CORPORATE GOVERNANCE APPENDED: APPLICATION OF BLOCKCHAIN TO REVIVE LOST MANAGEMENT

Aniruddh Vadlamani, Ryan Joseph & Chetan Soni[*]

One can ponder whether blockchain technology can provide a viable new-age solution to the age-old growing concerns surrounding corporate governance. This paper argues that the integration of blockchain technology has the potential to revolutionise the way corporations manage their governance processes. It highlights how the issue of agency costs, information asymmetry and lack of shareholder activism can be addressed by the lightning quick, secure, transparent, and immutable records of transactions on the ledger, thereby making it an ideal tool for improving corporate transparency and accountability. The ability to lower shareholder voting costs and the organisation costs for companies, including holding of an annual general meeting benefits both the company and the erstwhile forgotten shareholders. Further, through the introduction of tokens, and its uniquely malleable nature, blockchain provides the company with an opportunity to get creative with its capital raising while allowing a token holder to reap such benefits over a similarly placed shareholder. Lastly, the paper showcases that by reinstating oversight over the managerial role in hands of those directly impacted by a company's actions, blockchain allows us to call for the wringing back of control. Hence, the enhancement in a company's overall efficiency allows us to eliminate corporate governance concerns through the implementation and integration of blockchain technology.

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[*] Aniruddh Vadlamani and Chetan Soni are 5th-year law students while Ryan Joseph is a 4th-year law student at the Jindal Global Law School, Sonipat. All errors, if any, are solely attributable to the authors. The authors may be contacted at 19jgls-aniruddh.v@jgu.edu.in, 19jgls-chetan.s@jgu.edu.in, and 20jgls-rjoseph1@jgu.edu.in, respectively, for any feedback or comments.

I. INTRODUCTION

Yuval Noah Harari credited the cognitive revolution for humankind's success.[1] Amongst the wonders he cited when proving his point was the creation of companies as separate legal entities.[2] This simple concept has remarkably changed our society by reducing transaction risks accruing from setting up and engaging with an enterprise by veritable magnitudes.[3] The lowering of risk was achieved by allowing stakeholders to limit the risks accruing from the venture and apportion them on the basis of the amount each stakeholder wanted to be invested in the company.

However, this separation of legal personalities can be used by individuals to hide behind the smokescreen of a different legal personality, also referred to as the corporate veil, to execute nefarious plans.[4] Furthermore, as a mechanism to reduce coordination costs amongst shareholders, they have resorted to appoint agents and directors to operate the enterprise. At this juncture, it is only trite to state that the inordinate dependence on these systems has left one vulnerable to agency problems that are an inevitable consequence of the system.[5] Notwithstanding the foregoing, these limitations by no means outweigh the benefits accrued from the inception of a separate legal personality. Thus, corporate jurisprudence evolved around these limitations by developing principles of

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[1] Yuval Noah Harari Sapiens, A Brief History of Humankind, 18, 37 (Vintage, 2015).

[2] *Id.*

[3] Margaret M. Blair, *The Neglected Benefits of the Corporate Form: Entity Status and the Separation of Asset Ownership from Control*, in Corporate Governance and Firm Organization: Microfoundations and Structural Forms, 50 (Oxford University Press, 2004).

[4] Henry Hansmann & Reinier Kraakman, What is Corporate Law?' The Anatomy of Corporate Law: A Comparative and Functional Approach (Oxford University Press, 2004).

[5] *Id.*

corporate governance that ameliorate agency costs to a large extent.[6] However, with the growing pace and complexity of commerce, doubts have been cast on the efficaciousness of the existing guardrails. With concentrated shareholding and low participation by retail shareholders becoming a ubiquitous phenomenon[7], corporate governance models that were once considered the panacea to all ails have had to adapt to new realities else risk redundancy.

With commercial relationships and corporate transactions becoming palpably more complex, changes and disruptions in technology have not been lagging either. Various technologies have surfaced for a better part of the last century, and among those, a select few have disrupted our lives quite drastically than fathomed. One such technology is blockchain which aims to achieve the idealistic goal of a decentralised society. The buzz around the term blockchain is currently focused mainly on Bitcoin and how blockchain can provide for a scalable, secure, and decentralised peer-to-peer cash system.[8]

However, it is imperative to understand that blockchain is a state-of-the-art technology with countless use cases, many of which have not been explored yet.[9] Therefore, it was only a matter of time that blockchain technology was applied to corporate governance in order to revamp its operations. In this context, the proposal made by Alexander Andhov in her paper appears to be the guiding light for corporations and regulators around the world.[10] Her proposal, even though not a proof of concept, has led to people in believing that blockchain could in effect revolutionise the inefficiencies in the corporate structures. However, with time comes certain limitations to a proposal and same can be said for Andhov's work. Even though Andov's proposal is first of its kind and has laid down a framework, there are certain gaps that need be addressed in order for a foundation to be created. For instance, *inter alia*, from the shareholders perspective Andhov has failed to address a structure by which the already existing equity position of a shareholder can be retained once the corporation on boards a blockchain. With recent

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[6] Countries around the world have amended their legislations or drafted new legislations. For instance, after the Enron Scandal, the United States enacted the Sarbanes–Oxley Act, 2002.

[7] C.P. Chandrasekhar et al., *The Elusive Retail Investor: How Deep Can (and Should) India's Stock Markets be?*, Securities Exchange Board of India Development Research Group Study, available on https://www.sebi.gov.in/sebi_data/DRG_Study/elusiveretailinvestor.pdf (Last visited on October 5, 2023).

[8] Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, available at https://bitcoin.org/bitcoin.pdf (Last visited on October 5, 2023); *See also,* Michelle Mount, *Bitcoin Off-Chain Transactions: Their Invention and use*, Vol. 4, Geo. L. Tech. Rev., 685 (2020); David Houk, *Bitcoin: Reacting to Money with Non-Money Attributes*, Vol. 1, Geo. L. Tech. Rev., 371 (2017); Neelesh Mungoli, *Deciphering the Blockchain: A Comparative Analysis of Bitcoin's Evolution, Adoption, and Future Implications*, Vol. 1, arXiv, 1-5 (2023); Hussien Hellani, *On Blockchain Technology: Overview of Bitcoin and Future Insights*, IMCET (2018).

[9] Anne Lafarre & Christoph Van Elst, *Blockchain Technology for Corporate Governance and Shareholder Activism*, Ecgi Law Working Paper (2018).

[10] Alexandra Andhov, *Corporations on Blockchain: Opportunities & Challenges*, Vol. 53 Cornell Intl L. J., 1-40 (2020).

developments in blockchain technology, the difficulties in implementing such existing proposals have been ameliorated.

There are other scholars as well who have provided detailed literature on blockchain-based corporate governance. One of the most prominent analysis has been provided by David Yermack, who opinionates that the adoption of blockchain architecture in corporate governance is an insignia of shareholder strength, greater liquidity in market, transparent ownership of stock, and real-time accounting.[11] It has been contended that with the espousal of this technology, electronic voting could be revolutionised with the help of Ethereum and its smart contracting technology.[12] An example, albeit still an ongoing initiative, is the 'Delaware Blockchain Initiative' wherein the Delaware authorities have authorised the use of a distributed ledger for electronic voting, transfer and recording of shares and tracking of corporate issues.[13]

Further, it has been asserted that this technology could be an end to the long-lasting division between corporations and their shareholders,[14] and analogously improve the relationship between the proxy holders and shareholders.[15] Anne J. Laffarre has been strongly advocating for the integration of blockchain technology to combat waning shareholder participation in the European Union, and has opined on the need to integrate blockchain technology in modern shareholder so as to fulfil its core functions.[16] Scholars such as Huasheng Zhu and Zach Zhizhong Zhou have reasoned that the ineffective way in which the current investors participate in equity crowd funding can also be solved by blockchain.[17]

Further, according to Wulf A. Kaal, blockchain being a foundational technology creates the possibility of a decentralised networked governance.[18] Intergovernmental organisations such as the Organization for Economic Cooperation and Development ('OECD') have also recognised the potential of blockchain as a revolutionary technology. Vedant Akgiray in an OECD corporate governance working paper wrote on the applications of blockchain technology, in the area of corporate governance while highlighting the recent applications of blockchain

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[11] David Yermack, *Corporate Governance and Blockchains*, Vol. 21(1), Review Of Finance, 21 (2017).

[12] Salvatore Esposito De Falco et al., *Corporate Governance and Blockchain: Some Preliminary results by a Survey* in Corporate Governance; Search for The Advanced Practices, 104 (Virtus, 2019).

[13] Wonnie Song, *Bullish on Blockchain: Examining Delaware's Approach to Distributed Ledger Technology in Corporate Governance Law and Beyond*, Vol. 8(11), Harv Bus. L. Rev, 9-10 (2017).

[14] Andhov, *supra* note 10, 1

[15] Lafarre & Elst, *supra* note 9.

[16] *Id.*

[17] Huasheng Zhu & Zach Zhizhong Zhou, Analysis and Outlook of Applications of Blockchain Technology to Equity crowdfunding in China, Vol. 2, Financial Innovation, 4-8 (2016).

[18] Wulf A. Kaal, *Blockchain Solutions for Corporate Governance* in Information for Efficient Decision Making Big Data, Blockchain and Relevance, 314 (World Scientific Publishers, 2019).

technology in financial services.[19] Other scholars such as Abdelkader Derbali, Lamia Jamel, Yosra Mani and Raied Al Harbi have highlighted how the use of such technology will shift trust from within the organisation to being placed in the security and audit ability of chain, which in turn is verifiable by all stakeholders in a corporate.[20]

However, several scholars have contended that the adoption of this decentralised system of governance does not necessarily replace the current organisational system. Lin William Cong and He Zhiguo believe that smart contracting technology could actually prove to be an expense as it can lead to an increased collusive behaviour between the participants.[21] Though questions have been raised on the governance, accuracy and cost effectiveness of the blockchains.[22] Lastly, doubts regarding the environment sustainability of blockchains have been mooted. Scholars have argued that the non-sustainable nature of blockchain from an environment point of view, might prove to be against the dictates of corporate sustainability.[23]

Upon examining the above literature, it is evident that there is a majority of scholars who firmly deem blockchain technology as an effectual solution to the corporate inefficiencies. Whereas there are some scholars who believe that blockchain has the potential to enhance the corporate governance structure, however, the costs attached to it is not worth the effort. Accordingly, this paper intends to further add to the existing literature by providing innovative solutions to problems in corporate governance that currently remain unaddressed and provide mechanisms to implement solutions in the existing literature in a more efficient manner.

In Part II of the paper, the structure of blockchain is explicated, key blockchain related terms are defined and the characters of blockchain relevant to the paper's study are expounded upon. Part III thereafter theorises the concept of corporate governance and identifies the limitations of the current governance scheme. Specific emphasis is placed on the problem of agency costs, information asymmetry, and lack of shareholder activism. The paper under Part IV proposes blockchain as a solution for addressing the various agency costs that arise in the listed as well as private companies. *First*, it posits the advantages that blockchain technology offers in shareholder activism. Further, through a case study of

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[19] Vedat Akgiray, *The Potential for Blockchain Technology in Corporate Governance*, OECD CORPORATE GOVERNANCE WORKING PAPERS, 21 (2019).

[20] Abdelkader Derbali, *How Will Blockchain Change Corporate Governance?*, Vol. 2, INTL. J. OF RISK MANG., 16-18 (2019).

[21] Lin William Cong & He Zhiguo, *Blockchain Disruption and Smart Contracts*, Vol. 32, THE REVIEW OF FINANCIAL STUDIES, 1754-1797 (2019).

[22] Catalini, Christian & Joshua S. Gans, *Some Simple Economics of the Blockchain*, Vol. 22952, NBER WORKING PAPER, 1-24 (2016).

[23] Asanga Jayawardhana & Sisira Colombage, *Does Blockchain Technology Drive Sustainability? An Exploratory Review*, Vol. 15, GOV. & SUSTAIN. REV., 17-42 (2020).

'shareholders *versus* token holders' the paper contends the benefits that a token holder has over a shareholder. *Second*, it suggests how smart contracts and oracles can be used to mitigate agency costs and information asymmetry in start-up financing. Lastly, Part V analyses Andhov's proposal of a blockchain-based corporation and develops on the said proposal to surmise a blockchain system that leverages its capabilities to lower inefficiencies in a typical corporate structure. Part VI of the paper then offers concluding remarks.

II. WHAT IS BLOCKCHAIN?

In this part of our paper, we firstly define blockchain technology and subsequently identify certain characteristics of the same that are relevant to corporate governance. Most importantly, our study discerns the need for a decentralised and distributed ledger so as to ascertain that decision making power is not accumulated in the hands of few. This distributed power in the system eliminates and reduces the current mechanism of proxy based voting system and in doing so ensures shareholder activism. Next, the novel concept of smart contracts is elaborated upon and the advantages of such a conditional contract are highlighted in cases of private equity and venture capital firms and governance proposals. Moving on, the concept of tokenisation and transparency are described in relation with the enterprises on-chain. Lastly, we delve into the technical structure of blockchain exploring the aspects of cryptographic hashing, consensus mechanisms and block creation.

