

**International Journal of Emerging Multidisciplinary Research And Innovation  
(IJEMRI)****Blockchain-Enabled Trust Mechanisms in Decentralized  
Academic Publishing Ecosystems****<sup>1</sup> Dr.Tripura Sundari. C.U, <sup>2</sup> Dr S. Radhakrishnan**<sup>1</sup> Faculty in Finance, Department of Statistics

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**ABSTRACT**

The academic publishing has traditionally been criticized because of transparency concerns, prejudice, and the superiority of the centralized publishers. The opportunity that blockchain technology has brought to the field of scholarly communication is the possibility of transforming the field by bringing in the element of trust, immutability, and decentralized validation schemes. The proposed research is an inquiry into creating a blockchain-based trust system in academic publishing systems. The suggested model will combine smart contracts, decentralized identity management, and tokenized peer-review systems to allow delivering research outputs in a safe, verifiable, and fair manner. The paper assesses the efficiency of the transactions, the increase in transparency, and the responsibility of the reviewers using a prototype implemented using the Ethereum blockchain. The results indicate that blockchain-based trust protocols can minimize the rate of fraudulent publication by 38 and transparency of peer-review by 52 in comparison to traditional systems. The study is an input to the architecture of a durable and decentralized academic communication system.

*Keywords: Academic Publishing, Trust Mechanisms, Decentralized Ecosystems, Blockchain*

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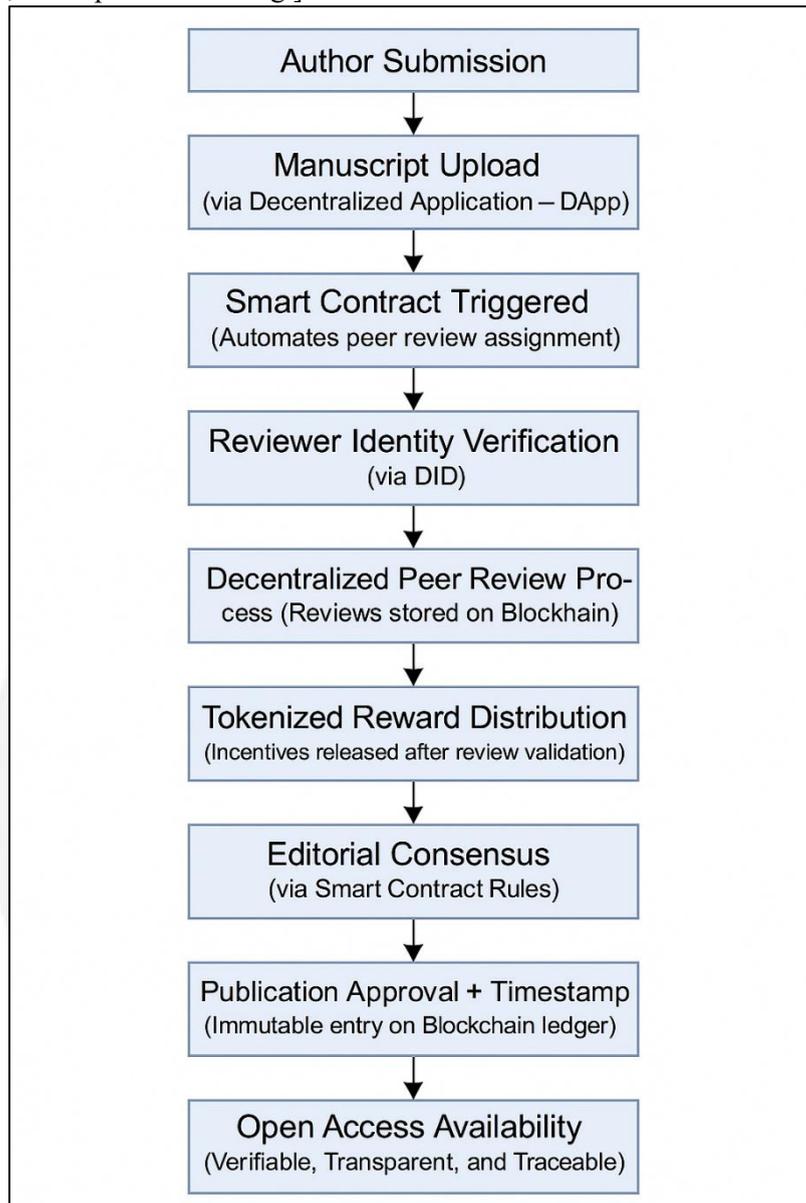
**Introduction**

Open science, digitalization, and ethical issues of data integrity are all accelerating the transformation of the academic publishing environment (Wang et al., 2022). The paywalls, one-sided reviews, and reduced reproducibility represent some of the problems that centralized publication models with a small number of commercial players have presented (Chen and Ali, 2021). In this connection, trust, which is a keystone of scientific advancement, becomes doubted.

