The seven capital sins in the governance of blockchain ecosystems

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Abstract

In recent years, blockchain has gained traction as a technology to increase the security and transparency of firms' transactions. There is a widespread misconception that blockchains, once rolled out, are fully decentralized and transparent in terms of governance. The practice of many blockchain initiatives tells a different story: the development of a robust and reliable governance structure for a blockchain ecosystem requires balancing the power, accountability, and incentives of each blockchain member. This is a highly complex balancing act. It is important that CEOs, COOs and other top managers become deeply aware of the complexity of setting up and governing an (envisioned or existing) blockchain, to increase its success chances. In this article, we discuss what we consider are the seven capital sins of the governance of an enterprise blockchain that can hinder the successful implementation of this technology. These insights are based on three years of research in which we studied a large number of blockchain ecosystems.

In recent years, blockchain has gained traction as a technology to increase the security and transparency of firms' transactions. From energy generation to supply chain traceability, or even environmental management, many large firms across sectors have invested millions of dollars in the creation of blockchain ecosystems. However, when brought into practice, the reality is that most blockchain ecosystems have not been successful. One of the most recent cases is TradeLens, the blockchain endorsed by IBM and Maersk, discontinued in early 2023.

Governing a blockchain ecosystem requires a careful balance between the sticks and carrots offered to its members, in the form of access and decision rights, accountability, rewards and conflict resolution mechanisms [1]–[3]. These aspects need to be taken into account both in the blockchain code [4], as well as in the non-coded, social structures built around the ecosystem [5]. However, conflicting interests among a wide variety of ecosystem members may lead to governance crises, and ultimately to the disintegration of the blockchain, before it reaches maturity and long-term financial sustainability.

In this article, we discuss which behaviors of blockchain governance boards hinder the successful implementation of the technology. We synthesize these behaviors into what we consider are the *seven capital sins* of enterprise blockchain governance. These insights are based on three years of empirical research in which we studied a large number of blockchain ecosystems, and during which we conducted including twenty-seven interviews with blockchain board and advisory members, and more than 350 hours of direct participant observations.

Pride: A single-leadership model

Blockchain ecosystems consist of an heterogeneous pool of participants, where no single participant has full or sole ownership. This inherent decentralization, and the reduced need for business intermediators, is what makes blockchain attractive to a large portion of the business community [6], [7]. This decentralization clashes head-on with the traditional operating model used by larger enterprises, where they hold a position of larger power and control. To achieve effective collaboration within the blockchain ecosystem, there must be a genuine willingness to embrace a collaborative ecosystem's model, especially when scaling up. Otherwise, blockchain participants may lose trust in the network. To increase the chances of success, blockchain managers may want to embrace an adaptive leadership model which can change according to the needs of a growing ecosystem at any point in time, and which allows for continuous evaluation of its effectiveness. In the case of Tradelens, Maersk and IBM soon realized they had to step back if they wanted to involve other industry players [8].

Greed: reluctance to decentralize the decision power as the blockchain matures

As blockchain ecosystems grow and gain members, they are expected to deploy governance mechanisms which transfer some of the decision power of founding members to newer members. Many blockchains have defined this in their objectives, and a few have put this into practice. This happens because existing members might not be willing to accept any changes to the governance structure which lower their power or rewards. As a result, blockchains may reach a point where newer members do not have enough incentives to remain in the ecosystem, and may leave and even create their own blockchain or fork. To avoid reaching this situation, blockchains should anticipate the incorporation of new members to their corporate boards. In addition, blockchains may use

consensus mechanisms such as Proof of Stake, where the power of a user in the network depends on how many tokens they hold, and for how long, rewarding long-term membership.

Sloth: Absence of a public rulebook

The absence of clear rules and regulations for the governance of a blockchain network is a common sin that can lead to a lack of structure, inefficiency, and slow implementation of changes. Even in cases where white papers are made publicly available, their governance chapters are testimonial or inexistent. This may happen, for instance, when the founding team has a pure technical background, and gives priority to the coded aspects of the blockchain. However, without clear governance structures established from the very beginning, future participants need to perform a leap of faith to embrace the ideas of the blockchain envisioned by the founding members, without any guarantee that their interests will be protected. In addition, a lack of a governance protocol may lead to an ossification of the solution which hinders networks' growth. To prevent this, it is imperative to agree on the rules, and 'the rules to change the rules' even before there is a working prototype of the blockchain. An illustrative example is the pluggable model developed by the Corda Network, which allows to customize the governance mechanism for each of the business networks they support, based on their requirements in terms of privacy, scalability, regulation, and performance.