A. *COMPREHENDING BLOCKCHAIN AND ITS CHARACTERISTICS RELEVANT TO CORPORATE GOVERNANCE*

Blockchain, an open-access distributed ledger technology ('DLT'), was developed on paper in the late twentieth century.[24] Being open-source, decentralised, and distributed in nature, blockchain has brought about a disruption factor hitherto unseen and unheard of.[25] It has evolved as a unique infrastructure to facilitate real-time data storage, communication, and management.[26] What is more intriguing is that with the universal acceptance and implementation of this technology, a more dynamic and propelling system has been created which provides for a new generation of decentralised solutions.[27] The sudden spur in this trustless, smart and disintermediate architecture has been due to the relative success of Bitcoin. Bitcoin, a peer-to-peer electronic cash system, uses this DLT to keep track

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[24]   Stuart Haber & W. Scott Stornetta, *How to Time-Stamp a Digital Document*, Vol. 2, J. of Crypto, 99 (1991).

[25]   Balázs Bodó et al., *Blockchain and Smart Contracts: The Missing Link in Copyright Licensing?*, Vol. 26, Intl. J. of L. & Info. Tech, 313 (2018).

[26]   Andhov, *supra* note 10, 2.

[27]   *Id*.

of the supply and flow of computer-generated cash token.[28] Further, blockchain technology has captured the attention of the business world, as it offers a new way of creating, exchanging, and tracking data and ownership of financial assets on a peer-to-peer basis.[29]

In wake of this shifting legal landscape with more dependence than ever on emerging technologies such as blockchain, lawyers, practitioners and the broader legal fraternity must also be prepared for these changes to revolutionise the legal world. The potential implications of blockchain in the corporate governance field are comprehensive. This DLT forges the hope of providing a low cost transaction, transparent record keeping, tracking of ownership, greater market liquidity and a new method of corporate equity trading.[30] For the purpose of the paper's study, it is important to examine the features of blockchain which are relevant to the corporate governance model.

1. Distributed and Decentralised Ledger

Every user on a blockchain has access to a continuously updated authoritative copy of the network making the system an appended only database.[31] This means that the database is structured in a distributed and decentralised manner whereby data consistent with already existing records can only be verified. This federated ledger system does not depend on any third party involvement and therefore is a trustless system.[32] In today's legacy systems, trust is essential for the transacting parties because of the involvement of a third party. For example, in the stock exchanges, there needs to be a certain degree of trust between the investors and the brokers because a broker is a third-party institution that buys and sells stocks on behalf of the investors. This centralised system has many overboard costs attached, which can act as an invisible fee on its customers. DLTs, especially blockchain has been developed to counter these high transaction costs and security issues. Therefore, a decentralised exchange system could be a cost-effective alternative to the above-discussed example. Through this paper we also look at various techniques such as side chains and sharding which are key to achieving decentralisation in the system.

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[28] Bodó et al., *supra* note 25, 312.

[29] Yermack, *supra* note 11, 9.

[30] Veronique Magnier & Patrick Barban, *The Potential Impact of Blockchains on Corporate Governance: A Survey on Shareholders' Rights*, Vol. 2, Intereulaweast, 189 (2018).

[31] Bodó et al., *supra* note 25, 314.

[32] Primavera De Filippi et al., *Blockchain as a Confidence Machine: The Problem of Trust & Challenges of Governance*, Vol. 62, Technology in Society, 1-3 (2020).

2.   Transparency

Transparency is the key to a successful corporate governance structure.[33] By design, blockchains are built on the fundamental principle of complete transparency to which, even if the transaction have been hashed, they are still visible to all the participants of the network thereby increasing information symmetry.[34] One-way cryptographic hashing function, also referred to as 'messages digest' or 'fingerprints', is an algorithmic technique which ensures the integrity of the data that is being transmitted and thereby keeping its user's transactions confidential.[35] Blockchain technology has gone one step further in introducing the concept of a public-key cryptography in which each participant is provided with a pair of keys: public and private.[36] These keys are fundamental in conducting transactions via blockchain as they provide transparency in the system and also ensure non-repudiation. For instance, a shareholder voting on a governance proposal or transacting on an exchange would initiate a transaction through her wallet account. This transaction is then cryptographically hashed into a secret code and then processed further. The hash of the transaction is publicly displayed on-chain as evidence of the transaction thereby ensuring transparency in the system.

3.   Smart Contracts

Another interesting interoperable structure developed by Ethereum are the self-executing protocols knowns as 'smart contracts'.[37] These contracts are interoperable in the sense that they have the ability to exchange data with other platforms, be it other types of blockchains, or the off-chain world.[38] Smart contracts as the term suggests are smart blockchain-stored codes which carry out pre-specified agreements between disparate, anonymous parties without any reliance on the centralised structures or institutions.[39] They can be categorised as an alternative to the present day legal contracts and work through a basic algorithm of 'if/when…then…' situation.[40] For instance, a governance proposal released by a

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[33]   Benjamin E. Hermalin, *Transparency and Corporate Governance*, Vol. 12785, Nʙᴇʀ Wᴏʀᴋɪɴɢ Pᴀᴘᴇʀ Sᴇʀɪᴇꜱ, 1-26 (2007); *See also,* Carla C.J.M. Millar et al., *Corporate Governance and Institutional Transparency in Emerging Markets*, Vol. 59(1/2), J. Oꜰ Bᴜꜱ. Eᴛʜ., 163-174 (2005).

[34]   Eugenia Politou & Fran Casino, *Blockchain Mutability: Challenges and Proposed Solutions*, Vol. 4, IEEE, 5 (2019).

[35]   Vaishali Sharma & Nilufar Yasmin, *Blockchain: Mining of Hash Function Using POW Algorithm*, Vol. 5, IJARIIE, 561 (2019).

[36]   *Id*.

[37]   Jamie Kim, *Regulation of Decentralized Systems: A Study of Uniswap*, Vol. 35, Hᴀʀᴠ J. ᴏꜰ L. & Tᴇᴄʜ., 335 (2021).

[38]   World Bank Group, *Blockchain Interoperability*, Tᴇᴄʜ. & Iɴɴᴏᴠ. Lᴀʙ, 7-45, available at org/curated/en/373781615365676101/pdf/Blockchain-Interoperability.pdf (Last visited on 16 December, 2022).

[39]   Kim, *supra* note 37, 336.

[40]   Maher Alharby & Aad Van Moorsel, *Blockchain-Based Smart Contracts: A Systematic Mapping Study*, Vol. 10, CS & IT, 127 (2017); *See also,* Maria G. Vigliotti, *What do we Mean by Smart Contracts? Open Challenges to Smart Contracts*, Vol. 3, Fʀᴏɴᴛ. Bʟᴏᴄᴋᴄʜᴀɪɴ, 2-3 (2020).

corporation on blockchain may require a certain number of shareholder votes for the proposal's to be passed. In this scenario, the smart contract identifies that if the certain number of votes have been registered via blockchain for that particular proposal then the proposal is accepted. Further, in Part IV we will identify smart contracts as interoperable constructs which can be used to reduce agency costs for corporations in private equity.

4. Tokenisation

Another ushering characteristic of blockchain is the tokenisation of assets which provides interoperability of network and the ability to use tokens across different blockchain networks.[41] Tokens are digital representation of ownership of anything in value and enable multi-party ownership of indivisible assets.[42] An enterprise on blockchain could benefit through tokenisation as this function as has no limits. For instance, intangible assets such as a patent of the enterprise could be tokenised and made available to the shareholders.[43] Multiple shareholders of the enterprise can have a share of such a tokenised patent as everything is code-driven. The tokenised patent will increase the shareholding of these holders in the enterprise and in turn provide liquidity to the firm thereby benefiting both the shareholders and the enterprise. Through this paper we try to conduct a similar type of study wherein we analyse the benefits that a token holder could have over a shareholder.

B. *STRUCTURE OF BLOCKCHAIN*

Apart from the aforesaid features, blockchain can alternatively be defined as a set of sub-sheets that is immutable, i.e. the network cannot be edited or to incorporate any information nor can any information be deleted thereby making the network indelible and unalterable,[44] interoperable, transparent, and cryptographically secured. Blockchain, an ordered list of blocks, is secured through a cryptographic hash that identifies each block and creates a link between the blocks.[45] This is due to the fact that the hash pointer in the last column of the previous block is precisely reproduced at the start of the next block, creating a chain of blocks.[46] For better explanation, a diagram is reproduced below as Figure-1.[47]

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[41] Ravi Subbaraman & Naren Krishnan, *Blockchain Tokenization in Enterprises and Beyond*, IBM SUPPLY CHAIN AND BLOCKCHAIN BLOG, February 24, 2021, available at https://www.ibm.com/blogs/blockchain/2021/02/blockchain-tokenization-in-enterprises-and-beyond/ (Last visited on October 5, 2023).

[42] *Id*.

[43] *Id*.

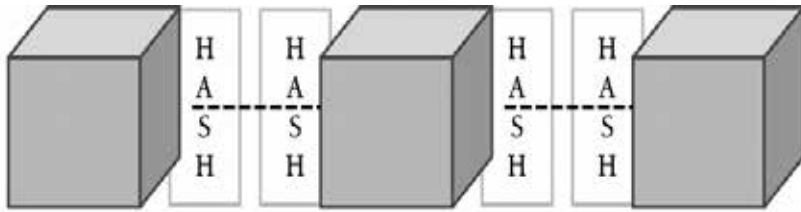[44] Politou & Casino, supra note 34, 5; See also, Kevin Doubleday, Blockchain Immutability — Why Does it Matter?, Medium, November 18, 2018, available at https://medium.com/fluree/immutability-and-the-enterprise-an-immense-value-proposition-98cd3bf900b1 (Last visited on October 5, 2023).

[45] Alharby & Moorsel, *supra* note 40, 126.

[46] *Id*.

[47] Andhov, *supra* note 10, 7.

Figure-1

          A central facet of any blockchain is its consensus mechanism, which is a process through which participants of a decentralised network concur on the security and validity of a shared data structure.[48] Alternatively, it can be defined as a method through which nodes are able to share information and achieve consistency in the network.[49] The architecture of traditional systems does not require a consensus mechanism to effectively run the system because of the existence of a centralised server.[50] However, by virtue of being a DLT, blockchain requires the achievement of consensus as all the nodes are not aligned to a centralised server but instead are independent hosts and the server themselves.[51] Therefore, consensus of blockchain is that all nodes maintain the same distributed ledger by exchanging information amongst each other.[52]

          Though there is no single perfect consensus mechanism on which a blockchain can run fault proof, but to identify the ideal consensus their needs to be evidence that the algorithm provides consistency, availability as well as fault tolerance.[53] There are certain protocols that are used more widely than others. For instance, Proof of Work ('PoW') is the consensus protocol for Bitcoin blockchain. PoW refers to a consensus achieving mechanism wherein all miners/validators participate in the network to validate transactions by solving a mathematical puzzle and get rewarded for the same.[54] Whereas Proof of Stake ('PoS') which is the mechanism used by Ethereum Mainnet to obtain consensus is opposite to the PoW protocol. In PoS, instead of mining power, i.e. solving the mathematical puzzle,

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[48]   *See* Cryptopedia, *What are Proof of Stake and Delegated Proof of Stake*, December 23, 2021, available at https://www.gemini.com/cryptopedia/proof-of-stake-delegated-pos-dpos (Last visited on October 5, 2023).

[49]   Xingxiong Zhu, *Research on Blockchain Consensus Mechanism and Implementation*, Iop Conf. Series Mater. Sci. Eng., 9 (2019); For more details on the consensus protocols, *see* Zhang and Lee, *infra* note 50.

[50]   Shijie Zhang & Jong-Hyouk Lee, *Analysis of the main consensus protocols of blockchain*, Vol. 6, Ict Express, 93 (2019).

[51]   Alharby & Moorsel, *supra* note 40, 126.

[52]   Zhang and Lee, *supra* note 50, 94.

[53]   *Id*.

[54]   Amitai Porat et al, *Blockchain Consensus: An Analysis of Proof-of-Work and its Applications*, Stan. Comp. Sci. Dept. (2017); *See also* Nakamoto, *supra* note 8, 5.

the probability to create a block and receive the requisite reward is dependent on the validator's stake in the network.[55]

A newer and more sophisticated way of achieving consensus on blockchain is by the way of Delegated Proof of Stake ('DPoS'). Such a protocol is an enhanced version of both the PoW and the PoS mechanisms.[56] It is inherently based on a voting election much similar to that of the democratic congress.[57] The stakeholders who have the stake in the network elect a certain number of representatives who exercise power on behalf of all the stakeholders and these elected representatives become validators on-chain and participate in consensus to generate blocks.[58] Both PoW and PoS are widely used consensus in blockchain protocols, however, PoS is considered a more viable option because of its environment friendly nature.[59] DPoS being a much newer process lacks the empirical study to be considered a satisfactory option for consensus achieving. Therefore, for our proposal in Part V we delve into advantages and disadvantages that PoS mechanism will have on our model.

