Blockchain Applications and Postprint Practices in Academic Journals

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Abstract

This paper first examines the application directions of blockchain in academic journals across four dimensions: peer review mechanisms, academic misconduct prevention, author attribution, and transparency of donation fund flows. Subsequently, using the journal Ledger as a case study, it elaborates on practical implementations of blockchain in academic publishing, including the linkage between Bitcoin addresses and identities, digital signatures and blockchain timestamps, and the realization of author anonymity, thereby offering insights and references for blockchain adoption in China' s publishing industry.

Full Text

Applications and Practices of Blockchain in Academic Journals

Abstract: This paper first explores the application directions of blockchain in academic journals from four aspects: peer review mechanisms, prevention and control of academic misconduct, author attribution, and transparency of donation fund flows. Second, using the journal *Ledger* as a case study, it presents practical applications of blockchain in academic publishing—including bitcoin address-identity association, digital signatures and blockchain timestamps, and implementation of author anonymity—to provide reference and guidance for China' s publishing industry in adopting blockchain technology.

Keywords: blockchain; peer review; academic misconduct; digital signature; timestamp

Introduction

In 2008, Nakamoto first introduced the concept of blockchain in the whitepaper "Bitcoin: A Peer-to-Peer Electronic Cash System" [1]. In subsequent years,

blockchain has become a hot topic, attracting widespread attention across various fields worldwide. The United States, European Union, Japan, South Korea, and others have actively supported blockchain research and laid out its application markets [2]. Blockchain can be applied not only to cryptocurrencies but also extensively in financial services, supply chain management, digital publishing, social welfare, and government management. Due to its characteristics of decentralization, immutability and non-forgeability, traceability, distributed storage, security, and privacy protection, blockchain is poised to bring revolutionary potential to traditional scientific publishing. In the September 2018 issue of *Forbes*, many scholars argued that blockchain would significantly impact the publishing industry within one to two years [3]. Domestic scholars have begun exploring blockchain's application in academic publishing: Liu Desheng et al. [4] discussed its use in copyright confirmation, distribution, and precision transactions for books; Jia Yinshi [5] summarized issues in online copyright transactions; Chen Xiaofeng et al. [6] explored transformation directions for China' s scientific journals; Xu Lifang [7] reviewed overseas academic publishing blockchain platforms; and Hua Jin [8] analyzed challenges and countermeasures in digital publishing from a blockchain perspective. However, most existing literature remains theoretical, lacking specific studies on practical applications in digital publishing.

Ledger journal [9], headquartered in Pittsburgh, Pennsylvania, represents the leading international example of blockchain integration in academic publishing and has achieved broad influence. Founded in 2015 by the University of Pittsburgh and the MIT Media Lab, *Ledger* is the first peer-reviewed open-access academic journal dedicated to cryptocurrency and blockchain technology, published online by the University of Pittsburgh Library System. The journal not only publishes research on cryptocurrency and blockchain but also combines blockchain with academic publishing itself, implementing fruitful application practices. This paper first examines blockchain' s application directions in academic journals, then uses *Ledger* as a case study to analyze its practical implementation, aiming to provide reference for China' s publishing industry.

1. Application Directions of Blockchain in Academic Journals

1.1 Peer Review

Peer review remains the most recognized method of academic evaluation, yet many problems have emerged. Editors and editorial board members often lack transparency in selecting reviewers, potentially enabling manipulation of the review process [2]; anonymous review may lead to irresponsible conduct, abuse of power, or bias among reviewers, while mandatory non-anonymous review may cause reviewers to refuse participation or question the validity of reviews.

Applying blockchain to manuscript submission and review systems can support peer review through distributed ledger characteristics, enabling authenticated

and credit-guaranteed anonymous public review. First, blockchain associates the identities of editors, experts, and editorial board members with bitcoin addresses, facilitating implementation of peer review rules. Additionally, while real identities cannot be publicly accessed on the blockchain, the review process can be verifiably anonymous and permanently preserved. This helps select appropriate reviewers and produce fair evaluations, improving the professionalism, transparency, and fairness of peer review. It also enables tracking of every transaction in the peer review process, providing technical evidence of reviewers' contributions and supporting diversified granularity in researcher evaluation.

1.2 Academic Misconduct Governance

Plagiarism detection is a proactive measure to avoid academic misconduct, using powerful database retrieval capabilities to identify copying. However, blockchain enables passive governance of academic misconduct. Through hash algorithms, blockchain assigns a unique hash value and timestamp to each published article, authenticating the creator' s identity. Additionally, smart contracts can be designed to check for plagiarized passages, directly reading all materials stored on the ledger. During the dissemination and sharing of academic works, blockchain-based application platforms can track online content usage, quickly tracing and notifying original creators when their work is used, thereby governing academic misconduct through tracking mechanisms.