Gluttony: The nothing-at-stake approach

In some blockchains participants in the network infrastructure do not have anything staked. This means that some participants, such as validators or miners, have proportionally more power than others, without necessarily having a larger number of tokens or in the absence of another mechanism rewarding active participation. The absence of reward mechanisms creates a situation where participants lack the incentive to contribute to the consensus mechanism, which is critical for the network's security and stability. Validators may not have any direct incentive to act in the network's best interest. As a result, the engagement of blockchain actors in voting processes is typically low, due to lack of personal interest or opacity of the voting process [9]. To avoid this, blockchains need to provide incentives for ecosystem members to become validators. For instance, we have observed that corporate blockchains have moved away from Proof of Work consensus mechanisms, and adopted Proof of Stake, but sometimes that is not enough. One possible solution is implementing a reward and penalty mechanism similar to most Proof-of-Stake blockchains, such as Polkadot [10], where validators receive rewards for attesting and proposing blocks to the blockchain as a percentage of their stake. Such mechanisms encourage good behaviors, promote active participation, enhance security, and maintain transparency in their blockchain ecosystems.

Envy: absence of penalty/reward structures for contributors

The lack of an incentive structure to encourage participation is often connected to a lack of coercive mechanisms to discourage malicious behavior from opportunistic members who act against the network's best interest. This is a grave danger for the security and performance of the blockchain. To remedy this, it is essential to establish transparent liability and obligation structures within the ecosystem while still maintaining its collaborative nature. A measure which can be taken to discourage dishonest validations and inactivity is to introduce *slashing* [11] mechanisms. Slashing is a punitive method which consists of taking away a portion of validators' pool of tokens when they misbehave. Additionally, repeated offenders could see their validator rights be removed, or even be expelled from the blockchain.

Lust: Forgetting about blockchain's interdependencies

From a technical perspective, blockchains are built on top of three distinct, yet interconnected, layers: the protocol, network, and application layers [12]. The *protocol* layer contains the blocks and the consensus algorithms of the blockchain. The *network* layer consists of several computers which allow the protocol to run, and ensure the consistency of the blocks, in charge of maintaining the security of the system [13]. The *application* layer is the interface with the end-user, where the transactions take place according to the logic established in the smart contracts [14]. Remarkably, each layer requires the development of different software, hardware, as well as a different group of stakeholders. We have observed that there is a tendency of actors in blockchain ecosystems to interact only with other actors within the same layer, forgetting the interaction with the other two layers. As a result, blockchain managers have limited visibility, and the network suffers limitations in terms of scalability and performance.

Wrath: Volatile transaction tokens

One of the most common financial reward mechanisms in blockchains is the supply of tokens to members of the network. In many cases, the total number of tokens is fixed, so that, as the ecosystem grows, the demand for the token will increase, which will drive prices up. This inflationary process generates value for both founding members and application developers. However, to attract new enterprises to deploy their products on the blockchain, it is vital that a transaction on the network has a stable, predictable cost profile. In an ideal world, the higher the transaction volumes, the more stable transaction costs should be, but that is rarely the case. In practice, many tokens suffer from large volatility. For instance, Ethereum (ETH) transaction fees went from approximately 0.05USD in early 2017, to 15-20USD at the end of 2020, and in 2023 sit around 2-3USD. This volatility affects all applications which are based ETH. A potential solution to reduce volatility is the adoption of a dual token system, such as the one adopted by Vechain. In Vechain, VET is the 'business coin' while VTHO is the operational coin which carries the transaction fee. The number of VET tokens is maximized in the design, but the number of VTHO tokens needed and created per transaction can vary and. VTHO is generated linearly when the VET blocks are held by users for a certain amount of time. This mechanism incentivizes users to hold tokens long enough so they can make transactions at no extra cost.