III. BULLISH ON BLOCKCHAIN: SOLUTION TO CORPORATE GOVERNANCE INEFFICIENCIES

In the following part, the authors attempt to showcase the advantages of integrating blockchain technology in the functioning of a company, as opposed to the processes which traditionally take place in the governance of a company. Part III(A) introduces principles of corporate governance and highlights the agency problems that exist in the current model of corporate governance. Part III(B) attempts to delve into aspects of the relationship once a legal person becomes a shareholder of a company. The author seeks to critique the present structure and showcase the inadequacies prevalent in the structure which hinders a shareholder from effectively using their rights. The solution to improve such governance is thereafter provided by showcasing the strengths in application of blockchain technology. Part III(C) begins with an analysis of the investments in the private unlisted sectors and identifies certain problems such as informational asymmetry and poor enforcement mechanisms which pose as risks to investors as well as the target company. The paper then proceeds to envision blockchain and smart contract-based solutions that may be used to address these two problems and facilitate better deal making in start-up financing.

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[55] BitFury Group, *Proof of Stake* v. *Proof of Work*, 2015, available at https://bitfury.com/content/downloads/pos-vs-pow-1.0.2.pdf (Last visited on October 5, 2023).

[56] Qian Hu et al., *An Improved Delegated Proof of Stake Consensus Algorithm*, Vol. 187, Procedia Comp. Sci, 343 (2020).

[57] *Id*.

[58] *Id*., 342.

[59] Jayawardhana and Colombage, *supra* note 23, 19.

A. *CORPORATE GOVERNANCE*

There are different ways to understand a company. Some view it as an instrument of oppression,[60] whereas others view it as an instrument for development and prosperity.[61] What sustains any of the myriad conceptions of a company is the fact that, at the heart of it, a company serves as a nexus of contracts. It arranges the contractual relationship between different stakeholders to have a compounding effect, which creates far greater value, for every stakeholder, by hedging transaction risks to catalyse trade and commerce in our society.[62] Unlike the pre-limited liability era, where entrepreneurs had to bear the entire risk of an endeavour by creating a fictitious entity, i.e. the company, risks of an endeavour can now be apportioned between different stakeholders in a far more equitable manner where each stakeholder takes on risk commensurate to the benefit they derive from the existence of the company.[63]

The benefit of limited liability accrues from the separation of ownership and management wherein the owners of the company, i.e. the shareholders, delegate the management of the company to an elected board of directors, who then run the company on behalf of the shareholders and are accountable to the shareholders. However, this system greatly relies on relinquishing powers to an agent and the principal's welfare being entirely dependent on the actions of the agent.[64] Ideally, all agents function in the best interests of their principals. However, at times, due to an incongruence of interests between the principal and the agent, the latter may not act in the best interests of the former and gives rise to 'agency costs'.[65]

Another form of agency costs arises when majority shareholders start taking decisions without adequately consulting the minority shareholders. As control over any company is directly correlated to one's shareholding, the minority shareholder's interests in the company are heavily dependent on the actions the majority takes, which once again creates a principal-agent relationship. However, the corporate governance mechanisms to allay such costs are often inadequate.[66] In numerous Asian jurisdictions such as Indian and China,[67] due to concentrated

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[60] Aitor Jiménez & J.C. Oleson, *The Crimes of Digital Capitalism*, Vol. 48(4), Mitchell Hamline Law Review, 977 (2022).

[61] Hansmann & Kraakman, *supra* note 4, 18.

[62] *Id*.

[63] *Id*.

[64] John Armour et al., *Agency Problems, Legal Strategies, and Enforcement*, Working Paper No. 644, John M. Olin Centre for Law, 11–12 (2009).

[65] *Id*.

[66] Sarah Glücksman, *Entrepreneurial Experiences from Venture Capital Funding: Exploring Two-Sided Information Asymmetry*, Vol. 22(4), Venture Capital, 331 (2020).

[67] Umakanth Varottil, *A Cautionary Tale of the Transplant Effect on Indian Corporate Governance*, Vol. 21(1), NLSIR, 16 (2009).

shareholding,[68] the majority exercises so much power over the company that the minority would have to incur considerable coordination costs to make their voices heard in the shareholder's meeting. Thus, the minority shareholders often eschew the duties of a responsible shareholder and take up the role of a rentier investor.[69] The majority shareholders often have long standing relations with the board and management of the company that gives them access to influence decision making in the company.[70] Moreover, through pyramid structures, and other devices such as tunnelling, majority shareholders effectively control the board and the management that is appointed by the board.[71] This gives them an indirect control even over the management. Quite often, the senior management would consist of family members of allies of such majority shareholders.[72]

The concept of agency costs will be further developed in the paper.[73] However, at this stage, it is important to note that Parliaments across the world such as in Germany, India and the United Kingdoms, have enacted laws to breathe in the air of corporate governance into companies in a bid to ameliorate agency costs to the farthest extent.[74] The principles of corporate governance empower the principal to control the actions of the agent through regulatory and governance strategies.[75] While these strategies have greatly diminished agency costs, they also have certain limitations. Transactions entered today are far more complex than they used to be. Companies and promoters use complicated structures and devices such as pyramid structures and tunnelling to exercise control and extract greater profits at the cost of minority shareholders.[76] The rising complexity has veritably inflated informational asymmetry between party's concomitant because of which there has been a gradual reduction in the principal's ability to enforce their rights.

Satyam scandal is a cogent example that illustrates the failure of corporate governance mechanisms in mitigating the foregoing agency costs. Satyam Computer Services Limited was one of the leading information technology companies of its time. It won billion-dollar contracts from world's major multi-national companies such as British Petroleum.[77] The company was also well-known for its corporate governance. It was ranked third in the corporate governance survey

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[68] Alexandre Edde Diniz de Oliveira, *The Board against all Odds: Assessing the Powers of Delegated Management in Brazil*, Vol. 22, Law & Bus. Rev. Am, 339 (2016).

[69] Paddy Ireland, *Efficiency or Power? The Rise of the Shareholder-Oriented Joint Stock Corporation*, Vol. 25(1), Indiana Journal of Global Legal Studies, 13 (2018).

[70] E. Berglöf & E. Von Thadden, *The Changing Corporate Governance Paradigm: Implications for Transition and Developing Countries*, SSRN, 17 (1999).

[71] Varottil, *supra* note 67, 16.

[72] *Id.*

[73] *See infra* Part III(B)(1) on "Agency Cost in Start-up Financing".

[74] The Indian Companies Act, 2013 §149; The UK Companies Act, 2006, §172; The German Companies Act, 1931, §93(1).

[75] Armour et al., *supra* note 64.

[76] Varottil, *supra* note 67, 16.

[77] Deepshikha Monga & Gaurie Mishra, *Big Clients Plan to Exit Satyam*, THE Economic Times, January 12 2009, available at https://economictimes.indiatimes.com/tech/software/big-clients-plan-to-exit-satyam/articleshow/3965316.cms?from=mdr (Last visited on October 9, 2023).

conducted by the Global Institutional Investors in 2005.[78] It even won the Golden Peacock award for corporate governance from the World Council for Excellence in Corporate Governance.[79] Despite this fancy facade, in 2009, it all came tumbling down when its chairman Ramalinga Raju confessed that he had manipulated the books.[80]

The agency cost between shareholders and directors is mitigated through the appointment of gate-keepers such as auditors who bridge the informational asymmetry between directors and shareholders to enable the latter to make informed decisions about the former's performance.[81] Herein, Satyam appointed Price Waterhouse as its auditors. However, after the fraud, it was found that two partners of the audit firm were allegedly negligent in their review of Satyam and allowed the manipulation to occur and were accordingly arrested by law enforcement officials.[82]

Ramalinga Raju as the chairman or the 'insider' for the second agency problem had control over the entire board and other senior officials at Satyam.[83] He controlled all the material aspects of the company such as strategy and operations.[84] He was known to not accept criticism and required complete obedience to his plans.[85] Raju much like other promoters had a tendency to pack the board with independent directors who would be aligned to his vision.[86] This trend is particularly concerning because at the face of it, appointment of independent directors would imply that the company is concerned about inculcating strong measures of corporate governance. However, when these directors are aligned, insiders such as Raju would hide behind a smokescreen of sobriety and continue to practice their unethical methods. In fact, Ramalinga Raju's control over the board was so strong that he and his brother were able to disguise a USD 1.47 billion fraud from the entire board and the gatekeepers.[87]

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[78]   *Id.*

[79]   *Id.*

[80]   Economic Times, *Satyam: Full text of Raju's Letter to the Board*, January 8, 2009, available at https://economictimes.indiatimes.com/tech/software/satyam-full-text-of-rajus-letter-to-the-board/articleshow/3946470.cms?from=mdr (Last visited on October 9, 2023).

[81]   Henry Kraakman, *Gatekeepers: The Anatomy of a Third-Party Enforcement Strategy*, Vol. 1, Journal of Law, Economics, & Organization, 2 (1986).

[82]   Menaka Doshi, *The Undoing of Price Waterhouse in the Satyam Scam Case*, January 11, 2018, available at https://www.bqprime.com/business/the-undoing-of-price-waterhouse-in-the-satyam-scam-case (Last visited on October 9, 2023).

[83]   Sharma & Yasmin, *supra* note 35.

[84]   *Id.*

[85]   *Id.*

[86]   E. Kumar Sharma, *Satyam: A decade on*, January 8, 2019, available at https://www.business-today.in/latest/corporate/story/despite-tighter-corporate-governance-norms-that-satyam-scam-triggered-india-inc-continues-to-shock-investors-with-financial-frauds-157048-2019-01-07 (Last visited on October 9, 2023).

[87]   Sharma & Yasmin, *supra* note 35.

Lastly, the governance measures at Satyam also failed to protect against the third agency problem. The World Bank in a landmark deal had contracted a multi-million-dollar agreement with Satyam in 2003.[88] However, after an investigation by the World Bank, it was found that Satyam had resorted to corrupt practice such as bribery to obtain the contract.[89] As a result, the World Bank imposed an internal eight year ban on contracting with Satyam.[90] With the lessons learnt from incidents such as Satyam in mind, this paper shall propose a blockchain solution that can complement the existing principles of corporate governance to create a fool proof solution that is better suited for today's complex commercial relations.

B. BLOCKCHAIN FOR SHAREHOLDER ACTIVISM

Shareholder absenteeism can be termed as the age-old occupational hazard of the present corporate structure. A company touted as a legal fiction, in order to survive and thrive has had to demarcate specific roles as played by its characters. With share owners possibly spread across geographically, in order to grow, the company has to orchestrate a split. The day-to-day concerns are compartmentalised to be the sole responsibility of the board of directors while the true owners are called upon for an annual update through the Annual General Meeting ('AGM'), and when the company requires a collective upheaval.[91] However, as analysed in the Part II, the intention and impact of a directors' action need not necessarily align and be recognised by those who bear the final burden of profit and loss.

The existing information asymmetry is aimed to be bridged through these stakeholders' interaction in an AGM. However, modern AGMs have transformed into redundant exercises, and act as a mere regulatory compliance.[92] While proxy shareholders are seemingly bound by the principal-agent relationship,[93] there is no practical provision to ensure that they would have voted in accordance with the wishes of the beneficial holder, with Indian jurisprudence pointing to the chairman as the final determinant of the same.[94] Other instances in developed economies such as United States of America ('USA') have shown how proxy shareholders are at times crucial to altering the company's existence. Elsewhere, the German courts have seemingly validated lack of shareholder activism, and upheld a provision within the articles of association which permits the limiting

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[88] *World Bank Bans Satyam for 8 Years*, ET Bureau December 24, 2008, available at https://economictimes.indiatimes.com/tech/ites/world-bank-bans-satyam-for-8-years/articleshow/3882667.cms?from=mdr (Last visited on October 9, 2023).

[89] *Id*.

[90] *Id*.

[91] The Companies Act, 2013, §13(1), §14.

[92] Lafarre & Elst, *supra* note 9, 9.

[93] The Indian Contracts Act, 1872, §182.

[94] B. Ramachandra Adityan v. Tamil Nadu Mercantile Bank Shareholders Welfare Assn., 2009 SCC OnLine Mad 1860.

of speaking and questioning time at an AGM.[95] This is done in order to end the regular general meeting within six hours in accordance with the German Stock Corporation Act.[96] A total speaking time for all shareholders of forty-five minutes was considered acceptable in the mentioned case, and was set as the norm in Germany.