1.3 Author Attribution

Generally, once a manuscript is submitted, the number of authors and their order cannot be changed; modifications require justification and signatures from all authors, with order typically determined by contribution size. However, post-acceptance changes to author order or additions/removals have occurred frequently in recent years for various reasons. Embedding blockchain into application platforms from the stages of grant application, team building, collaborative discussion, co-authoring, and manuscript submission would record every data operation on the blockchain, traceable across all stages. This provides direct proof for evaluating each author' s contribution and attribution issues, ensuring reproducibility of research and authenticity of authorship while providing more reliable evidence for future impact assessment and grant applications.

1.4 Donation Fund Transparency

Lack of information disclosure and transparency in public welfare projects has become a major obstacle to social philanthropy development and a source of controversy. Integrating blockchain with public welfare leverages its immutability and high transparency. Information such as fund flows and donation details can be added to the blockchain for network-wide verification and supervision. For example, *Ledger* journal received financial support from Coin Center and Bitcoin Unlimited at its founding. To ensure transparent fund flows, donation information is timestamped to record when blocks are written. All fund usage

requires cooperation between a public key (held by an editor) and a private key (held by an executive editor as a digital signature tool). When funds are used, the executive editor must sign a digital signature for the transaction recipient and amount, then broadcast the record to the entire network, with each node recording the transaction information. Blockchain' s distributed ledger ensures immutable fund records, making blockchain a "trust machine" that operates public welfare "in the sunlight."

2. Blockchain Applications in *Ledger* Journal

2.1 Bitcoin Address and Identity Association

To promote blockchain application in *Ledger*, the journal encourages corresponding authors to associate bitcoin addresses (or PGP public keys) with their identities. After successful registration, authors log into their bitcoin wallet homepage, switch to BITCOIN, and click the "Request" button to generate a personal bitcoin address.

For *Ledger*, only the corresponding author' s bitcoin address is displayed on the published article' s first page. For example, in "An Overview of Blockchain Integration with Robotics and Artificial Intelligence," corresponding author Vasco Lopes' s bitcoin address is "bc1qqcpw3dn9ss4548srnwldgzfftycuz99as9jxxs" —a unique 42-character ID worldwide. *Ledger* uses bc1-prefixed bitcoin addresses with bech32 encoding, an address format specifically developed for SegWit (Segregated Witness). Due to blockchain' s immutability, authors can record their entire process from submission to final publication through identity authentication, making it easier to prove copyright ownership during transactions and enabling traceability throughout the publishing lifecycle, providing powerful technical guarantees for judicial evidence.

2.2 Digital Signatures and Blockchain Timestamps

Ledger requires every submitted paper to include a statement describing any potential conflicts of interest (such as relevant commercial interests), which becomes part of the file hash signed by the corresponding author. After acceptance through peer review, *Ledger* provides the SimpleSign tool for digital signatures and timestamps. The corresponding author uses SimpleSign to sign the final version' s hash, indicating that all authors have reviewed and agreed to publish the content and understand related responsibilities. Before online publication, journal editors verify the digital signature and timestamp the article' s hash on the blockchain to prove its publication date, generating irrevocable evidence of the article' s existence on that date.

Thus, author and article information is uploaded to the public ledger. Timestamps and cryptographic digital signatures provide identity and copyright proof for any time point—completely public and transparent—offering new perspectives and solutions for copyright protection, dissemination statistics, and content asset management.

2.3 Author Anonymity

Should authors submit anonymously? For most journals, submitting authors cannot be anonymous, while reviewers generally are. If submitting authors were anonymous, they couldn' t be notified upon acceptance, let alone use the publication for promotion. *Ledger* allows anonymous publication under certain circumstances, but submissions must include a statement explaining why anonymity is desired and whether conflicts of interest exist. Even when published anonymously, author information is recorded on the blockchain, which creates comprehensive and accurate digital identity information that cannot be publicly accessed, ensuring anonymity while holding authors strictly accountable for content.

2.4 Other Features of *Ledger* Journal

Negative reports about peer review in scientific journals frequently appear and remain controversial in academia, yet peer review continues to be widely used in academic publishing. *Ledger* acknowledges peer review' s drawbacks but views the process as a necessary and effective mechanism for improving scientific record quality and accuracy, helping editors decide on publication. Since its founding, *Ledger* has actively sought suggestions to improve peer review for the academic community. For accepted articles, review comments are published alongside the article, including expert reviews, editorial evaluations, and author responses. For rejected manuscripts, authors may choose whether to disclose review comments. *Ledger* respects reviewers' right to anonymity, publishing comments without attribution. The journal believes that publishing review comments helps reviewers conduct fair evaluations and stimulates broader discussion, benefiting scientific development.

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