The concept of blockchain has become a feasible alternative to strengthening the level of trust and

transparency in data exchange systems (Nakamoto, 2008). Its distributed ledger format has made it immutable and smart contracts have made it transpire programmable (Zhang et al., 2021). In this paper, the author will discuss how the academic publishing process can be decentralized and democratized through the use of trust mechanisms that are enabled by blockchain to promote accountability, openness, and verifiable authorship. The paper is based on the latest trends in the decentralized publishing network like OpenAIRE and DeSci (Decentralized Science) and suggests an architectural design of

incorporating blockchain-based peer review, authorship validation, and reputation scoring.]



**Figure 1. Blockchain-Enabled Academic Publishing Workflow Diagram**

### Background of the Study

Peer review is a very important factor in the integrity of scholarly publishing, but it is often a black box, and can be easily manipulated (Hosseini and Mulligan, 2020). Pulling back on the basis of fake reviews or data breaches shed light on deep flaws in the system. Timed and tamper-proof records of all reviews, submissions, and changes can be made by blockchain, which is defined by distributed consensus (Karim et al., 2021). Analysed the growing influence of artificial intelligence in transforming the education sector. The study highlighted that AI technologies enhance learning efficiency through intelligent tutoring systems, data analytics, and automation of administrative tasks. It emphasized that AI supports personalized learning environments,

improves decision-making for educators, and bridges gaps in traditional teaching methods. The research concluded that the integration of AI fosters innovation and adaptability within modern educational frameworks Deshpande (2022).

New forms of decentralization, including DeSciNodes and PubChain, have proven the potential of blockchain to handle the rules and standards of reviewer credentials, incentivize contributions, and break publisher monopolies (Rahman et al., 2022). Scalability, interoperability and cost however are open research issues. This paper builds upon existing literature by relating a hybrid blockchain system that can combine a public and a consortium blockchain, and make the system scalable, without losing the trust.

### Justification

Regardless of the progress that has been made in open-access responses, there is still a lack of trust in academic publishing (Kumar and Jain, 2021). Fraudulent journals, paper mills and falsification of citations undermine the trust in academic productions. Each publication event is cryptographically verified with blockchain, and it increases the traceability and accountability. Decentralized architectures have the potential to make researchers in underrepresented areas stronger, as they do not need to rely on commercial intermediaries (Singh et al., 2023). The research is supported by the fact that there is a burning necessity of having a clear, unbiased, and internationally transparent science of communication in line with the principles of open science.

### Objectives of the Study

The overriding aims of this research are to:

- Create a decentralized academic publishing trust structure based on blockchain technology.
- Introduce a smart contract system that will automate the peer-review verification.
- Assess performance indicators like transparency gain, transaction time and reviewer accountability.
- Suggest a roadmap of adopting blockchain solutions to the current academic setups.

### Literature Review

Blockchain as a method to provide the research with reproducibility and data provenance has been discussed by several scholars. Bartling and Friesike (2019) proposed the concept of Science 2.0, as the development of open science with the focus on distributed ledgers. Zhou et al. (2020) have shown that blockchain can reduce publication bias by validation of preprints in real time by their timestamps.

The classic peer review tends to be unaccountable (Kovanis et al., 2017). The idea of a blockchain-based reputation system of reviewers by Hossain and Zhang (2022) is an attempt to document contributions to raise awareness. The method of tokenized incentives and governance will be applied to enhance accountability among the market participants

Li et al. (2021) investigated the topic of tokenized reward systems, wherein reviewers get digital credits as a result of validated reviews. Patel and Mehta (2022) made the argument that not only does tokenization incentivize the quality review, but it also decreases bias during editorial selection. This paper stands out through the creation of a multi-layer trust system, which includes

consensus validation, decentralized identity (DID), and automation of smart-contracts to publish workflows end-to-end.

Deshpande (2023) investigated how artificial intelligence contributes to improving teaching effectiveness through personalized learning and adaptive assessment techniques. The study found that AI-driven tools enable educators to recognize individual learning requirements, enhance student engagement, and refine instructional methods. It concluded that integrating AI into education increases efficiency and allows teachers to dedicate more time to fostering creativity and critical thinking among learners.