In such a background, i.e. the heightened insignificance attached to the shareholders participation coupled with the costs incurred to participate can be said to have cumulated into dwindling shareholder numbers. Especially, as seen in Germany, the number for average voting turnout by shareholders in AGMs has fluctuated between fifty-two percent to fifty-eight percent in the years ranging from 1998-2013.[97] A study conducted by the World Bank in cooperation with the Confederation of Indian Industry and Government of India in 2004 has also showcased shareholders reluctance to take part in governance activities in Indian corporations.[98] The study is one of the few standalone primary research initiatives on corporate governance in India, and the reluctance of institutional investors to not attend shareholder meetings or even read the agenda has been documented in the same showcases the necessity to bring changes in the status quo.[99]

In essence, the death of the AGM can further be classified as a symptom of the greater issue of concentrated shareholding patterns, wherein the minority shareholders' vote in the affairs of the company is approximately zero.[100] The small shareholder's miniscule, marginal impact in the voting process has led to the growing disinterest, as well as a feeling of discontent due to the voting costs exceeding the value of their vote.[101] As viewed under the Companies Act, 2013, small shareholder, i.e. any person who does not have at least twenty-five percent of the total paid-up share capital ('PUSC'), is helpless. They are neither in a position to outvote, nor do they have an ability to veto decisions as proposed by the controlling shareholders.[102] This is true even in situations where a special resolution is required, and the basis of a company's legal persona is proposed to be altered, with the threshold for passing a resolution being set at seventy-five percent of the total votes cast.[103] This problem is further accentuated by the veritable number

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[95] Bundesgerichtshof (BGH) Karl-Walter Freitag/Biotest AG-case, II ZR. 94/08 (February 8, 2010).
[96] *Id.*
[97] Wolf-Georg Ringe, *Stewardship and Shareholder Engagement in Germany*, Working Paper No. 501/2020, European Business Organization Law Review, 97 (2021).
[98] World Bank, *India - Report on the Observance of Standards and Codes (ROSC): Corporate Governance Country Assessment*, 15, 2004, available at http://hdl.handle.net/10986/14465 (Last visited on October 5, 2023).
[99] Jayati Sarkar & Subrata Sarkar, *Large Shareholder Activism in Corporate Governance in Emerging Economies: Evidence from India*, Vol. 3, Int'l Rev. of Fin., 190 (2003); George S. Geis, *Can Independent Blockholding Play Much of a Role in Indian Corporate Governance?*, Vol. 3, Corp. Governance L. Rev., 292 (2007).
[100] Lafarre & Elst, *supra* note 9, 9.
[101] Frank H. Easterbrook & Daniel R. Fischel, The Economic Structure of Corporate Law, 41-48 (Harvard University Press, 1996).
[102] The Companies Act, 2013, §114.
[103] *Id.*

of rentier investors in developing markets who are invested in the company for arbitrage or dividend and are not concerned with the internal governance, and therefore, choose not to vote.[104]

Thus, even though the purpose of the law through the regulatory (rules that an agent must follow) and governance strategies (principal's mechanisms to enforce their rules) is to ameliorate agency risks, it has been unable to assist minority shareholders. The minority shareholders are unable to effectively exercise their rights due to their miniscule impact. It is thus easy for the majority shareholder to either block the proposals of minority shareholders or use the regulatory strategies in order to attain validity for their own private benefit and opportunism, rather than that of the company. For instance, in 2021, media behemoth Zee Enterprises Limited witnessed the influence of its managing director Punit Goenka, who hushed away corporate governance concerns, with the matter never being allowed to be raised during the AGM.[105] A subsequent investigation by the Securities and Exchange Board of India ('SEBI') concerned with an abuse of power to siphon off Zee Enterprises Limited funds without authorisation, led to Goenka and other promoters being banned from holding any key managerial position in a listed entity.[106] The matter was proposed to be settled by the defendant and eventually led to a hefty settlement order without an admission of guilt on part of the defendants.[107] Thus, in such a hostile environment towards minority shareholders, it is imperative to view the solutions offered by blockchain to revive shareholder activism, while creating an unbreachable and efficient database to record the proceedings of such meetings.

Part III(B)(1) further inquires into the informational and participational inefficiency of the shareholder meetings as conducted traditionally. The balance is sought to be achieved by giving the informed shareholders a platform on the blockchain to come together, while reducing the costs involved in voting, and thus removing the functional issues which have been previously allowing a company's management to simply dictate the resolutions within the meetings. Thereafter, Part III(B)(2) highlights the procedural issues associated with shareholder voting, which occur at times due to appointment of proxies by shareholders. The solution offered by blockchain eases voting, provides an immutable ledger for

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[104] Lee Harris, *Missing in Activism: Retail Investor Abstinence in Corporate Elections*, Vol. 1, Colum. Bus. L. Rev., 177 (2010).

[105] Dev Chatterjee, *Zee Entertainment AGM Skips Discussions on Invesco Board Removal Plan*, Business Standard, April 17, 2022, available at https://www.business-standard.com/article/companies/zee-agm-board-sidesteps-questions-on-corporate-governance-lapses-121091401517_1.html (Last visited on October 5, 2023).

[106] *SEBI bans Subhash Chandra, Punit Goenka from Holding Directorial Position for Siphoning off ZEEL Funds*, The Indian Express, June 13, 2023, available at https://indianexpress.com/article/business/market/sebi-bans-subhash-chandra-punit-goenka-directorial-position-siphoning-off-zeel-funds-8659814/ (Last visited on October 5, 2023).

[107] The Securities and Exchange Board of India, Settlement Order in respect to Mr. Punit Goenka in the matter of Zee Entertainment Enterprises Ltd., No. 7117 OF 2023, SO/AN/EFD2/2023-24/7117 (April 13, 2023).

the appointment of proxy, as well as the vote of such a proxy, eliminating the possibility of human frailties to the maximum extent. Lastly, Part III(B)(3) attempts to transform the existing shareholder into a tokenholder, by proposing to replace the traditional equity share into utility and governance tokens. The token seeks to provide innate value in ownership in the company, while creating a robust corporate governance structure through a limited number of governance tokens being distributed.

1.   Informational and Participation Efficiency in General Meetings

The 2008 financial crisis brought forth the need for greater shareholder participation and an increased oversight over the board's decisions, thus, inadvertently making the board more accountable to the shareholders. The AGM typically plays an essential theoretical role in collective shareholder monitoring,[108] by furthering three primary functions. These are: *first*, carrying out the information function, *second*, providing a venue for shareholder meetings to discuss and enquire on relevant questions, and *third*, facilitating decision-making.[109] Despite the growth in corporate law, the traditional nineteenth century outline of an AGM refuses to evolve. The information function carries no potential advantage to the shareholders since the information sought to be mentioned and discussed is present in the public domain due to the evolved market regulatory and disclosure obligations.[110] However, the heightened need is to combat such shareholder apathy, i.e. the tendency to either refrain from voting or simply supporting the management due to the cost of coordination among minority shareholders being so high.[111] In effect, the same nullifies the AGM's goal of discussion, and decision-making being reduced to the prerogative of the management.

A study was conducted by Anne J. F. Lafarre in 2017 wherein a five year research period from 2010-2014 was chosen for a study of 251 companies in the seven Member States of the European Union – Austria, Belgium, France, Germany, Ireland, the Netherlands, and the United Kingdom, providing a sample size of 1255 AGMs.[112] An under-researched topic, the study revealed that small shareholders' were expected to vote only when they have more voting power, and that such shareholders are unlikely to attend in situations where the voting is concentrated in the hands of the largest shareholder.[113] Additional findings had revealed that the AGM was not meaningless to shareholders, but rather that there was a tendency to free-ride on the decisions of the larger shareholders and the corporate insiders.[114]

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[108]   Lafarre & Elst, *supra* note 9, 8.
[109]   *Id*., 9.
[110]   *Id*.
[111]   Umakanth Varrottil, *The Advent of Shareholder Activism*, Vol. 1(6), Journal on Governance, 588 (2012).
[112]   Anne J. Laffarre, The AGM in Europe: Theory and Practice of Shareholder Behaviour, 292-295 (Emerald Group Publishing, 2017).
[113]   *Id*.
[114]   *Id*.

An earlier study was conducted by Jayati Sarkar in the Indian context.[115] In the same, empirical evidence was used to draw a link between the ownership patterns and corporate governance concerns.[116] The data set used was the publicly disclosed information by listed companies in the private sector from 2000-2008. The results revealed that the promoter holdings are in control of a large majority of the listed companies, and the counter-vailing force of outside parties, i.e. other institutional shareholders and retail shareholders is weak, and ineffective in impacting decisions-making.[117]

A recent instance was during the 2021 AGM of Zee Enterprises Limited, wherein the board approved and appointed a non-independent executive director as a member of its audit committee.[118] In the AGM, no discussion was initiated by its chairman, R. Gopalan, even when the proxy advisory firm specifically raised corporate governance concerns, especially with regard to such an appointment, along with a request for an Extraordinary General Meeting ('EGM') by the minority shareholders on the said issue.[119] Lastly, to reiterate, the decision-making process is inherently flawed because of the low incentives that the small shareholders receive to engage themselves in the said process – since voting costs are generally higher than the incentives.[120] In the study conducted by Lafarre, shareholder turnouts conclusively showcased that the small shareholders willingness to participate is inversely correlated to the transaction costs involved in the voting.[121] The findings of the Corporate Governance Country Assessment of India conducted by the World Bank in 2004,[122] presented a similar finding on shareholder apathy, wherein the shareholders are unbothered by the company's activities.[123]

To counter these inefficiencies, blockchain-based smart contracting acts as a potential for enhancing informational and participation efficiency in general meetings. Blockchain technology substantially lowers the transaction costs and makes the voting process more transparent and reliable, indirectly increasing shareholder participation, and reigniting activism. A blockchain-based AGM is a better alternative to the current centralised setting. This is because shareholders will gain access to a decentralised network wherein information can now be

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[115]   Jayati Sarkar, *Ownership and Corporate Governance in Indian Firms* in Corporate Governance: An Emerging Scenario, 244 (National Stock Exchange, 2017).

[116]   *Id.*

[117]   *Id.*

[118]   Dev Chatterjee, *Zee Entertainment AGM Skips Discussions on Invesco Board Removal Plans*, Business Standard, September 14, 2021, available at https://www.business-standard.com/article/companies/zee-agm-board-sidesteps-questions-on-corporate-governance-lapses-121091401517_1.html (Last visited on October 5, 2023).

[119]   *Id.*

[120]   Frank H. Easter-Brook & Daniel R. Fischel, The Economic Structure Of Corporate Law, 78 (Harvard University Press, 1991).

[121]   Lafarre & Elst, *supra* note 9, 16.

[122]   World Bank, *supra* note at 98, 15.

[123]   George S. Geis, *Can Independent Blockholding Really Play Much of a Role in Indian CorporateGovernance?*, Vol. 3(3), The Corporate Governance Law Review, 292 (2007).

shared on a timely basis, and since every transaction posted on the network is time-stamped, it will allow the shareholders to easily access the particular piece of necessary information. The availability of quality information being available more readily and in a more organised manner, than in the present structure wherein the AGM leads to a chairman speech re-iterating the publicly disclosed information, would facilitate the information function and allow action upon such information to be take more readily. The platform provided to communicate will inevitably reduce the cost associated with minority shareholders to come together and is likely to have the catalyst effect of increasing the relevancy of the AGM by increasing the value of a shareholders' opinion, as well as their collective vote.

An EGM under Companies Act, 2013, is a meeting conducted to discuss special business of a company outside of an AGM.[124] As showcased in the 2004 World Bank report on the relationship between shareholders and Indian companies, shareholder apathy is not limited to participation in an AGM, but rather is representative of the fractured relationship shared between them.[125] Thus, in the traditional setting a director's sudden resignation warranting an EGM will be a highly expensive affair, wherein shareholders' are unlikely to incur costs so as to attend the meeting for appointing a new director, engage in discussion and thereafter vote on the resolution.

Blockchain, however, would allow a lightning-fast selection process on the blockchain network without incurring excessive voting costs, which can be initiated on the blockchain network. The decentralised public nature of the voting ledger coupled with its characteristics of immutability and non-repudiation will create an audit trail for the vote allowing it to be more transparent and reliable while eliminating the possibility of a human error. Further, a blockchain-based shareholder meeting will help facilitate a productive forum for shareholder discussions, and allow the previously irrelevant minority to now have a voice. The questions raised by shareholders, even while attempting to be ignored, will be present as time-stamped data on the blockchain, and so would the response from the daily executive – the board. This will prevent any manipulation in the minutes of the meeting prepared by the management, or subversion of shareholder voices as done in the Zee Enterprises Limited AGM.

2.   Shareholder Voting: A Proxy-Based System

Another unwanted common norm in today's corporate governance structure is voting through a proxy mechanism. The majority of shareholders worldwide, irrespective of jurisdictions, have started casting their votes through proxies, and it is these intermediaries who have the final authority in casting the

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[124]   The Companies Act, 2013, §102.
[125]   Geis, *supra* note at 123, 293.

votes.[126] As seen in the Yahoo case, wherein the inspector of elections revised the vote count stating that a glitch caused a significant undercount of votes against the directors, this translates into a remote voting system that lacks transparency, verification, and identification of the shareholders.[127] A study conducted in 2018 demonstrated that the Depository Trust & Clearing Corporation ('DTCC') had provided custody and asset servicing to 131 countries with an estimated value of USD 57.4 trillion.[128] This indicates that even though this trade repository is settling transactions and working as a clearinghouse, at the same time, it is providing these benefits at a significant cost.

