
Exploiting Corporate Governance to Evaluate Blockchain Applications: A Comprehensive Framework

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Abstract:

Purpose: *This paper proposes a comprehensive framework to assess real-world blockchain applications' potential outcomes using three corporate governance literature.*

Design/Methodology/Approach: *Reviewing the most recent papers on the subject, the author draws upon existing and new case studies to outline overlapping areas between blockchain features and Corporate Governance (CG).*

Findings: *Any blockchain type/relation has potentials and drawbacks. Recognizing and effectively addressing the relationship between the company and blockchain may prove useful in the management of a business. Failing at managing the blockchain integration can, on the other hand, be detrimental for the company. The present analysis supports the view that although the blockchain revolution aims to reduce the intermediaries, the blockchain oracles' limits will still grant a predominant role to human interaction.*

Practical Implications: *More than contributing to the blockchain and corporate governance literature, this paper is focused on providing managers with an accessible overview of the outcomes of blockchain integration. If facing difficulties, the framework provided could help understand the motives behind the struggle and help find a way to overcome them.*

Originality/Value: *To the best of the author's knowledge, no other paper attempted to study the overlapping areas between blockchain and the three corporate governance literature. Given the scarcity of blockchain papers relying on corporate governance, this study will provide an additional resource to draw upon.*

Keywords: *Blockchain, oracles, Corporate Governance, agency theory, stewardship theory, voluntary disclosure.*

JEL codes: *M14, M15, M31.*

Paper Type: *Research study.*

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1. Introduction

“When the water recedes, you can tell who on the beach was not wearing a swimsuit!” (Antonopoulos, 2018a). Every time a significant discovery is made, like after the invention of the internet, the enthusiasm and imagination broadly overtake reality (Gates, 2017). Blockchain is not intended to solve all the world's problems, but according to recent studies, it will have a disruptive impact on everything that will come in touch (Nofer *et al.*, 2017). Scholars and researchers proposed blockchain integration among sectors such as finance, food, fashion, energy, and intellectual property (Saber *et al.*, 2019; Hu *et al.*, 2019; Sung 2019). Despite the initial hype, however, further investigation over blockchain smart contracts shown that although useful and practical, the low interoperability and the heterogeneity of national law would constitute a threat to mass adoption (Frankenreiter, 2019). As Tsankov (2018) explains, the main limitations for successful integration are social rather than technical.

Furthermore, only a few authors contributed to analyzing the impact of blockchain applications on corporate governance. Existent literature seems to suggest that blockchain modifies the institutional environment in which firms operate. It acts as a trusted intermediary (Advisors, Financial institutions, Administrations), changing the habits of the firm to which it comes in contact. The blockchain characteristic to limit or impede “data manipulation” is seen to improve service quality (Zyskind *et al.*, 2015; Pilkigton 2016; Swan 2015), enhancing shareholders’ trust. However, since limitations regarding the oracles, or networks, are neglected in the literature, results are often overly optimistic (Egberts, 2017). To discuss the potential of blockchain integration, this study makes parallelism between blockchain features and three major CG, literature streams. Unlike common opinion, since data disclosure is not mandatory, voluntary disclosure is the first literature to be connected with blockchain features.

Due to oracles, the level of disclosure is indeed decided by the company (Kumar *et al.*, 2019). The stewardship theory is then considered (Donaldson and Davis 1991; Clarke 1998) since having a determinant share in a blockchain network makes it more rewarding to work for the community than to follow personal agenda. Lastly, the agency theory (Coase, 1937; Jensen and Meckling 1976; Fama and Jensen 1983) is linked since when operating on blockchains, with scarce or no control over it, any decision taken by the community may affect the blockchain application. Although non-exhaustive, some practical examples are presented to outline better the linkage between the blockchain features with the selected CG literature. Building on the presented parallelism, the framework created should support the managers in the blockchain integration process. The present study also wishes to answer two research questions.

- 1) To what extent can blockchain substitute human interaction in corporate governance?

2) What are the possible outcomes of blockchain integration?

This study supports the view that the idea of substituting humans with blockchains is somewhat unrealistic, and wise governance management determines the outcomes of blockchain integration. Although revised and brainstormed with colleagues, this study is limited by the personal author's background and data scarcity.