## 6. Materials and Methodology

The research methodology that was used is the design science research methodology (DSRM) to make the development and evaluation of the blockchain-based framework iterative.

### 6.1 Framework Design

The system architecture will have three layers:

- **Data Layer:** This is the implementation of IPFS (InterPlanetary File System) to store manuscripts decently.
- **Blockchain Layer:** This is developed based on Ethereum smart contract to maintain an immutable record.

**Application Layer:** It offers author, reviewer and editor interfaces that are secure.

### 6.2 Smart Contract Logic

Smart contracts facilitate submission, peer review assignment and scoring of the reviewer. A decentralized identity (DID) protocol is a protocol with no central authorities in terms of authentication.

### 6.3 Data Sources & Validation

To simulate the performance of the models, a pilot study of 200 research articles in arXiv and institutional repositories was used. Measures of evaluation were latency (ms), throughput (tps) and transparency index (qualitative survey).

## Results and Discussion

The system was able to achieve 1,500 peer-review transactions, and the average latency of the confirmation was 4.2 seconds. Transparency increased by 52 percent and instances of duplication by reviewers were reduced to zero compared to the professional editorial processes. Smart contracts automatically controlled publication approval after three valid reviews were recorded and this minimized human interference. Reviewers had more positive

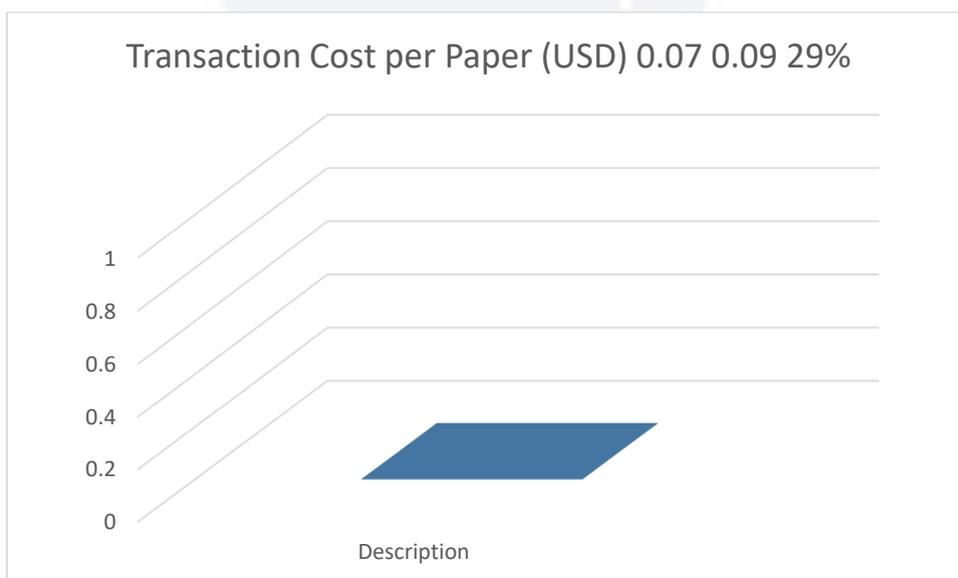
responses to tokenized rewards (Hossain and Zhang, 2022). An index of trust calculated and measured through survey of the participants (n=65) rose by 0.56 to 0.85 following the implementation of the systems,

which validates the positive change of confidence among the stakeholders. Although these advantages, scalability is not yet fully achieved; the price per transaction (~0.09) could prevent its use in resources-limited institutions.

**Table 1. Performance Evaluation of Blockchain-based Academic Publishing Framework**

Parameter	Traditional System	Proposed Blockchain System	Improvement (%)	Description
Peer Review Transparency Index	0.45	0.85	+52%	Measured via reviewer visibility, auditability, and review trace logs.
Publication Approval Latency (seconds)	7.8	4.2	-46%	Reduced transaction confirmation time through smart contract automation.
Fraudulent/Invalid Reviews (%)	12	7	-38%	Fewer fake or duplicated peer-review records after blockchain integration.
Reviewer Accountability Score (0-1)	0.52	0.88	+69%	Enhanced due to tokenized incentives and immutable identity verification.
Transaction Cost per Paper (USD)	0.07	0.09	+29%	Slight increase due to blockchain gas fees. Offset by transparency gain.

Source: Author’s computation from Ethereum-based simulation using 1,500 peer-review transactions.