Most notably, in May 2016, the judicial officer of a Delaware court denied the shareholders' petition and entered judgment against them by holding that they had lost standing to claim shareholder appraisal rights due to a proxy voting error.[129] Even while being consistent with the law, the judicial officer of the Delaware court had acknowledged the absurd outcome of the case.[130] As a result of a clerical error, the proxy voter recorded a vote contrary to the original shareholders' will, for a merger. The mistake led to the statutorily granted right of qualifying as a "dissenter" being taken away from such original shareholders.[131]

In India, a similar situation has been previously viewed in matters present before the Delhi High Court, *In Re Swadeshi Polytex Ltd.*,[132] wherein confusion due to the appointment of a multiple proxies, led to the vote being wasted and nullified as the proxy was adjudged to be ineffective. Thus, a trusted intermediary may still not be trustworthy enough to exercise the shareholder's true will. Therefore, within the current corporate structure it is evident that shareholders are losing, rather than gaining the power to make decisions. Further, the Madras High Court in *B. Ramachandra Adityan* v. *Tamilnadu Mercantile Bank Shareholders Welfare Assn.*,[133] while opining on the contractual relationship created via an appointment of a proxy-holder, noted that a revocation may only take place if the shareholder exercises his right to vote, prior to the proxy holder representing him. This implies that the rights will subsist in the agent up until a valid revocation is communicated to the agent, the company, and other shareholders by the principal (original shareholder).

[126] J. Travis Laster, *The Block Chain Plunger: Using Technology to Clean up Proxy Plumbing and Take Back the Vote*, Council of Institutional Investors, Chicago, September 29, 2016, 2-4, available at https://www.cii.org/files/09_29_16_laster_remarks.pdf (Last visited on October 5, 2023).

[127] Benjamin Pimentel & Dan Gallagher, *Yahoo Board Vote Count Sharply Revised*, Market watch. com, August 5, 2008, available at https://www.marketwatch.com/story/votes-against-yahoo-board-much-higher-than-first-reported (Last visited on October 5, 2023).

[128] DTCC, *DLT Can Support Trading Volumes in the US Equity Market*, October 16, 2018, available https://www.dtcc.com/news/2018/october/16/dtcc-unveils-groundbreaking-study-on-dlt (Last visited on October 5, 2023).

[129] Song, *supra* note 13, 12.

[130] *Id*.

[131] *Id*.

[132] In Re Swadeshi Polytex Ltd., 1988 (63) Comp. Cases 709.

[133] B. Ramachandra Adityan v. Tamilnadu Mercantile Bank Shareholders Welfare Assn., 2009 SCC OnLine Mad 1860.

Furthermore, the ownership in shares, mandatory in case of public companies and voluntary for private companies, has to be held only as beneficiaries through the depositaries – National Securities Depositaries Limited or Central Depository Services Limited.[134] This raises concerns as to the determination of exact voter lists with the voting process being facilitated entirely through these intermediaries.[135]

With blockchain technology, the entire voting system could be revolutionised, making corporations more dynamic and transparent.[136] Through such a mechanism, shareholders will have the power to cast their votes, at a click of a button, with lesser costs and thus eliminate the system of intermediaries. Using blockchain as a store of data, the requisite votes could be entered remotely and tallied in real-time.[137] Further, as blockchain is an unbreachable, transparent database, the recorded votes cannot be tampered with, it makes the election process simple and accessible.

However, one may misconstrue that the current online voting system is considered equivalent to the one as proposed in this paper. Studies showcase that many corporate elections face the problem of an inexact voter list.[138] Blockchain, as an immutable database, will solve this issue of inaccurate voter lists as once shareholder ownership or information is entered, it is permanently recorded. Further, there have been issues wherein the current voting mechanism has faced the problem of chaotic vote tabulation.[139] A reference could again be made to the 2008 Yahoo incident,[140] wherein the vote count was revised due to a glitch that caused a significant undercount of votes.[141] These concerns can thus be accurately addressed through blockchain architecture, making the process more accessible to the individual shareholder, and ultimately providing a blueprint for efficient corporate governance.[142]

At this juncture, however, it is necessary to note that the solution provided by blockchain through the elimination of intermediaries along with conduct of the voting with greater security, and transparency will still be susceptible to

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[134] *E-voting Facility by Listed Entities*, Economic Laws Practice, December 12, 2020, available at https://elplaw.in/wp-content/uploads/2020/12/ELP-Corporate-Update-e-Voting-Facility-by-Listed-Entities-SEBI-directs-simplification-of-the-process.pdf (Last visited on October 5, 2023).

[135] *Id.*

[136] Andhov, *supra* note 10, 25.

[137] *Id.*

[138] Marcel Kahan & Edward B. Rock, *The Hanging Chads of Corporate Voting*, Vol. 96, Geo. L. J., 1229 (2008).

[139] Yi-Wyn Yen, *Yahoo Recount Shows Large Protest: Yang's Approval at 66, not 85 Percent*, Huffington Post, May 25, 2011, available at http://www.huffingtonpost.com/2008/08/06/yahoo-recount-shows-large_n_117195.html (Last visited on October 5, 2023).

[140] *Id.*

[141] Benjamin Pimentel & Dan Gallagher, *Yahoo Board Vote Count Sharply Revised*, August 5, 2022, available at Last visited on October 5, 2023).

[142] See *infra*, Part IV(D) on "Corporate Trust Holder: A Look into Liquid Democracy".

human frailties, much like any process dependent upon human action. This implies that inaccuracy in the shareholder data fed on the chain along with technical glitches preventing a shareholder from voting altogether, may still take place, but are likely to be minimised in the future with greater refinement of the technology.

3.   Shareholder Versus Tokenholder

The waning interest of a shareholder in the companies governance requires us to critically analyse the base contract which forges such a relationship. A simple transaction will require a shareholder to buy the equity share of the company, which would lead to influx of capital for the company in exchange for voting rights for the shareholders. However, as we have observed above, such voting rights do not tend to remain relevant, leading to a possible flouting of corporate governance norms, and the deemed investment itself failing to stay relevant.

Through the introduction of tokens, an attempt can be made to revolutionise such a dynamic, by enabling and assisting in more specific wants of the shareholders' being satisfied. As discussed above, a token based on a smart-contract, functions on the basic principle of "If… then…". In colloquial terminology – if a specific condition is satisfied, then the program will proceed by sending or blocking the use of an amount of token.[143] Such smart contracts based tokens can be linked together to build complex organisation, where validation is the necessary first step in order to use and exhaust the token as the second step. The adoption of tokens will significantly lower transaction costs by eliminating intermediaries such as the depositaries, and share-transfer agents and make the execution of contracts instantaneous.

Moreover, a traditional shareholder typically acquires the voting rights in a company, along with a right to receive dividend. However, with the introduction of tokens, a shareholder's engagement with the company could be increased multi-fold. Based on the simple "if…then…" premise, it will be possible for a company to offer and securitise a multitude of things, other than merely the right to vote. For instance, an e-commerce behemoth such as Amazon in addition to a typical 'equity token' could propose a 'utility token' for subscribing shareholders. Thus, the previously limited equity share with no real-world application or value would now have an innate value. The nature of a utility token is such that the developer can programme any service or product for its holder. Amazon could perhaps incentivise its tokenholders to be more proactive in meetings through a utility token which offers extra discounts to such tokenholders, who satisfy the clause based on increased participation.

Further, through a utility token, the capital generation ability of a company is likely to increase with the return not only limited from the equity

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143   Magnier & Barban, *supra* note 30, 8.

token but from the real-world value generated out of the return from the utility token. However, the utility token will inadvertently be a cost to the company to raise capital,[144] and thus may not necessarily align with the company's best interests. As viewed in our example, the discounts offered by Amazon will be a cost incurred so as to offer and sustain such utility tokens.

Furthermore, companies could introduce 'governance tokens' which could rescue the miniscule impact a small shareholder currently has. For the precursor condition of the "if… then…" clause, matters could then be identified as those which require heightened corporate governance compliance – typically those requiring a special resolution. Such issues could thus now be voted upon through a governance token, wherein each shareholder will be only permitted to exhaust only one governance token to vote upon the matter, mirroring voting by a show of hands, rather than the prevalent voting by share percentage. The same directly tackles the issue of shareholder suppression, and counters the possibility of the management attempting to supress and push a corporate governance matter through. The nature of such tokens will inherently be limited and will be exhausted upon one use, thus preventing hoarding of such tokens. At the same time it will prevent the creation of a pool since only one token can be used for a single governance matter. However, it is crucial to note that the same is not immune to collusion among shareholders. To address this, the paper later in Part IV attempts to provide a comprehensive technical framework which could make such participation collusion proof.[145]

Thus, the introduction of blockchain technology could play a crucial role in reviving shareholder activism while making the modern AGM relevant again. At the very first instance, it would efficiently increase and improve the administrative concerns of recording information while promoting greater transparency. Thereafter, while a governance token would substantially increase the miniscule value which was earlier attached to the voting power, a utility token would inherently incentivise a shareholder to participate more actively. Additionally, the concept of differential voting rights could be absorbed efficiently within the flexibility of tokens. Hence, if used as a platform for voting, blockchain would not only have effects on very practical issues in the exercise of the vote but would also significantly impact shareholders behaviour.

C. *BLOCKCHAIN FOR AGENCY COSTS IN START-UP FINANCING*

This sub-part focuses on unlisted merger and acquisition deals and identifies governance difficulties that arise in typical start-up financing. It starts by

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[144] Edmond Baranes, et al., *Utility Tokens Financing, Investment Incentives, and Regulation*, 12, 2021, available at http://entfin.org/wp-content/uploads/2021/06/Utility-Tokens-Financing-Investment-Incentives-and-Regulation.pdf (Last visited on October 5, 2023).

[145] *See infra* Part IV "Redefining Alexandra Andhov's Proposal".

unpacking the agency costs that lie in private equity deals and identifies the existence of 'lemon effect'[146] which diminishes value for both the investor as well as the investee. Having done so, it delves into other more technical difficulties that arise in the process of due diligence when investing in the unlisted space. Cognizant of these difficulties, the paper ultimately moves on to proposing the role of blockchain in mitigating difficulties that may arise in start-up financing and through an illustration examines the role of smart contracts to improve the enforceability of contractually agreed clauses in investment agreements.

1.   Agency Costs in Start-Up Financing

In private equity, investors invest their capital in the investee (the start-up) to buttress the success of the enterprise, and, in return, the investee remunerates the investor with capital gains or dividends. This relationship can be characterised as a principal-agent relationship.[147] Michael C. Jensen and William H. Meckling have argued that whenever the economic assumption of a rational man is made (everyone acts to maximise their own utility), the investor (the principal), and the founder (the agent),[148] are bound to have divergent interests, and these players will act in the furtherance of these divergent interests.[149] These agency costs are further aggravated by the presence of informational asymmetry between the principal and the agent. The investees have better knowledge of their enterprise, its potential, and the market size and perception of their product. This is primarily because private companies are under no statutory obligation to disclose their financials to the market. The investor, therefore, only has access to perceptions about the enterprise industry insiders have. Even post-investment, when the investor has access to the financials of the enterprise, the investor cannot truly monitor how the investee is using the capital provided. The situation is worsened by the fact that entrepreneurs have the incentive to lie to investors.[150]

Such asymmetry in information leads to agency problems such as 'adverse selection' and 'moral hazard'.[151] *Prima facie*, the existence of these costs seems to only have implications for the investor and not the investee, as an obfuscated value could potentially push investors to overvalue a company. However, this assumption is the fruit of a very limited understanding of decision-making in private equity. Goerge Akerlof in his work discussed the existence of the 'lemon

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[146] *See infra* note 156.

[147] Stephan Poth & Torsten J. Selck, *Principal Agent Theory and Artificial Information Asymmetry*, Vol. 29(2), Political Studies Association, 137-144 (2009).

[148] Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure*, Vol. 3(4), Journal Of Financial Economics, 32 (1976).

[149] *Id.*

[150] Kyle Jensen et al., *Entrepreneurs and the Truth*, Harvard Business Review, 2021, 4, available at https://hbr.org/2021/07/entrepreneurs-and-the-truth (Last visited on October 13, 2023).

[151] R. Amit et al., *Why Do Venture Capital Firms Exist? Theory and Canadian Evidence*, Vol. 13(6), Journal Of Business Venturing, 441 (1998).

effect' in markets wherein the value of objects gets distorted to such an extent that it affects both the acquirer as well as the seller.[152]

This lemon effect principle can be explained through an illustration by applying it to the private equity space. Let us assume that there is an investor who is looking for entities to invest in. They understand that start-ups are risky investments and have a generally tendency to be overvalued. With this fear of overvaluation, the investor would specifically look for companies that have low valuations and would invest in companies that may have a very low price-earnings ratio. A low valuation could imply two things either the target company is attractively valued or that the target company's ability to generate returns are bleak. However, the risk averse investor in this example, might invest in this low valued entity assuming they are getting a good deal and their down-side risks are protected. The effect of such an investment strategy at a macro level is that entities that are fundamentally strong and hence have high valuations would automatically be rejected owing to the fears of overvaluation.

In effect, these companies would find it difficult to raise capital which might affect their performance whereas, the average companies with lower valuations would attract more investors and their capital. Eventually, this would weed out companies that perform really well (but have high valuations) and average companies with low valuations would multiply in number. Ultimately, such a scenario leaves the market full of companies that are not great investments and the overvaluation-under performance fear of investors gets reinstated once again to further deplete the pool of quality target companies. Akerlof goes onto suggest that to avoid such scenarios, the seller ought to provide adequate disclosures to the buyer so that they are reassured of the quality of asset and have more information to make a well-reasoned decision.[153] Therefore, mitigation of informational asymmetry in the private equity space is not solely the burden of the investor, but also of the investee.