On the other hand, the importance of this study is given by the lack of critical studies on blockchain applications concerning corporate governance. The paper is divided into five sections, of which this introduction is the first. Section two gives a critical overlook at the blockchains, while the third discusses parallelism between CG and blockchain features. Section four discusses the results, presenting a framework for the managers. Section five concludes the paper, providing hints for further researches.

2. Blockchain Strengths and Constraints

The first to refer to the "chain of blocks" appears to be Nakamoto (2008). Motivated by distrust in the financial establishment, Nakamoto exploited this idea for a cryptocurrency (Bitcoin) managed by no central authority (Yermack, 2017). Cryptocurrencies are not new concepts. People have actually been working on the topic since 80', although with poor results (Arslanian, 2019). Nakamoto's innovation was that he thought about blockchain as a public distributed ledger updated thanks to a consensus mechanism to prevent double-spending. Following the idea of Professor Kai-Lung Hui, from Hong Kong University, the distributed ledger origin can be traced back to the Roman Empire. It is a system in which every node has a complete copy of the ledger (Yun, 2018). The consensus mechanism instead is a multilateral agreement that substitutes the central authority decisional power (Grover *et al.*, 2018). Decision taken through consensus regards the addition of new blocks.

There are many consensus mechanisms, but the most known are Proof of Work (PoW) and Proof of Stake (PoS). In the PoW, all the nodes wishing to contribute to the network (miners) compete against each other's to solve a cryptographic puzzle using their hardware computing power. Miners that solve the cryptographic puzzle receive cryptos as an incentive to contribute to the network (Wang *et al.*, 2018). Misconception about this consensus type tells that it is not environmentally friendly. Computational power, however, is an infinite resource; the problem lies in its generation, which consumes energy and creates unwanted heat.

However, clean energy production and hardware cooling are social problems and are not directly connected with blockchains. The advantage of using this method is that the network is more secure and unlikely to be altered. The reason is that the cost of a hacking attempt would be higher than any hacking return (Antonopoulos, 2018a). The disadvantage of this consensus type regards flexibility, speed, and scalability, which are low due to the time needed to add new blocks (e.g., around 10 minutes for

bitcoin). PoS consensus type instead grants to the owner of a considerable stake (of crypto) the right to decide which block will be added to the chain (Tasca and Tessone 2019). As they don't make any effort to mine new blocks, they are called witnesses. Witnesses are generally chosen upon voting by other blockchain users, and when acting fraudulently, they lose part of their stake (Nguyen *et al.*, 2020).

Despite common knowledge, PoS is not an improvement of PoW as it was created before (Antonopoulos 2019). Although PoS enables faster and cheaper transactions, networks based on this consensus type are less secure, and immutability is not guaranteed. Differently from mining pools, where even if miners gain the power of changing the network, they would, in any case, pay a high fee to alter the system, staking pools only need the right amount of stake to modify the ledger. Apart from consensus type, blockchains vary also according to their access type: public, private, and hybrid (He *et al.*, 2016; Buterin, 2015). Public blockchains are open, borderless, censorship-resistant but may be slow and less scalable (Swan 2015). Private blockchains are less decentralized and secure, but they are more versatile, flexible, and scalable. An ulterior distinction sees some applications being called as real-world blockchains (Sharma, 2019).

According to the author, real-world blockchains are not created with the scope of trading cryptocurrencies but to interact with real-world assets. Examples are voting systems, real-estate applications (Song, 2018), supply chain integrations (Caldarelli *et al.*, 2020), health records (Ekblaw *et al.*, 2016), media sharing, and so on. Real-world blockchains follow different rules from the one developed by Nakamoto and have significant constraints that need to be considered when hypothesizing integrations. The main limitation faced by these applications is that real-world blockchains are dependent on oracles (Antonopoulos and Woods 2018). Oracles are the interfaces between the blockchain and the real world (Damjan, 2018). Regardless of the blockchain type, the oracle constitutes the bottleneck of the network.