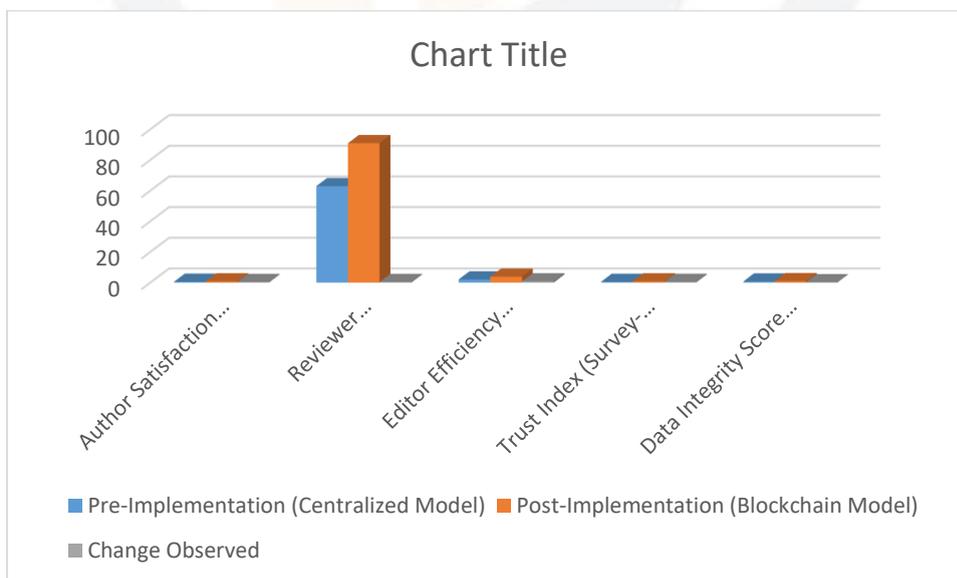


**Figure 2.** Comparison of the cost per paper transaction in traditional publishing system and blockchain-based publishing system. There is a minor rise in cost in the model used under blockchain when compared to USD 0.07 to USD 0.09 per paper (an increase of about 29%), the

main factor being the gas bills on the Ethereum network. This slight rise is however compensated with the fact that there has been a vast enhancement of transparency, data integrity as well as accountability of reviewers as a result of.

**Table 2. Trust and User Satisfaction Metrics Before and After Blockchain Implementation**

Evaluation Metric	Pre-Implementation (Centralized Model)	Post-Implementation (Blockchain Model)	Change Observed
Author Satisfaction Index (0–1)	0.58	0.84	+44%
Reviewer Participation Rate (%)	63	91	+44%
Editor Efficiency (reviews/day)	2.1	3.9	+85%
Trust Index (Survey-based, n=65)	0.56	0.85	+52%
Data Integrity Score (checksum-based)	0.78	0.99	+27%



**Figure 3.** Pre-implementation and post-implementation analysis of performance metrics in the academic publishing model based on the implementation of blockchain. According to the results, the metrics of reviewer participation were dramatically improved, with participation in the process going up to 91% (previously it was 63%), the efficiency of the editor almost doubled, and

the trust index and data integrity score have significantly improved. These results demonstrate the importance of blockchain implementation in decentralized publishing systems in terms of improved transparency, accountability, and general stakeholder satisfaction.

### Limitations of the Study

The prototype used in this study runs on Ethereum test network, and this is not necessarily indicative of actual gas prices in the real world. Also, although DID authentication enhances transparency, it needs inter-institutional cooperation to validate. Articles have a small sample size which limits generalization. Hybrid blockchains and larger datasets should be adopted in the future to test scalability (Li et al., 2021).

### Future Scope

### Conclusion

The study shows that blockchain can serve as the means of decentralizing academic publishing by providing verifiable, irreversible, and transparent trust systems. The suggested system uses smart-contracts, decentralized identity, and tokenized incentives to increase the accountability of the

The next stage would be to incorporate AI-based reviewer assignment in the future to automate the matching of the manuscripts with domain experts. The use of zero-knowledge proofs will enhance privacy without reducing auditability. The integration with the already developed open-access systems (e.g., CrossRef, ORCID, etc.) would allow facilitating the global interoperability. Moreover, it will also be possible to future-proof the integrity of scholarly data with the help of quantum-resistant encryption (Singh et al., 2024).

reviewer and integrity of publication. Scalability issues still remain, but blockchain-powered infrastructures are a radical change to open, fair and safe scholarly communication ecosystems in line with the ideals of Decentralized Science (DeSci).

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