

Crypto Journal: The Use Of Blockchain In Editorial And Publishing Platforms. JES Case Study

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Abstract: The author endeavors to provide a retrospective analysis of the experimental use of blockchain technology in editorial and publishing activities on the platform for electronic scientific journals JES. The author considers the most promising cases of the implementation of this technology that formulate the general concept – Crypto Journal. Further, based on the review of sources in the public domain and 3 years experiment on the implementation of blockchain into JES journals, we demonstrate the major pain points, define the promising directions for further researches and give a careful optimistic forecast on the use of DLT in scientific periodicals.

Keywords: scientific journal, DLT, editorial and publishing activity, cryptocurrency

For citation: Tarkhanov, Ivan. 2022. Crypto Journal: The Use Of Blockchain In Editorial And Publishing Platforms. JES Case Study. *Law & Digital Technologies* 2(1): 3–6.

INTRODUCTION

As early as 2008, Satoshi Nakamoto was the first to describe the technical implementation of the first cryptocurrency Bitcoin that was based on distributed ledger. Following that, blockchain technology (hereinafter DLT) started to grow rapidly (Nakamoto 2008). Ten years later, in their report «Hype Cycle for Emerging Technologies, 2018» Gartner ranked DLT as a promising technology that was placed between Peak of Inflated Expectations and Trough of Disillusionment (Miraz and Ali 2018; Kietzmann and Archer-Brown 2019). By 2021, in the latest report «Hype Cycle for Emerging Technologies, 2021» (Gartner 2021) blockchain no longer exists as an independent technology, but rather is represented by DLT derivative technologies such as NFT (Nonfungible Tokens) and DeFi (Decentralized Finance).

As with other economic sectors, technologies such as DLT, smart contracts and tokenization attracted the attention of the major world publishers of scientific periodicals (Kenneally 2019). However according to the information available in public domain, big players did not find DLT implementation beneficial for their businesses, so they shifted their focus in 2019 to another anchor technology – AI (Artificial intelligence) (Gold Finch 2019).

Quite another level of interest in DLT was demonstrated by start-ups that saw in it an opportunity to change the process of dissemination of scientific knowledge and market landscape in that sector of the economy (Knowles 2019).

In 2017–2020 many start-ups announced the start of promising projects on the DLT implementation in order to create fundamentally new publishing models. Those models were intended to make the process of creation and dissemination of scientific publications more transparent, reduce the role of publisher provide more opportunities for researchers, authors and scientific organizations to generate revenues, and almost completely replace the conventional model of scientific journal and editorial process (Niya et al. 2019; Mackey et al. 2019).

Due to their characteristics, DLT technologies can be implemented and used in editorial and publishing activities in the following aspects:

- Ensuring immutability and authenticity of publications.
- Introduction of new subscription models based on tokens and cryptocurrencies.
- Registration and control over copyrights.
- Increasing transparency of the submission and review process through smart contracts (DAO, decentralized autonomous organization).

Many researchers view these aspects as the most promising (Van Rossum 2018; Janowicz et al. 2018). However, is it possible to implement DLT without disrupting the existing well-established model of a scientific journal?

In cooperation with the editorial and publishing platform JES, Laboratory for Blockchain Research in Education and Science of the State Academic University for the Humanities has been developing and testing the above-listed aspects for the last four years. Throughout the following sections, the author will provide a brief review of

the results of practical experiments and plans for each of the above aspects. Together, the listed aspects will enable the formulation and testing of the new concept – Crypto journal.

1. ENSURING IMMUTABILITY AND AUTHENTICITY OF SCIENTIFIC PUBLICATION

By utilizing the main feature of data that is stored in DLT, namely the fact that data in public DLT networks cannot be changed, we may ensure the authenticity of published content (Tran et al. 2017; Solovyev and Tarkhanov 2018). Thus, the immutability of data can be achieved by storing the hash of scientific publication data in DLT and checking the previously recorded hash every time a URL is accessed from DLT. In contrast to digital signature, this check only requires the integration with the publishing site and with the public DLT that ensures immutability and transparency of data recorded in it (Lemieux 2016). Technical implementation of this approach is described by Tarkhanov, Fomin-Nilov and Fomin (2019).

As we developed the JES platform and worked with journals, we discovered that over 90% of mistakes and changes into the published materials are related to the review of the main text. Thus, in the journal it is forbidden to edit the title, the list of authors, the annotation and other data associated with the imprint. A journal administrator can amend the article on behalf of the user. However, the amendments will result in the generation of a new hash and its recording into the blockchain.

The main idea behind this approach was checking immutability in real time. In general, the check took 2–3 seconds, but as we used open Ethereum network as a DLT storage, its changes and resetting constantly caused problems with operational stability. Nevertheless, one of the advantages of this approach is the price. A check of 146 hashes in Ethereum cost 9.23 USD, compared to 29.2 USD for a service that offers similar functionality, Crossmark, during the 2019 experiment.