Wherever the blockchain operates on a public network or not, oracles' reliability is what it matters to determine if the information provided is trustworthy (Apla, 2018). In the crypto world, the blockchain type is what makes the difference between a reliable and immutable ledger or not, but for real-world blockchains, blockchain type is practically irrelevant. For example, when evaluating the reliability of crypto, public blockchains with consensus mechanisms based on proof-of-work ensure higher stability, reliability, and the ledger's immutability. On the other hand, evaluating real-world blockchains, those characteristics are not favorable, because if lies are fed to the blockchain through tampered oracles, the network will be fed of immutable lies: “*garbage-in/garbage-out*” (Arner, 2019). The issue mentioned above is known as the “oracle problem,” of which some authors explain its dual outcome (Damjan, 2018). Song (2018), in a known article, explains that even if data is correctly transferred from the real-world to the blockchain, there is no guarantee that the physical world is influenced by smart contracts executed on the ledger. For example, if an apartment is sold with a smart contract, nothing prevents the former

owner from occupying the apartment, impeding the buyer to take possession of his good. A realistic evaluation of blockchain applications should take into consideration all these aspects and limitations. The next sections outline the parallelism of these blockchain features and limitations with major corporate governance literature streams.

3. CG and Blockchains

3.1 Voluntary Disclosure on Blockchain

Despite common opinion, disclosure of data on the blockchain is not mandatory. With few exceptions, the process is based on a voluntary choice. A significant number of studies examine the economic consequences of voluntary disclosure. Increased liquidity and reduction of the cost of capital are sought to be the main outcomes (Francis *et al.*, 2007). Diamond and Verrecchia (1991) and Kim and Verrecchia (1994), stated that voluntary disclosure reduced information asymmetries among insider and outsider investors. Those conjectures have been confirmed by many other authors and researches (Healy *et al.*, 1999; Gelb and Zarowin, 2000).

First, they show that firms with a high level of disclosure experience a surge in stock price, unrelated to earning performance. Second, firms with higher disclosure have increasing stock prices compared to others with lower disclosure levels. A significant stream of literature (Daske, 2006; Hung and Subramanyam, 2007; Daske *et al.*, 2008) linked the voluntary adoption of IFRS with voluntary disclosure literature (Welker, 1995; Leuz and Varrecchia, 2000), theorizing that the disclosure level, determined by the adoption of IFRS could generate an increase in stock liquidity. This view is also supported by other researches (Botosan, 1997; Piotroski, 1999; Botosan and Plumlee, 2000), who shows that there is a negative relation between the cost of capital and voluntary disclosure (Healy *et al.*, 2001).

Drawing upon the discussion mentioned above, it could be debatable that the voluntary adoption of blockchain, with its higher level of disclosure, may also determine a liquidity effect. The most discussed blockchain application involving firm disclosure is Real-Time accounting. To the best of the author's knowledge, Lazanis (2015) was the first to hypothesize that if firms used cryptocurrencies, they could voluntarily decide to post all the ordinary business transactions on a public blockchain. The opportunity could also be exploited using regular currency if done on a permissioned blockchain. The firms' usual accounting data could be recorded permanently with a timestamp that prevents data from being altered ex-post. The company ledger as a whole could be immediately accessible (but not modifiable) and visible to all the stakeholders. There should not be the need for the company to present any sort of income statement or balance sheet, since being all the data available in a digitalized form, the software should at any time produce an income statement according to the stakeholder's needs. Subsequent papers also investigating real-time auditing (Schmitz and Leoni, 2019; Rozario and Vasarhelyi, 2018)

enlighten at least two significant advantages. It will increase trust for shareholders since all the data is publicly available at any time and secondly and will decrease auditing' costs since "in principle," cheating on the blockchain should be less likely to happen.

Basically, instead of relying on auditors, which in the past have been subject to moral hazard and agency problem (Cunningham, 2006; Ronen 2010), stakeholders could make their depreciation or revaluation of assets, observing raw accounting data made publicly accessible on the blockchain. Real-time accounting could also prevent firms from engaging in accounting manipulation or real earning management through value-destroying practices. Ideally, as an irreversible timestamp transaction watermark, it should be impossible for managers to backdate sales contracts or manipulate amortizations. Yermack (2017) hypothesize a potential saving in costs of over \$50 billion per year only in the US.

Nofer *et al.* (2017), building on the same approach, states that the implementation of Real-Time accounting would determine a decline in the advisor industry and a depreciation of the accountant role, which will be substituted by AI and smart contracts. However, the hype around the technology shed few lights on its real potential and limitations. Unlike what is hypothesized by Lazanis (2015), Real-Time accounting does not force the company to provide any sort of data requiring a higher level of disclosure. Due to oracles, disclosure on the blockchain is voluntary for real-world applications. Regardless of the chosen network, oracles' use guarantees the discretion of data uploaded on the blockchain. When disclosure is imperfect as for blockchain use, investors consider highly risky and improbable the future payoffs of their investment (Barry and Brown, 1984).