One mode of reducing the informational asymmetry is for investors to conduct due diligence on the investee.[154] In typical due diligence, the investor goes through every document that is associated with the company and looks for potential risks. This exercise is conducted in pursuance of the principle of *caveat emptor*, and it allows the investor to be aware of the risks inherent to her investment.[155] However, this is not an easy process and is extremely time-consuming and laborious. The exercise is often outsourced to law firms who then, based on the risks discovered, inform the client on how to proceed with the transaction.

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[152] George Akerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, Vol. 84(3), The Quarterly Journal Of Economics, 488 (1970).

[153] *Id.*

[154] James A. Sherer et al., *Merger and Acquisition due Diligence Part II- The Devil in the Details*, Vol. 22, Rich. J.L. & Tech, 4 (2016).

[155] Arjya B. Majumdar, *The (Un?)Enforceability of Investor Rights in Indian Private Equity*, Vol. 41, U. Pa. J. Int'l l., 981 (2020).

The process of due diligence suffers from numerous practical challenges. As the statutory obligation on private companies qua reporting is minimal, often these companies do not maintain their files in an orderly manner and may often simply forget to share certain documents with the investor's lawyers or may purposely choose not to. Law firms then draft a requisition list wherein they make a list of documents that they need the company to send. In every transaction, numerous requisition lists have to be created. Not only does this process slow down the transaction, but it also increases the transaction costs as the lawyer's billables will increase, and any delay in the transaction will inevitably inflate the concomitant opportunity costs.

Finally, the scope for human error is very high. While the professionals involved in investment deals are qualified, the nature of documentation, especially pursuing statutory forms that the investee files with the government to make disclosure, can get tricky to retrieve information.[156] The case of *In re Motors Liquidation Co*,[157] best highlights the risk of human errors. Due to an error in understanding statutory filing to list out the properties that JP Morgan had over General Motors, JP Morgan accidentally unsecuritised USD 1.5 billion worth of property, for which JP Morgan then had to approach the courts in Delaware to once again perfect their title on the property.[158] The root of the problem is the fact that there are numerous governmental filing systems with different search methods[159] that are, at times, outdated[160] and have so many legal intricacies attached that have serious implications on their validity and lapse.[161] These labyrinthine and abstruse forms of retrieving information from these forms or even identifying all the necessary forms only aggravates human errors in investment deals.[162]

By virtue of being a DLT, blockchain can greatly reduce such risks in investment deals and lower transaction costs. DLT allows parties to track the trajectory of transactions in accurate order and allows the concerned stakeholders to reach a consensus on the veracity of these transactions, ensuring informational symmetry between the parties without relying on a third party.[163] Furthermore, by creating a single immutable append-only ledger, DLT creates a 'pure copy' of transactions and disclosures by parties which ameliorates the need for stakeholder to maintain their own copies of the information.[164] In addition to the forego-

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[156] Lynn M. LoPucki, *The Spearing Tool Filing System Disaster*, Vol. 68, Ohio St. L. J., 281 (2007).

[157] Motors Liquidation Co. In re, 777 F.3d 100 (2015).

[158] *Id*., ¶¶777-778.

[159] Lynn M. LoPucki, *Computerization of the Article 9 Filing System: Thoughts on Building the Electronic Highway*, Vol. 55, L. & Contemp. Probs., 5 (1992).

[160] Eric M. Sherman, *Chasing Perfection: Collateral Indications and Ambiguous Debtor Names on Financing Statements Under Article 9*, Vol. 61, B. C. L. Rev., 2229 (2020).

[161] LoPucki, *supra* note 159, 24-25.

[162] *Id*.

[163] Carla L. Reyes, *Creating Cryptolaw for the Uniform Commercial Code*, Vol. 78(4), Wash. & Lee L. Rev. 1521, (2022).

[164] Steve Young, *Changing Governance Models by Applying Blockchain Computing*, Vol. 26, Cath. U. J. L. & Tech, 87 (2018).

ing benefit of lower monitoring costs,[165] the pure copy is created in an unreliable system,[166] which helps reduce agency costs in transactions.[167]

Taking cognizance of these benefits, the Delaware blockchain initiative allowed companies to make their corporate filings on DLT. Experts have noted that since this change, the process of disclosures has been automated *in toto*.[168] If all companies were to adopt such a model, it could revolutionise the due diligence process by enhancing the ease of access of law firms to an investee's documents. Such a system would stave off the unnecessary hassles of creating requisition lists and other practical problems that arise in a typical due diligence process.

2.   Smart Contracts to Contract Out of Transaction Risks

Parties can take steps to reduce agency costs by monitoring the actions of the counterparty, taking steps to improve the chemistry between them and aligning their interests. In a nutshell, this is the process adopted in any investment deal wherein the investor first conducts due diligence on the company she intends to invest in and identifies the risks of her investment. Based on this report, she decides either to not invest at all or to incorporate certain clauses in the definitive documents such as share subscription agreement or share purchase agreement and shareholder agreements, which allow her to lower her investment risk. However, these measures inevitably inflate the transaction cost because parties now have to factor in the monitoring cost, the cost of information acquisition and the cost of aligning interest.[169]

Mounting information acquisition costs are not only private in nature but pose externalities which in turn lead to the systemic risk of adverse selection.[170] If the cost of information acquisition is too high, investors would prefer to rely on market signals rather than acquiring tangible information.[171] Market signals without the corroboration of tangible evidence can be extremely misleading and may cause investors to become extremely paranoid and factor in a certain amount of

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[165]   Wulf A. Kaal, *Private Investment Fund Regulation – Theory and Empirical Evidence from 1998 to 2016*, Vol. 20, J. Bus. L., 579 (2018).

[166]   *Id*.

[167]   Gregory Benson, *Comment, Implications of Adopting Blockchain Technology on International Sales Transactions*, Vol. 39, N. Ill. U. L. Rev., 486 (2019).

[168]   Andrea Tinianow, *Delaware Blockchain Initiative: Transforming the Foundational Infrastructure of Corporate Finance*, Harvard Law School Forum on Corporate Governance, March 16, 2017, available at https://corpgov.law.harvard.edu/2017/03/16/delaware-blockchain-initiative-transforming-the-foundational-infrastructure-of-corporate-finance/ (Last visited on October 5, 2023).

[169]   Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure*, Vol. 3(4), Journal Of Financial Economics, 32 (1976).

[170]   Sarah Glücksman, *Entrepreneurial Experiences from Venture Capital Funding: Exploring Two-Sided Information Asymmetry*, Vol. 22(4), Venture Capital, 331 (2020).

[171]   Cristiano Bellavitis et al., *Mitigation of Moral Hazard and Adverse Selection in Venture Capital Financing: The Influence of the Country's Institutional Setting*, Vol. 57(4), Journal Of Small Business Management, 1328 (2019).

risk in every investment they make which lowers their willingness to invest.[172] Poor investments forces investors to become extra sensitive about valuations and may force them into making inefficient decisions wherein they decide to not invest in a good company due to its pricy valuation and instead invest in a fundamentally inferior company that may have a lower valuation. This inefficiency eventually drives out the good companies because of the lack of demand and leaves behind a pool of companies which *prima facie* have a low valuation and hence appear as a bargain deal,[173] creating the lemon effect.[174]

Moreover, granted the definitive documents play a critical role in lowering these agency costs by equipping the investors with *ex-ante* and *ex-post* measures to align interests in case of a divergence in the future,[175] the enforcement of these definitive documents gives rise to new transaction costs (enforcement costs). An investor may have a certain clause that, upon a certain interpretation, protects her interest. However, if courts interpret the same clause in another manner, her rights are nullified. In other jurisdictions, the legal system may not enforce all the clauses in a shareholder agreement,[176] leaving the investor without a remedy. Definitive documents also create additional monitoring costs because the investors must constantly monitor whether the conditions precedent ('CP') and condition subsequent ('CS') to the investment have been satisfied or breached. The existing framework goes a long way in mitigating agency costs. However, it arguably also adds new agency costs, which begs the question as to whether there is a better mechanism.

One alternative to the traditional deal structure is to ascribe dollar values to the performance of CP and CS and to use smart contracts to either claw back or pump in the investment amount that corresponds to the dollar values to the performance of CP and CS. As an illustration, consider an investment deal worth USD 100 million. The valuation would have been USD 20 million lower had the investee not agreed to comply with the CP and CS. Therefore, the mere existence of the CP and CS adds USD 20 million to the transaction, and a dollar value of USD 20 million can be ascribed to them. The investor would now have to actively monitor their performance, presumably by requiring the investee to submit documents that prove the completion of CP before the longstop date and post the closing, the process would be repeated for CS. The investor can make the task of monitoring more efficient by coding a smart contract under which USD 10 million is ascribed to the performance CP and the remaining USD 10 million to the performance of CS. The investor can then choose to invest USD 90 million (pre-performance of

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[172] Jiong Min Yong, *Deterministic Time-Inconsistent Optimal Control Problems — An Essentially Cooperative Approach*, Vol. 28, Acta Mathematicae Applicatae Sinica, English Series, 1 (2012).

[173] Jinting Yang et al., *Game Analysis on the Double Principal-Agent Risk in Risk Investment*, Pacific-Asia Conference On Knowledge Engineering And Software Engineering, 159 (2009).

[174] Akerlof, *supra* note 152.

[175] Francesca Cornelli & Oved Yosha, *Stage Financing and the Role of Convertible Securities*, Vol. 70(1), The Review Of Economic Studies, 1 (2003).

[176] Majumdar, *supra* note 155.

CP value in addition to the CS value) of which the smart contract will be coded to claw back USD 10 million if the Oracles fail to detect the performance of CS. The balance USD 10 million (CP Value) will be transferred to the investee as long as the oracles detect completion of CP before the agreed upon date. While this is a simplistic example for the purpose of illustrating a use-case scenario, the quantum of investment value contingent under the smart contract can be altered to match the specific requirements of the investment deal at hand.

The principal advantage of this deal structure is that the investor no longer has to actively monitor the performance of CP and CS and in case of non-performance. It lowers the agency costs of the investors as they no longer have to satisfy a court of a breach in the performance of the contract or trying to counter the arguments of the counterparty that condition precedents have not been satisfied yet, to recover their investment.[177] Similarly, this system does away with the entire risk of a clause in the agreement or the agreement itself being deemed unenforceable in a court of law and allows parties to execute the bargain they negotiated.[178] On the other hand, the investee has access to a sizeable chunk of the investment deal even before the performance of CP, which allows the investee to perform them with greater ease and have greater access to capital. Above all, since this mechanism gives the investor a means for investment, where the amount invested is directly correlated to the enforcement of the investor's investment protections rights, the investor will be more confident in investing. This will then keep the lemon effect at bay and enable companies to achieve better valuations.

Blockchain's role in lowering transaction costs has been recognised globally and is being implemented in a foray of avenues.[179] Recently Maersk entered into a partnership with IBM to develop a blockchain alternative to the existing labyrinth of paperwork involved in shipping and supply chains.[180] IBM has partnered with Northern Trust to create a blockchain ecosystem to facilitate private equity deals at an unprecedented pace and transparency.[181] This is not a proof of concept, but a very real blockchain platform that has revolutionised private equity deals. Unlike typical scenarios where a high information asymmetry exists between the founders and investors,[182] this platform leverages DLT to make information more accessible to potential investors. The platform also allows fund man-

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[177] Cong & Zhiguo, *supra* note 21.

[178] Eliza Mik, *Smart Contracts: Terminology, Technical Limitations and Real World Complexity*, Vol. 9, Law, Innovation And Technology, 269 (2017).

[179] Max Di Gregorio, *Blockchain: A New Tool to Cut Costs*, available at https://www.pwc.com/m1/en/media-centre/articles/blockchain-new-tool-to-cut-costs.html (Last visited on October 5, 2023).

[180] M. White, *Digitizing Global Trade with Maersk and IBM*, IBM, October 9, 2023, available at https://www.ibm.com/blogs/blockchain/2018/01/digitizing-global-trade-maersk-ibm/ (Last visited on October 10, 2023).

[181] Kevin Pleiter, *Northern Trust Trusts Blockchain for Private Equity*, IBM Think Blog, October 4, 2022, available https://www.ibm.com/blogs/think/2017/02/39850/ (Last visited on October 10, 2023).

[182] Sarah Glücksman, *Entrepreneurial Experiences from Venture Capital Funding: Exploring Two-Sided Information Asymmetry*, Vol. 22(4), Venture Capital, 8 (2020).

agers to manage, transfer and assess the audited performance of their asset, i.e. the investee company, throughout its investment lifecycle in a transparent manner offering "one version of the truth" to investors.[183]

Finally, a system very similar to the one proposed in this part is being mulled over to be applied as part of the Delaware blockchain initiative. There are plans to link the DLT filing with smart contracts through oracles to automate the process of requiring counterparties to act in a certain way.[184] For instance, Uniform Commercial Code filings qua collaterals are constantly monitored by oracles, and the moment the value of the collateral dips, the oracle informs the smart contract of the same, which in turn requires the debtor to provide more collateral for securitising the debt.[185] The attraction of such a system lies in the fact that it obviates the need for intermediaries, and the concomitant absence of subjectivity lowers the instances of biases and uncertainty and helps reduce agency costs through the adoption of a trust-less structure.