2. NEW SUBSCRIPTION MODELS BASED ON CRYPTOCURRENCIES

In our experiment, we tried to implement a new subscription model based on Ethereum smart contracts and SuCoin token. The main idea is that all funds raised in real money are allocated in the form of tokens to all participants with the exception of publisher's commission. Then, the more popular the token becomes, and the more publishers start to use it in their online journals, the higher the price of the token is, which motivates token owners to active and quality work in the specified digital ecosystem. Thus, there evolves a self-sustained “market” ecosystem (Narayanan et al. 2016) that is fueled by fiat money.

The details and an analysis of the results of a 2-year experiment is presented in “Crypto access: Is it possible to use cryptocurrencies in scholarly periodicals?” (Tarkhanov et al. 2021). The research shows that tokens' popularity did not spike after they were used in one journal. It is highly likely that this is due to a lack of promotion among authors engaged in journal publications and to the humanities background of the majority of researchers. Evidently, and our polls confirm it, the main obstacle was the difficulty of depositing and withdrawing tokens. Furthermore, users stated that there were not enough benefits to using SuCoin. Therefore, further steps in the development of the experiment should focus on providing more user-friendly options to use SuCoin. An example can be the transition from subscription model to open access with the option to pay an article processing charge (APC) or the ability to partner with other publishers for the development of co-use of crypto assets to create a unified journal ecosystem with the new economic model Crypto Access.

Until 2019, the experiment was only held in “Istoryia” journal. In mid-2019, we added the option to purchase subscription for SuCoin tokens to other journal on JES platform. Authors, editors and reviewers used this option in other journals only 3 times. However, after the law on the regulation of cryptocurrencies (Izvestia 2020) was adopted in Russia, this experiment had to be closed, and SuCoin was transformed into normal bonus points of the JES platform.

3. DIGITALIZATION OF RIGHTS IN EDITORIAL AND PUBLISHING ACTIVITY

Evidently, protection and control over copyrights in scientific periodicals is one of the most important topics. It is apparent that automatic registration of copyrights in DLT with the opportunity for easy real-time access to the creation process is crucial for researchers and scientific organizations. With the emergence of this technological option followed by legitimatization of this kind of digital rights, authors will gain more trust in publishers and

will tend to register their scientific breakthroughs in articles instead of using a considerably slower process of patent mechanisms.

Initially we planned to store information on publications' copyrights along with the data hash of the article itself similarly to section 1. However, at the implementation stage we faced difficulties with identification, search and control over necessary data. Information model required for the management of intellectual property only in the context of authorship of scientific publication is quite complex for the storage on Ethereum.

DLT projects focused on the management of copyrights are emerging worldwide (Wang et al. 2019) including in Russia (Savelyev 2018). There are plans to integrate JES journals with DLT features of IPCHAIN, a popular platform in Russia. Moreover, the integration should cover not only the storage of the fact that there is a license agreement between authors, editorial teams and a publisher, but it should also register author's rights at the first submission of the article and initial review. Additionally, it should control and monitor the history of changes – authors, types of rights (exclusive or non-exclusive distribution rights), and register facts of any violations, etc.

4. DECISION ON PUBLICATION (DAO)

According to the major models, DAO (Johnston 2014; Singh and Kim 2019) is a decentralized autonomous organization where all basic rules on publication decision taking are already defined in smart contract, and the system of human management is almost fully eliminated. Generally speaking, there is no hierarchy in DAO, no directors and top management; there are only tokens, i.e. shareholders' shares in this company, and rules of the smart contract rules.

DAO implementation in scientific periodicals is primarily concerned with the review and publication decision-making process which will undoubtedly make the process of decision making more transparent and will build trust toward the editorial team.

As we evaluated the opportunities to implement DAO in scientific journals, we chose not to use models that significantly change the conventional editorial cycle of a journal (Kosmarski and Gordiychuk 2020; DEIP 2021) but to implement one of the basic models in which every reviewer has the right to "vote" for the publication, just as editors do. As a result, it may be possible for a publication to be approved by the majority even if the chief editor rejects it. We plan to review possible decision-making models and implement the first version of DAO based on smart contracts of public Ethereum in 2022.

CONCLUSION

Despite the skepticism that was voiced by many researchers about DLT technology, DLT is now widely implemented in financial and gaming spheres. A systematic review of resources in the public domain dedicated to DLT development in 2021 clearly demonstrates a downward citation trend for this technology (Wang et al. 2021). This observation is backed up by the fact that the use of blockchain in scientific periodicals has been recognized as a mainstream trend at the biggest 2018 world expo Frankfurter Buchmesse. However, in 2019 and 2020 the focus was already on the use and perspectives of AI (Springer Nature Group 2019).

After more than 10 years of excitement around DLT, we can state that the areas where DLT has brought significant value are now limited. And these areas are far from editorial and publishing platforms for scientific periodicals.

The results of our laboratory's experiments described in sections 2.1 and 2.2 support this fact. However, the application potential demonstrated in sections 2.3 and 2.4 allows to positively assess the perspectives for the implementation of DLT and the development of Crypto journal concept. Laboratory for Blockchain Research in Education and Science of the State Academic University for the Humanities continues the review of prospective directions and will continue experiments in cooperation with JES platform. Our studies have the unique feature of being conducted in real scientific journals and editorial teams. Moreover, as it was mentioned above, we do not try to change the operational model of journals.

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