Real-time accounting's unrealistic hypothesis also faces the limitations of using a public blockchain where smart contracts are slow and costly. In that case, the saving in price hypothesized by Yermack (2017) and Nofer *et al.* (2017) is then completely eroded by the high registration costs that in a congestion time might reach several dollars per single contract or be delayed by hours (e.g., Ethereum). Although open and borderless, data uploaded on a public blockchain is carefully selected by the accountant, who operates on the blockchain through oracles. The disclosure level remains then voluntary, and the time of disclosure is unlikely to be immediate (Schmitz and Leoni, 2019).

3.2 Blockchain Stewards

As operating on blockchain implies, being a shareholder of the network, owning a significant share, should encourage operators to act as stewards. A consistent area of corporate governance literature is dominated by Stewardship theory. This approach sees the directors and senior executives as stewards of companies and assets, firmly cooperating with the board and mentoring the top management (Donaldson and Davis 1991; Clarke 1998). According to Davis, Schoorman, and Donaldson's (1997)

model, managers chose to be stewards or agents based on their psychological motivation and perception of the situation. Executives also want to be stewards or agents according to their understanding and trust over the manager. If one or both perceive a selfish ‘motive’ in the opposing party, they will act as an agent leading to a suboptimal outcome. Otherwise, they will serve as a steward gaining the maximum reward. In a less equilibrium view, it can be argued that when managers’ personal needs are based on growth, success, and self-realization, they may obtain a more excellent utility by managing the company successfully than prioritizing their agenda.

Stewardship behavior is widely recognized as being one of the best ways to manage companies. Many industries and companies have promulgated the so-called Stewardship codes (FRC, 2020) to create more responsible and dedicated investor engagement. Stewardship codes are not homogeneous, but they mainly require shareholders to:

- Describe how to discharge their institutional responsibilities;
- Possess a robust mean for managing potential conflict of interests;
- Keep monitoring the companies where they invest;
- Cooperate with other investors where possible;
- Participate in voting activities;
- Provide reports of their voting and stewards activity.

The role of stewards in the blockchain environment can be better outlined by considering the examples of blockchain platforms. In our technology-driven economy, many of the largest and most successful businesses now operate as Platforms (Parker and Van Alsyne, 2018). Platforms are businesses that facilitate interactions between creators and value appropriators, meanwhile creating wealth for the platform owner. Intuitively, platforms create wealth exploiting their role as intermediaries (Hagiu and Wright 2005; Evans *et al.*, 2006). Platforms do not just utilize technology to enable interaction between actors; they promote an active collaboration for a win to win strategy between users and providers (Kiron and Unruh, 2018). The platform business model's popularity has recently grown with the development of inter-connective technologies (Clouds) and the global diffusion of PCs and smartphones. The created environment encourages users and creators to produce more content, eventually attracting more creators and consumers (Network effect).

There are four kinds of recognized platforms: Social platforms (Facebook, Instagram), Exchange Platforms (Amazon, Alibaba), Content platforms (Netflix, YouTube), and Software platforms (iOS, Android). Unlike a centralized platform (Amazon, Uber) where a central firm has control of the network, decentralized platforms are based on peer-to-peer interaction. The founder firm of a blockchain platform (e.g., Openbazaar) does not control the data and users linking processes. In decentralized platforms, users get “tokens” (Cryptocurrencies) for being trusted

utilizers, that can be spent on the web (Evans and Schmalensee, 2016). In a platform, communication and cooperation among users are enhanced and welcomed. Users are also shareholders and value creators. Differently from regular firms in which shareholders are usually not interested in governance, in platforms, shareholders actively cooperate for the productive running of the business. Users with higher shares/power have the potential to act as leaders and drive innovation in the platforms. Steem platform is an example of a Blockchain platform where stewardship is incentivized. Users contribute to the network uploading original content for which they receive payouts based on other user approval and traffic generated (Scott and Larimer, 2017). Rather than making a partnership with the Steem company, as it happens for Youtube and Facebook, every user receives a payout based on their share and contribution to the network.

