The blockchain-based scientific study

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The blockchain-based scientific study

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INTRODUCTION

The scientific study is outdated and dead at least as we know it. Pharmaceutical companies pollute clinical trials with money, creating a financial bias. Academics live under the rule of "publish or perish," creating a career bias. Journal editors want notoriety for publicity purposes, creating a publicity bias. In spite of established guidelines for the publication of clinical research, they are often not followed.[1]

Researcher bias creates bad science, and science as it is currently practiced does not do enough to eliminate this bias. Guidelines still allow raw research data to be withheld from the public, resulting in author bias being inexorably embedded into the research. Similarly, although disclosures of conflicts of interest are becoming more common, they do not eliminate bias, they only recognize an existing bias.[2]

The blockchain is a distributed database secured by the community. It can be thought of as a ledger, with a single transaction per line. As these lines of transactions add up, they are grouped into an encrypted block. Each block is then connected to the previous block, back to the first block in the chain. This blockchain technology was pioneered by Nakamoto, the creator of Bitcoin.[3]

The blockchain is revolutionary in that it produces data integrity through a public network of nodes not dependent on individuals. These nodes all include copies of the blockchain. If one copy is surreptitiously altered, it is quickly identified and promptly rejected. Thus, the blockchain contains immutable data that is highly trusted.

Instead of trusting a company, individual, or a government, the blockchain widely distributes blocks throughout an open, global community anyone can join. This low trust on the individual creates high trust through the larger community. Everyone verifies the integrity of everyone else's copy of the blockchain.

REDUCING BIAS

Not unlike the echo chamber effect observed in social media,[4] journal editors become biased through repeated exposure to the same researchers over and over again. Discussions at medical meetings gravitate toward a few thought leaders, making their biases everyone's bias. Academics dominate conversations, with relatively little input from practicing clinicians. This low diversity of thought creates a group think bias. The blockchain reduces this by making raw research data immutable and publicly available. Anyone can reanalyze the data, providing a second opinion. A time-stamped record verifies authorship and reduces bias.[5]

It is essential that the blockchain utilized to record the data is trusted. At present, the Bitcoin blockchain is the largest, most trusted, and most immutable chain. To make scientific research data time stamped and immutable, it is possible to utilize a side chain of the Bitcoin network.[6,7] Another high-trust possibility is the development of decentralized applications (dapps) utilizing Ethereum.[8]

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THE BLOCKCHAIN-BASED SCIENTIFIC STUDY

Recording medical research on the blockchain will lead to rapid advances in medical knowledge by creating an immutable record and by making the analysis of research data less dependent on a few individuals.

The blockchain-based scientific study involves five key steps:

1. The hypothesis is first published on the blockchain
2. The research methods are then published on the blockchain, including details on how each item in the database was collected and coded, and from what study population it came from
3. Only after the above are published is the data collected
4. The results, including the raw data, are then published on the blockchain
5. Finally, study conclusions are published on the blockchain.

Scientific rigor requires that there is full public access to the hypothesis, methods, results (including raw data), and conclusions.

BARRIERS TO IMPLEMENTATION

Although the benefits of a distributed blockchain to create immutable proof-of-existence and wide availability of research data, multiple barriers exist including technological, financial, and cultural barriers.

Blockchain technology remains a new field of cryptography and distributed ledgers. The original white paper on the technology was introduced back in 2008 by Nakamoto[9] and has been widely adopted in the form of digital money, Bitcoin. Yet, in spite of Bitcoin's global adoption, applications to fields outside of cryptocurrency have been limited. The Ethereum blockchain is perhaps the most advanced platform for the development of dapps. Many applications built on the Ethereum platform aim to create decentralized versions of existing apps such as Facebook or Google Docs, while others aim to create smart contracts that create public, immutable records of legal transactions such as land purchases.[10] The technological challenge facing implementation of a scientific research database is significant. Software engineers would be working in mostly uncharted territory although they would be able to draw from a growing foundation of related blockchain projects, many of which run on open source software.

Financial challenges in setting up a research blockchain database would be significant, likely running in the millions of US dollars. Many blockchain companies have been able to overcome this challenge by creating initial coin offerings (ICOs), which are a type of crowdfunding.[11] For an ICO to be successful, the company needs to show investors they have a solid group of developers. In the still young world of blockchain technology, finding such individuals who are not already involved in a startup can be challenging. The potential financial rewards, however, may balance the risks and hard work required for such a scientific research blockchain implementation.

Finally, the development of a new scientific research dapp requires a company culture that is open to innovation and new types of collaboration. Companies or groups interested in developing a new blockchain application must be flexible and have a willingness to change their business model to allow working with startups, partners, and competitors. Letting go of centralized power and shifting to a decentralized network will require a paradigm shift for many companies.

CONCLUSION

The scientific method of research has greatly advanced human society, yet it suffers from excessive human bias and conflicts of interest. Blockchain technology has the potential to be at the forefront of a second scientific revolution by creating publicly available, immutable data that anyone can read, evaluate, and reanalyze.

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Conflicts of interest

There are no conflicts of interest.

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