For instance, in India, interpretation of put options with an internal rate of return construct in investment agreement in favour of non-residents has been hotly contested. In numerous instances although the clause was drafted as a claim for damages, the Reserve Bank of India has treated them as clauses granting an assured return and come down heavily upon residents who have purchased shares from non-residents pursuant to such clauses.[186] Such uncertainties generate a lot of uncertainties where parties are unsure whether a clause that they contractually agreed with a particular intent in mind will be interpreted as such when it is the bone of contention before courts. Mitigating such subjectivity would greatly aid in providing investors confidence over their investments.

For long the position on blockchain has been that it is a technology for the sake of technology.[187] However, as the use cases of blockchain increase by the day, companies and investors must pivot in their thinking and formulate new strategies that allow them to leverage the benefits of innovation in blockchain. The first movers in this space accelerate the disintermediation and catalyse the evolution of blockchain and other advanced applications of DLT, such as Ethereum infrastructure in finance.[188] The first-mover advantage allows the few select firms to reap the benefits of novelty and forward-looking brand image.

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[183] Nathan Fulmer, *Exploring the Legal Issues of Blockchain Applications*, Vol. 52(1), Akron Law Review, 8 (2019).

[184] Jared Arcari, *Decoding Smart Contracts: Technology, Legitimacy, and Legislative Uniformity*, Vol. 24, Fordham J. Corp. & Fin. L., 363 (2019).

[185] Tinianow, *supra* note 168.

[186] NTT Docomo, Inc. v. Tata Sons Ltd., 2017 SCC Online Del 8078; Cruz City 1 Mauritius Holdings v. Unitech Ltd., 2017 SCC Online Del 7810; Banyan Tree Growth Capital LLC v. Axiom Cordages Ltd., 2020 SCC Online Bom 781.

[187] Andhov, *supra* note 10.

[188] Kaal, *supra* note 18.

IV. REDEFINING ALEXANDRA ANDHOV'S PROPOSAL: ADAPTING BLOCKCHAIN INFRASTRUCTURES TO MEET MODERN CORPORATE STANDARDS

The adoption of blockchain tools into corporate governance brings about a systems change with plethora of advantages as seen in the previous part. However, it is necessary to understand how a corporation would function on a distributed ledger. For this, it is important to deliver a model which would enable the readers, practitioners, governmental agencies and developers to comprehend the possibility and practicality of using blockchain infrastructure through a corporation. Therefore, in this part we evaluate Alexandra Andhov's proposal of using blockchain infrastructure through a corporation and subsequently envisage a more nuanced framework for future considerations.[189] The aim of this part is twofold: *first*, to provide a brief insight into Andhov's proposal and *second* to evaluate the proposal and provide a refined structure which best suits the corporate needs in tandem with the rapid growth that is currently taking place in the blockchain space.

A. ALEXANDRA ANDHOV'S PROPOSAL

Through her proposal, Andhov does not intend to provide a bullet-proof technical solution, rather an analysis of the advantages that each proponent of a corporation could ideally expect by adopting the blockchain infrastructure.

Andhov has divided her proposal into six segments. The most effective way to summaries her proposal is by drawing reference to the requirement of a strong foundation for a house upon which the whole structure of the house is dependent. Similarly, the foundation of her proposal is the debate that she entails regarding the type of blockchain that would best suit the needs of a corporation. She argues that for the purposes of a corporate architecture, a permissioned blockchain (consortium blockchain or a combination of private and consortium) or a sidechain blockchain,[190] would be the most efficient as compared to their permissionless counterpart.

Andhov tries to maintain that the permissioned network is preferable to its permissionless counterpart because of its controlled access functionality.[191] To support her argument she furthers the instance of specific corporate parties like the shareholders. Shareholders as per her are the heart and soul of a corporation but at the same time their access to corporate information should be limited.[192] Permissionless blockchain would not limit the amount of information

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[189] Andhov, *supra* note 10, 29.
[190] *Id.*, 30-31.
[191] *Id.*, 30.
[192] *Id.*

that the shareholders can read or write on the blockchain. Whereas, permissioned networks would curtail the amount of information that is being spread across the system and ensure that only the concerned individuals, i.e. nodes, have the right to access such classified information.[193]

In addition, Andhov is pro permissioned blockchain because of the secondary advantages that it offers. For instance, unlike the scalability issue of permissionless blockchain (due to substantial number of participants), permissioned networks are less congested and so, markedly faster.[194] Moreover, her preference is justified as permissioned networks are purpose-driven in nature which means that in contrast to a public blockchain, these networks are only formed with an intrinsic goal in mind. This can be hugely beneficial for the corporate setting as it would help in information sustenance and consistency in record keeping and shareholder voting.[195]

On the other hand, sidechains are permissioned networks which are secondary to the mainchain and have their own consensus/security protocols.[196] These secondary chains are inter-connected with each other and the mainframe via a two way peg.[197] This interoperability allows for the possibility of data transfer from one chain to the other at a fixed exchange rate without any compromise on decentralisation or scalability.[198] Andhov endorses the sidechain technology as it is essentially based on the division of work functionality. The multiple secondary chains help reduce the transaction load of the mainchain by validating the transactions on the secondary chains itself and maintain the mainframe as a repository of data.

Andhov's example of stock exchanges as possible sidechains is convincing since the independent public trading companies would each have their own sidechains, which would enable them to validate and approve transactions, while simultaneously interoperating the relevant data with the mainchain which would be characterised as the central clearing house.[199] However, the biggest drawback or challenge that this type of a distributed network system can face is with relation to its independent security protocols. For example, in the case of stock exchanges, every publicly traded company would have its own sidechain and so would have to set up their own consensus/security protocols. The problem arises when one of the sidechain's (publicly traded company's) security is breached. Even though the security protocols are not inter-connected, the whole system would suffer as *firstly*, the data from a company's sidechain would not be stored on the mainchain

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[193] *Id*., 31.

[194] *Id*.

[195] *Id*.

[196] Amritraj Singh et al, *Sidechain Technologies in Blockchain Networks: An Examination and State-of-the-Art Review*, Vol. 149, J. Of Network & Comp. App., 1-2 (2020).

[197] *Id*.

[198] *Id*.

[199] Andhov, *supra* note 10, 31.

and therefore the transparency characteristic becomes redundant. *Secondly*, from an economic perspective, the whole trading system will be financially affected if a company's trading functionalities are suspended because of a security breach. We endeavour to provide a solution to this problem in the next sub-part.

After a strong foundation has been laid, it is important that the house has pillars for its sustenance. Analogously, Andhov has identified four pillars, i.e. governmental agencies, the corporation itself, shareholders and stock exchanges, on which the sustenance of the whole of corporation depends.[200] For governmental agencies, Andhov attempts to weed out the uncertainty of whether an agency should be an observer or a developer or both.[201] Her main concern with the shift of corporate architecture to a blockchain system is the supervision and regulation of such a network. She argues that without the necessary regulatory body, a few nodes on such a decentralised network would have the opportunity and the incentive to collude and manipulate the system.

For instance, if company X and company Y shift their entire corporate infrastructure on a blockchain-based system which has no supervision or regulation, the companies then would have the incentive to collude and attempt to carry out a 'fifty-one percent attack' on the network to reap the benefits. Andhov advances a solution to this problem. She endorses the establishment of a permissioned blockchain controlled by a government regulatory authority such as the Securities and Exchange Commission.[202] Although this would limit the manipulative and collusive power of the corporations but it is not without its own flaws which we examine in-depth in the forthcoming sub-parts. To counter the flaws we propose the institution of a Decentralised Autonomous Organisation ('DAO') as the regulatory body which operates and regulates the consortium of corporations by undertaking a '*de minimis*' approach.

Further, with regards to corporations as trust holders, Andhov appears to have taken a balanced approach.[203] She contends that corporations could be the trust holders but only towards a specific set of rights.[204] She argues that corporations and government regulators should both have the key to the corporate treasure as it would ensure balance in the system.[205] We agree with Andhov's analysis. However, we believe that a technologically advanced field such as blockchain requires leniency in supervision and regulation and the same cannot be achieved if a government regulator has an overarching power dynamic in the system. Therefore, for this particular pillar we take a different road and advocate for a system wherein corporations can be effective trust holders with partial governance and regulation handed over to the regulator, i.e. the DAO.

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[200] *Id.*, 29-37.
[201] *Id.*, 32.
[202] *Id.*, 33.
[203] *Id.*, 35-36.
[204] *Id.*
[205] *Id.*

For shareholders, Andhov takes a unique perspective whereby she tries to classify them as either miners or readers.[206] According to her there could be two possible situations. One wherein all the shareholders act as miners on the network and earn a reward for their work, or there is a classification amongst the shareholders and some are given the right to mine whereas others are just passive participants.[207] The problem with this proposition would be that in the first scenario. This is because even though decentralisation would increase, scalability and security would be massively affected. Similarly, in the second instance wherein she proposes a classification of shareholders, the practicality of such an approach can be brought into question. How does a classification happen? Who is given preference over whom? What are the criteria which are evaluated in order to give one shareholder preference over the other. These question could pose a significant challenge when implementing Andhov's proposal. Therefore, we have taken an altogether different approach to solve this consensus issue.

Lastly, in relation to stock exchanges, Andhov tends to present certain instances wherein different stock exchanges have adopted blockchain technology to build a digital platform for issuing stocks.[208] She neither lays down a particular proposal for this part nor delves into the specifics of how the blockchain-based stock exchange would function. In order to bridge this inherent gap we view that it is necessary to go one step ahead and introduce the concept of Decentralised Exchanges (DEXs) and subsequently assess its importance in a blockchain-based corporate governance system.

Andhov concludes her proposal by mentioning the risks and inherent flaws of blockchain technology. She touches upon the 'fifty-one percent attack', the concern of cost related to setting up and maintaining the blockchain ecosystem and the substantial flaw of high energy consumption by a blockchain network.[209] In addition to these flaws and concerns we also provide other more recent and relevant drawbacks of this DLT that could impact the corporations on-chain.

B.   REDEFINING ANDHOV'S PROPOSAL

It is argued that with the ever evolving technology, it is very difficult to propose a fool proof solution. Rather, the scholarships on blockchain based corporate governance should develop on the already existing literature. Therefore, through this sub-part, the paper attempts to extend a proposal which develops on the already existing framework laid down by Andhov.

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[206]   *Id.*, 36-37.

[207]   *Id.*

[208]   *Id.*, 33-35.

[209]   *d.*, 37-38.

1. Consortium Blockchain: The Way Forward

While debating about the type of blockchain that best suits the corporate architecture, it is extremely important that one keeps in mind the three basic principles, i.e. scalability, decentralisation and security. Blockchains can be categorically divided into public, private, and consortium blockchain.[210] Public blockchains can be defined as a trustless system wherein the code is open source making the database accessible to anyone anywhere and thereby making the technology redundant.[211] For instance, Bitcoin is an open source blockchain wherein there is no central authority but instead an open network where users have the liberty to send in new transactions and also verify the blocks. In contrast, private blockchains are centralised blockchains in which only the users with permission can enter and validate the transactions.[212] These networks generally use proprietary source code, i.e. they are created by private organisations who themselves define the roles, use and applications on the network.[213] For instance, Ripple, a digital payment protocol, is a private blockchain as it uses bank owned servers to validate transactions.[214]

Unlike a public and a private blockchain, consortium blockchain is a subtype network which has fewer nodes as compared to a public blockchain, but is more secure and scalable because of less load on the network.[215] Consortium blockchain can alternatively be defined as an enterprise-level blockchain that does not compete in establishing a resource-saving global consensus algorithm.[216] They may be viewed as a close relative to private blockchains but in reality there are slight differences in the architecture of the two blockchains. In a private blockchain only a single organisation will have access and authority to read and validate transactions on the network.[217] Whereas, multiple organisations can be a part of a consortium blockchain where every organisation will have the same amount of access and authority over the network.[218]

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[210] Vitalik Buterin, *On Public and Private Blockchains*, Ef Blog, April 7, 2015, available at https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/ (Last visited on October 10, 2023).

[211] Dominique Guegan, *Public Blockchain versus Private Blockchain*, HAL-SHS, 2 (2017).

[212] *Id.*, 3.

[213] Bodó et al, *supra* note 25, 318.

[214] Jake Frankenfield, *Ripple*, Investopedia, April 10, 2022, available at https://www.investopedia.com/terms/r/ripple-cryptocurrency.asp (Last visited on October 10, 2023).

[215] Vrinda Mathur, *What is a Consortium Blockchain?*, Analytics steps, July 8, 2022, available at https://www.analyticssteps.com/blogs/what-consortium-blockchain (Last visited on October 10, 2023).

[216] Wei Yao et al, *A survey on Consortium Blockchain Consensus Mechanism*, Vol. 2, NJIT, 1 (2021).