Users should also participate in the voting activity to avoid witnesses' concentration or delegate their power to other trusted investors and cooperate with them to help the platform grow. Finally, they are encouraged to monitor the platform and its governance as the shares price is highly volatile and dependent on platform performance (Danji, 2018). In the steem/hive, hard fork, for example, a fraction of the community unhappy for the governance choices, created a parallel network which, in a few days, tripled the price of the forked token² (Parker, 2020). Users on blockchain platforms are then called to follow a non-written stewardship code, that as the steem/hive example shows, prove to be more rewarding than a selfish agent position. However, there are applications and blockchains where a steward position is unlikely to be undertaken by users, as power is retained in few mining/staking pools. In those cases, blockchain bedecks an agent's role, with all the consequences of an agency relationship.

3.3 Blockchain as an Agent

This study explains that when companies hold no control over blockchain networks and no dominant position in the referring community, the relationship between firm and blockchain can be described as an agency type. Extensively described by Coase (1937), Fama and Jensen (1983), the agency theory is the base of the firm's contractual dimension. The underlying concept is the separation of ownership of a firm from the power to make decisions. When managers and shareholders sign contracts, for example, as they cannot foresee all future conditions, broad discretion is left to managers (Grossman and Hart, 1986; Hart and Moore, 1990). For public companies with the property being highly distributed and volatile, owners are not even interested in decision management, as they mainly care about the value of their share. On the other hand, share value is seen more connected with market dynamics than managers' behavior (Shleifer and Vishny 1997). An extensive literature also

² This condition is very unlikely to happen as normally forked tokens are less valuable than the original one. See the BTC BCH prices charts for further details <https://www.tradingview.com/symbols/BCHBTC/>

explains how managers use their power to undertake projects and investments for self-benefits rather than investor's (Baumol 1959; Marris 1964; Jensen 1986). In any case, as argued by Shleifer and Vishny (1997), managerial ability to manage a firm is always lower when the manager relies on external funds than using his own.

Another literature stream supports the view that incentives can induce managers to act in investors' interests; however, a credible threat mechanism may also be sufficient to encourage managers to act in compliance with shareholders (Berle and Means, 1932; Murphy, 1985; Coughlan and Schmidt, 1985; Benston, 1985). To have an idea of how agency cost negatively impacts firm performance, peculiar research of Johnson *et al.* (1985) shown that if managers die accidentally in a plane crash or for hearth attack, the stock price increase as it was a good announcement. For its simplicity, the agency theory has been utilized in a plethora of corporate governance papers, referring to the contracting between the board, managers, and shareholders (Becht *et al.*, 2003; Gabrielson and Huse, 2005). The lack of compliance for managers to shareholders' needs has often been related to corporate scandals (Christopher, 2010).

Agency theory is then considered the main theoretical framework for analyzing corporate governance in all its aspects (Parker, 2014), and it is relevant because of specific blockchain features. When utilizing blockchain, there is indeed a separation between property and utilization. If, theoretically, blockchains are meant to be distributed, the truth is that power and control over them are shared between few but powerful entities (Casper, 2018; Tuwiner, 2020). In the case of blockchain based on proof of work, the power is shared between a few major mining pools. Although they are not exerting their power to alter the ledger, they "might be" able to. The same also applies for Proof of stake blockchains like Tron, where power is shared among a few staking pools, whose ability to modify the ledger is even higher (Armstrong, 2019). When using a public blockchain, the user has to trust the community that controls the system, which is mostly unknown and based on pseudonymous, while using a private blockchain, users should trust the corporation that runs it.

After blockchain integration, the system's risk to collapse with the network itself must be taken into account. If the company is considered a shareholder and the blockchain community an agent, there is no guarantee that the agent will act in the shareholder's interest. The agent (community) will always act in the community's interest to ensure its survival. This agency relationship inevitably affects blockchain applications' governance and has to be considered when integrating the business on the blockchain. Ocheja *et al.* (2019), for example, hypothesize the reason behind the choice of bitcoin blockchain for many government and academic applications is due to the stability of the community, although the costs to operate on the bitcoin blockchain are higher. A comprehensive example of the agency problem on the blockchain comes from Dapps running on public blockchains (e.g., Ethereum, Tron).