Recommendations for blockchain managers

In this piece we have described several common challenges which hinder the growth and integrity of blockchain ecosystems. Contrary to popular belief, blockchain technology is not a trustless technology, but rather a confidence machine that increases trust in the operations and functions of the ecosystem. It is crucial to understand that the success of the ecosystem depends on a governance structure that promotes trust among parties. The success of blockchain ecosystems is largely dependent on network effects, but a blockchain incapable of creating such governance structure will be unable to attract and retain new users, and therefore will not generate value. Founding members need to understand that attitudes focused on short-term gains are incompatible with the long-term development of a healthy ecosystem.

References

[1] M. Zachariadis, G. Hileman, and S. V. Scott, "Governance and control in distributed ledgers: Understanding the challenges facing blockchain technology in financial services," *Information and Organization*, vol. 29, no. 2, pp. 105–117, 2019, doi: 10.1016/j.infoandorg.2019.03.001.

[2] P. Hacker, "Corporate Governance for Complex Cryptocurrencies? A Framework for Stability and Decision Making in Blockchain-Based Organizations," *SSRN Electronic Journal*, 2018, doi: 10.2139/ssrn.2998830.

[3] M. Hütten, "The soft spot of hard code: blockchain technology, network governance and pitfalls of technological utopianism," *Global Networks*, vol. 19, no. 3, pp. 329–348, Jul. 2019, doi: 10.1111/glob.12217.

[4] S. Ølnes, J. Ubacht, and M. Janssen, "Blockchain in government: Benefits and implications of distributed ledger technology for information sharing," *Government Information Quarterly*, vol. 34, no. 3, pp. 355–364, 2017, doi: 10.1016/j.giq.2017.09.007.

[5] R. van Pelt, S. Jansen, D. Baars, and S. Overbeek, "Defining Blockchain Governance: A Framework for Analysis and Comparison," *Information Systems Management*, 2020, doi: 10.1080/10580530.2020.1720046.

[6] C. Antal, T. Cioara, I. Anghel, M. Antal, and I. Salomie, "Distributed Ledger Technology Review and Decentralized Applications Development Guidelines," *Future Internet*, vol. 13, no. 3, Art. no. 3, Mar. 2021, doi: 10.3390/fi13030062.

[7] S. Makridakis and K. Christodoulou, "Blockchain: Current Challenges and Future Prospects/Applications," *Future Internet*, vol. 11, no. 12, Art. no. 12, Dec. 2019, doi: 10.3390/fi11120258.

[8] M. Jovanovic, N. Kostić, I. M. Sebastian, and T. Sedej, "Managing a blockchain-based platform ecosystem for industry-wide adoption: The case of TradeLens," *Technological Forecasting and Social Change*, vol. 184, p. 121981, Nov. 2022, doi: 10.1016/j.techfore.2022.121981.

[9] V. Buterin, "Notes on Blockchain Governance," *Vitalik Buterin's website*, 2017.

[10] H. Abbas, M. Caprolu, and R. Di Pietro, "Analysis of Polkadot: Architecture, Internals, and Contradictions," in *2022 IEEE International Conference on Blockchain (Blockchain)*, Aug. 2022, pp. 61–70. doi: 10.1109/Blockchain55522.2022.00019.

[11] Z. He and J. Li, "Contract Enforcement and Decentralized Consensus: The Case of Slashing." Rochester, NY, Feb. 16, 2022. Accessed: Apr. 05, 2023. [Online]. Available: https://papers.ssrn.com/abstract=4036000

[12] X. Chen, S. Tian, K. Nguyen, and H. Sekiya, "Decentralizing Private Blockchain-IoT Network with OLSR," *Future Internet*, vol. 13, no. 7, Art. no. 7, Jul. 2021, doi: 10.3390/fi13070168.

[13] L. Shekhtman and E. Waisbard, "EngraveChain: A Blockchain-Based Tamper-Proof Distributed Log System," *Future Internet*, vol. 13, no. 6, Art. no. 6, Jun. 2021, doi: 10.3390/fi13060143.

[14] N. Kapsoulis *et al.*, "Consortium Blockchain Smart Contracts for Musical Rights Governance in a Collective Management Organizations (CMOs) Use Case," *Future Internet*, vol. 12, no. 8, Art. no. 8, Aug. 2020, doi: 10.3390/fi12080134.