in token trading

The token mechanism is an important incentive system for blockchain-based news platforms, but as a virtual currency, compared to fiat money or precious metals, tokens are not as stable, whose value is entirely determined by supply and demand. Therefore, any business model based on the crypto economy requires a large user base to stabilize the price of tokens against the fluctuation in supply and demand. Besides, the token economy relies on bets from outsiders, leading to little intrinsic risk resilience.

As a virtual currency, tokens need to be redeemed for real-life use, making them a potentially valuable commodity, attracting a flock of speculators and venturers to the market, who exploit loopholes in the reward mechanism to get more tokens than they deserve by producing repetitive news. Their speculative behaviors generate economic bubbles and disrupt the virtuous cycle of news production. Journalistic professionalism cannot survive in such economic bubbles, and quality journalism is overwhelmed by a flood of low quality and redundant information, a phenomenon known as bad money drives out good.

### 5.3. The incompatibility between blockchain technology and news

Blockchain technology is decentralized, transparent, open, autonomous, and immutable, which is useful to a certain extent for guaranteeing the credibility and objectivity of news and protecting copyrights, but due to the incompatibility between blockchain technology and news, applications of blockchain in journalism may not be able to eliminate fake news.

Blockchain technology is digital and, therefore, intrinsically quantitative, easily meeting the needs for accurate figures in the fields of stock and finance, producing, circulating and storing the only existing truth. As an interpretive discourse, news does not have the mathematical characteristics of reliability and certainty so there's no need for indisputable truth and complete consistency in data. News involves a wide range of topics, complex issues, and narrative tones which may even be emotional. Therefore, the diverse situations are beyond the capacity of blockchain technology to process and distinguish.

Moreover, Fake news is based on various wrong standpoints and some of them even involve cognitive distortions, so it is difficult to identify the mistakes by relying on the powerful storage capacity of blockchain for traceability and accountability. Therefore, the role of blockchain in combating fake news should not be overestimated, and there is still a long way to go to re-establish public trust in news and enhance media's credibility on a technical level.

## 6. Conclusion

The continuous technological development brings about evolving risks of modernity which include the journalism crisis. Blockchain technology envisions a big picture for the development and transformation of journalism and provides new ideas to resolve the crisis. However, blockchain technology is not a panacea, and some problems in blockchain technology need solving urgently. Expected to start a revolution for journalistic ideals, applications of blockchain in journalism are not perfect before further adjustments and updates.

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