Dapp developers write their application on top of the blockchain, implementing smart contracts to run some of the features (Sethi, 2020).

To do so, they trust the blockchain community to maintain a certain level of service. In the case of Biscuits Labs, a Korean company, which creates mobile games running (at first) on EOS blockchain, some in-game features could be transferred to the external wallet to be traded among users (Biscuitslabs.io). When they launched their first mobile application running on Ethereum, the fees to efficiently run smart contracts were just fractions of dollars. However, due to the DAO and DDoS attacks, the enhanced security measures undertaken by the Ethereum community made the smart contracts costly and slower (Thomson, 2016; Graham, 2016; De Silva, 2019).

As a result, to maintain the system's stability, the price of running the Biscuits mobile game features shifted from a few cents to almost one dollar per day. The new scenario made it nearly impossible for new users to enter the community and more costly for former users to keep using the app. Probably also to address this issue, the developer created a new server running with Tron blockchain and scheduled another one operating with EOS (De Candia, 2019; Dennis, 2020). The found solution, however, could only partially solve the problem of pricing/delays. In a recent update, they removed some of the most expensive blockchain features from the game.

A different approach was then pursued by Dapper Labs, the creators of the *kryptokitties* game. Due to the Ethereum network instability, they decided to move their Dapp on Flow, their own blockchain (Haig, 2020). Dapper Labs could opt for this solution, counting on their large customer base, however not all the firms can benefit from the same network effect. Effective counters to the blockchain agent role could be then to operate on a private or more reliable blockchain (Dapper Labs) or to remove unnecessary blockchain features (Biscuits Labs). In any case, to benefit from the blockchain features, the agency problem needs to be faced and withstood. Wisely managing the agency relationship between firm and blockchain community could prevent losses and increase business flexibility.

4. A Comprehensive Framework

Having discussed corporate governance theories related to blockchain features, this study aims at providing a framework (Table 1) to evaluate the potential and drawbacks of blockchain applications. The following table should help managers understand the limitation and strengths of their project built on a blockchain, presenting successful/unsuccessful integration insights.

Table 1. Blockchain (CG) Framework

	CONDITION		
	Low or no dominant position	Interaction with real-world assets	Relevant or Dominant position
CG Theories	AGENCY	VOLUNTARY DISCLOSURE	STEWARDSHIP
Blockchain Features	Private or Public	Disclosure level required	Exert decisional power
	Consensus type	Oracle type	Cooperate with the community
	Purpose of the blockchain	Control over oracles	Defend the community
	POSSIBLE OUTCOME		
Favorable	Increased Flexibility. Loss prevention	Liquidity effect. Decrease in cost of capital.	Higher revenues. Low or inexistent costs
Detrimental	Skyrocketing costs. Service delays	Surge in costs. Low reputation returns	Hard forks Stake loss

Source: Author.

4.1 Voluntary Disclosure

Condition: Disclosure is voluntary when blockchain is linked to real-world assets (e.g., Certificates, Intellectual property rights). If the blockchain exclusively regards crypto trading (with few exceptions), data disclosures are instead mandatory and transparent.

Level of disclosure required: Although voluntary, the level of disclosure depends on the implemented application. The traceability of drugs, for example, indeed requires higher disclosure than clothes supply chains (Staples *et al.*, 2017; Chang *et al.*, 2019).

Oracles type: Oracles can be Hardware, software, or AI, but in some cases can also be humans. The idea of blockchain and smart contracts replacing human auditors and accountants is then somewhat unrealistic (Schmitz and Leoni, 2019; Rozario and Vasarhelyi, 2018).

Controls over oracles: Oracles as trusted entities are not independent and are subject to malfunction and data tampering (Egberts, 2017). A specialized auditing service is then mandatory for blockchain applications involving accounting features. The potential saving expected is then eroded or overcome by the cost of oracles surveillance and maintenance service (Pereira *et al.*, 2019).

Outcome: The increased disclosure may determine a liquidity effect and a decrease in the cost of capital (Leuz and Varrecchia 2000; Francis *et al.*, 2007). If an increase in disclosure does not accompany blockchain adoption, integration may result only in an added cost. Furthermore, oracles management may overcome any savings obtained with automation.

4.2 Stewardship

Condition: Being aware of the control that the firm or user exerts on the blockchain is essential when evaluating blockchain applications. A dominant share not only means visibility but, in some networks, may increase revenues.

Exert decisional power: Having a dominant share without exerting rights is unlikely to be a desirable option. Decisions taken may irreparably affect the blockchain network.

Cooperation with the community: Depending on the blockchain, it may be necessary or welcome to vote for witnesses or delegate voting power (Danji, 2018).

Defend the community: “Community First” is imperative when operating on the blockchain. As no central authority can guarantee the network's survival, every decision needs to be taken to defend the community before any personal interests. Protecting particular interests over community ones determines cases such as steem/hive hard-fork (Parker, 2020).

Outcome: The Higher is the participation in the blockchain community; the higher are the revenues connected with the blockchain application. On the other hand, smart contracts' costs are lower or inexistent (Sklaroff, 2018). If choices are wrong or ill-timed, the company may expect stake loss or witness community hard-forks.

4.3 Agency

Condition: Blockchain is perceived as an agent when no controls can be exerted over it. The company may have low shares or no contact at all with the managing community.

Private or public: Given a non-dominant position over blockchain, it is essential to understand the relationship with a public or a private blockchain. A public blockchain will always make decisions aimed at defending the stability of the network, which may alter the transaction timing or cost (Thomson, 2016; Graham, 2016; De Silva, 2019). Private or consortium blockchains, on the other hand, are subject to maintenance and managing costs. Furthermore, depending on the sector, they may not be welcomed or trusted by the user community (Brody, 2019).

Consensus type: Before choosing the consensus type, some considerations need to be done about the different impacts that they may have on the business. PoW is more secure but also slower and costly (Antonopoulos, 2018). Applications may then be expensive to manage for the firm and users, but the content may also gain an unexpected value (Varshney, 2018). When choosing a PoS, the security is lower, and the network is less immutable and more exposed to a hostile takeover (Valenzuela, 2020). However, applications and user experience should be faster and cheaper. On the other hand, the created value is more likely to be low and stable.

Purpose of the blockchain: Blockchains are incredibly versatile; however, the creator cannot foresee any possible utilize of his blockchain. For that reason, the initial characteristic or purpose of the blockchain has to be evaluated when choosing a specific blockchain. For example, even if Ethereum is meant to be the “world computer,” for the traceability of documents, the bitcoin blockchain is preferred (Ocheja *et al.*, 2019).

Outcome: A wise management of the blockchain agency relationship would increase the firm flexibility and avoid unnecessary losses. Otherwise, the company may expect a surge in cost and delays in services.

5. Conclusions

The purpose of this paper was to provide a comprehensive framework to evaluate the potential of blockchain applications utilizing corporate governance literature. To do so, the author made parallelisms between blockchain features and three major CG literature streams. The selected literature streams were voluntary disclosure, stewardship, and agency theories. As real-world blockchains are dependent on oracles, disclosure of data is reasonably voluntary. If the firm covers a dominant position over the blockchain network, acting in respect of the system as a steward may be more rewarding than undertaking a selfish attitude.

On the other hand, if the company has no control over blockchain, the relationship between firm and network may be considered an agency type. CG literature suggests that voluntarily increasing disclosure over blockchains may generate a liquidity effect with a decrease in capital cost. Whether human or AI, oracles should also be considered a determinant for the reliability of data provided. In blockchain platforms, instead, where ownership is distributed, firms and users are incentivized to follow a stewardship code, participating in the community events and voting activity. This study hypothesizes that the higher is the involvement of the firm in the community, the higher are the revenues connected to the blockchain applications. Finally, if the company operates on a blockchain in which it has low or no control, the agency relation needs to be evaluated and wisely addressed.

An informed selection between private and public blockchain, a consistent consensus mechanism, and a congruous purpose would help the blockchain application to be more flexible and resilient. Managers would benefit from this study, having a framework for evaluating their present or scheduled blockchain project. Academics could exploit this study to address further the limitations of blockchain applications building on the selected CG literature streams. The framework is not meant to suffice to an extensive project analysis but would provide an overview of the critical aspects to evaluate. As a single author study, the paper is biased by personal background and opinion over the technology and its potential. The given examples are also drawn from known case studies and market development conjectures. Further researches may corroborate the propositions given in the model, and an explorative study with CG experts may also prove the robustness of blockchain relation with CG literature.

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