[217] Diego Geroni, *Private Blockchain versus Consortium Blockchain*, 101 Blockchains, November 3, 2022, available at https://101blockchains.com/private-blockchain-vs-consortium-blockchain/ (Last visited on October 10, 2023).

[218] *Id.*

Types of Blockchain	Read	Write	Validate	Examples
Public	Any participant/user	Anyone	Anyone	Bitcoin, Ethereum and Solana
Private	Network identified users only	Network permissioned operator only	Network operator only	Ripple, R3's Corda and Hyperledger
Consortium	Network authorised participants only	All authorised participants or a subset of authorised participants	All authorised participants or a subset of authorised participants	Quorum, Ethermint and Tendermint

Andhov has rightly pointed out that public blockchain, which are permissionless, are not ideal for a corporate governance because of the openness of the network.[219] Imagine a joint venture deal happening via a permissionless blockchain where every participant can read, write and validate. It will permit the flow of information to every participant who should not in an ideal situation have access to such information. The controlled access functionality can only be achieved via a private or consortium blockchain, which have permissions embedded in the network, and therefore, only a limited number of parties can read, write and validate.

However, as discussed above, a private blockchain has one single central node which has access and authority to write and validate transactions on the network. This would be against the basic principle of decentralisation. If one were to opt a private blockchain for corporations, it would be entirely analogous to a current corporate situation wherein the Board of Directors have the ultimate say in governance. Another drawback would be that if a large number of corporations are on a private blockchain then it begs the question as to which single corporation/entity will have the authority to write and validate and how such a classification would take place. These inherent challenges would ultimately outweigh the benefits offered by such a technology.

Therefore, we propose the setting up of a consortium blockchain wherein the network authorises the participants who can contribute in the consensus. As opposed to a private blockchain it does not have a single node. Rather it contains multiple nodes all coming together to form consensus, and it is superior than a permissionless blockchain because of its feature of controlled access. A consortium blockchain therefore becomes more scalable than a public blockchain, more decentralised than a private blockchain. Further, by the virtue of having multiple nodes it is more secure than both the other counterparts.

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[219] Andhov, *supra* note 10, 30.

However, there happens to be a gap in the proposal which needs to be addressed. At present a default consortium chain mainly uses a Practical Byzantine Fault Tolerance ('PbFT') consensus protocol which in case of multiple corporations will lead to a system communication congestion.[220] PbFT is a consensus security protocol that is based on the ideology of the byzantine generals problem whereby the protocol presents the network with the advantages of fault tolerance and large transaction throughputs.[221] Scalability can be best defined as being directly proportional to the amount of transactions processed by a blockchain network.[222] As the amount of transactions will increase with the increase in users, the nodes that have the authority in the validation process will remain the same because of restricted access making the overall network less scalable and therefore congested.

Sidechain technology, as notated by Andhov, could be a solution to this inherent gap because of its nature to independently process transactions on multiple side-chains and lower the overall load of the mainchain.[223] However, this technology too has its drawbacks for corporate architecture. The sidechain technology was developed to create a discrete two-way link between the mainchain and the sidechain.[224] This two-way peg makes the sidechain independent with its own consensus and security protocols.[225] However, they are still interoperable to the mainchain signifying that all the metadata related to the transactions processed on a sidechain are still recorded on the mainchain, which is a permissionless blockchain.[226] This would not be an optimal technology for corporate structures because of the confidential information that is getting shared with unauthorised users.

Therefore, we deem apposite to propose a sharded consortium blockchain to solve the issue of scalability and simultaneously account for decentralisation and security. Sharding can be best defined as partitioning of the computational and storage workload of a decentralised network.[227] Herein each node is not responsible for the entire transactional load of the network, and instead it is

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[220] X. Wu et al., *An Efficient Sharding Consensus Algorithm for Consortium Chains*, Vol. 13, Sci. Rep, 20 (2023).

[221] Xiandong Xeng & Wenlong Feng, *Research on Practical Byzantine Fault Tolerance Consensus Algorithm based on Blockchain*, Vol. 1802, J. Of Physics Conf. Series, 14 (2021).

[222] Sneha Goswami, *Scalability Analysis of Blockchains through Blockchain Simulation*, Unlv Theses, Dissertations, Professional Papers, And Capstones, 2976 (2017).

[223] Crypto.Com, *What are Sidechains? Scaling Blockchain on the Side*, February 4, 2021, available at https://crypto.com/university/what-are-sidechains-scaling-blockchain (Last visited on October 5, 2023).

[224] Singh et al., *supra* note 196.

[225] Adam Black et al., *Enabling Blockchain Innovations with Pegged Sidechains*, Blockstream (2014).

[226] A. S. Yadav et al., *Sidechain: Storage Land Registry Data Using Blockchain Improve Performance of Search Records*, Vol. 25, Cluster Comput, 1475–1495 (2022).

[227] Lucas Mearian, *Sharding: What it is and Why Many Blockchain Protocols Rely on it*, Computer World, December 28, 2022, available at https://www.computerworld.com/article/3336187/sharding-what-it-is-and-why-so-many-blockchain-protocols-rely-on-it.html (Last visited on October 5, 2023).

responsible to maintain the information of its 'partition' or 'shard'.[228] This results in parallelisation in the network and transactions can be executed at the same time thereby reducing network congestion and increasing transaction throughput.[229] With a sharded consortium blockchain as the foundation, the corporations on the consortium chain will each have a node and their own shard or partition to improve transactional throughput and thereby increase the scalability, security and decentralisation in the network.

Further, the consensus protocol that would be used in such a sharded chain would be the proof-of-stake consensus. The proof-of-stake consensus mechanism, is an ideal choice for our permissioned chain because of the less computational resources that are required to validate a block.[230] The probability to create a block and receive the requisite reward is dependent on the participant's stake in the network and not on the solving of an extensive mathematical puzzle which requires large computational resources.[231] Moreover, with the low cost of implementing and maintaining a proof-of-stake consensus in the network, coordination of managing multiple shards effectively would be undemanding.

Figure-2 below depicts the model of a sharded consortium blockchain. The mainchain is the consortium blockchain which is hypothetically divided into three shards. Nodes of the consortium blockchain are equivalent to a corporation, implying that every corporation has one node. Transaction ('Tx') Pool is a repository of transactions which are to be processed on the consortium blockchain. A consortium blockchain without a sharding consensus would not have partitions and every transaction in the Tx Pool would be validated after consensus is reached amongst all the nodes of the consortium chain. This lowers the scalability of the network as parallel validation is not possible. However, in a sharded consortium blockchain, the nodes are divided into each shard. In such a model, the transaction only needs to get a consensus of the nodes of the particular shard in which the transaction is being processed and not of the those that do not belong to that shard. This increases the transactional throughput whereby transactions can be validated parallelly.
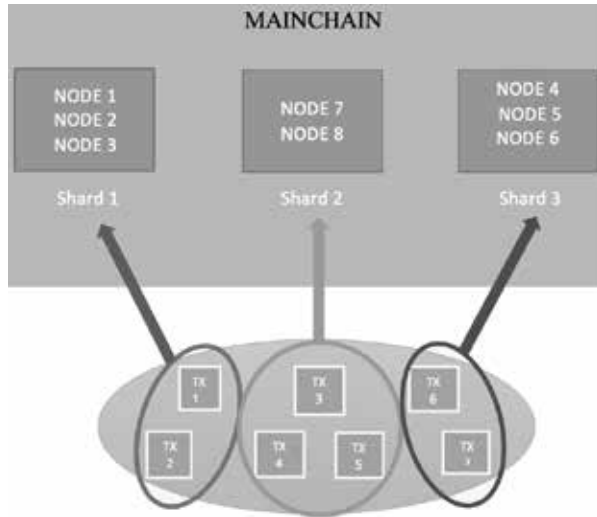
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[228] *Id.*

[229] Song, *supra* note 13.

[230] Igor Makarov & Antoinette Schoar, *Cryptocurrencies and Decentralized Finance*, Vol. 1061, Bɪs Wᴏʀᴋɪɴɢ Pᴀᴘᴇʀs, 9 (2022).

[231] *See supra* notes 54 and 55.

Figure-2: Sharded Consortium Blockchain Model

Nonetheless, this concept is not without its own flaws. Primarily, in relation to the setting up of a consortium blockchain, we believe that there could be two main challenges that corporations could face. *First*, problem related to governance of competition and *second* problem related to lack of trust in the network. With the corporations each having a node on a consortium chain, there could be instances where the existing nodes deny new corporations entry into the market.[232] For instance, a consortium blockchain of web services may consist of primary players such as Amazon Web Services, Microsoft Azure, and Oracle. For very obvious reasons these primary nodes having the power to append the chain would want to restrict the entry of a new player such as IBM or Alibaba in order to create an oligopoly in the system. This could result in an anti-competitive practice in the blockchain network.

Additionally, this DLT being trustless in nature goes against one of the basic principles on which corporate governance is theorised. Ralph Chami and Collen Fullenkamp believe that the purpose of a good corporate governance model is to warrant the maximisation of shareholder interests including but not limited to the shareholder wealth and participation agency.[233] These interest according to them are only possible when there exists a notion of trust in the system whereby a mutual confidence develops between the shareholders and the corporations.[234] To support this contention, they cite relevant authors such as Nobel Laureate Ken Arrow and Fukuyama. Arrow remarks trust as a necessary element in the

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[232] Elyes Ben Hamida et al., *Blockchain for Enterprise: Overview, Opportunities and Challenges*, ICWMC, 6 (2017).
[233] Ralph Chami & Collen Fullenkamp, *Trust as a Means of Improving Corporate Governance and Efficiency*, Vol. 33, IMF Working Paper, 3 (2002).
[234] *Id.*

development of the economy, more important than technology, education or any other resource.[235] Whereas, Fukuyama observes that trust in the system improves the performance of the institutions.[236] Andhov too has rightly pointed out that because of the lack of trust in a permissioned blockchain there is no guarantee that a corporate node would not tamper with the network for its own benefit.[237] Therefore, for future research it begs the question: Whether corporations and its proponents could survive a system that is not trustworthy?

Another issue related to the adoption of a consortium blockchain could be that since there are limited nodes on a sharded consortium blockchain as compared to its permissionless counterpart, there is a possibility of all the nodes going offline at once. Questions can be raised as to how will the blockchain function and more importantly how will the corporations carry out their day-to-day activities, in such cases. This fundamental flaw needs to be solved before the mass adoption of blockchain by the corporates materialises.

Similarly, the technique of sharding that has been proposed in this paper is too not without its limitations. The authors maintain that the sharding technology has two principal drawbacks which could affect the smooth functioning of corporations on a sharded consortium chain. First and foremost, the division of the network into smaller shards/partitions although provides the framework with an increase in transaction throughput but it also sets up the network for failure. The division of the network makes the individual shards vulnerable to attacks as it is easy to target a smaller part the chain as compared to the whole chain.[238]

This individualistic nature of sharding is concerning when we look from a corporate perspective. For instance, if Shard 1 gets compromised, then the problem of single-point-of failure arises[239] whereby the work of Shard 1 will now be carried on by the nodes in Shard 2 and Shard 3. Ultimately, decentralisation in the consortium chain will be lowered and scalability will also be affected due to their being less partitions in the network. The next problem which could stem from partitioning of a blockchain is the fact that each shard is independent of the other, and therefore, there happens to be no communication between shards.[240] This could ultimately cause a downfall in the corporate governance process.

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[235] *Id.*, 5.
[236] *Id.*; *See also* Kenneth R. Gray, *Trust: The Social Virtues and the Creation of Prosperity-Review*, Vol. 14(1), INTERNATIONAL JOURNAL ON WORLD PEACE, 84 (1997).
[237] Andhov, *supra* note 10, 32.
[238] Coin Dcx Blog, *What is Blockchain Sharding? (How it Works, why we Need it, Pros, & Cons)*, February 23, 2023, available at https://coindcx.com/blog/cryptocurrency/what-is-blockchain-sharding/#:~:text=One%20factor%20that%20has%20been,thus%20defeating%20the%20 whole%20purpose (Last visited on October 5, 2023).
[239] *Id.*
[240] Mearian, *supra* note 227.

Consider a situation wherein there is a mergers and acquisitions deal going on between corporation X (node 1) and corporation Y (node 7). The fact that both these nodes are on different shards could cause extremely difficulty or even impossibility to execute/validate such a mergers and acquisitions deal between these corporations. In such a situation it would be difficult to assess as to which shard would execute such an inter-nodal transaction. Thus, additional technical research will be necessary in order to make the proposal fool-proof.

2. Regulatory Decentralised Autonomous Organisation: A Possible Alternative to Government Regulators?

With the entire corporate infrastructure being placed on a consortium blockchain, it raises the question of governmental regulation and oversight. Regulators such as the SEC and Financial Crimes Enforcement Network ('FINCEN') in the case of the United States of America, and Financial Conduct Authority ('FCA') and the European Parliament's Committee on Economic and Monetary Affairs ('ECON') in the case of European Union, have been arguing in the Senate and European Parliament, respectively, for increased oversight on blockchain technology and its developers.[241] We can look at the recent instances, such as the FINCEN proposal on self-custody wallet users which has proposed that any transaction made via a self-custody wallet above USD 3000 is compulsorily required to be customer verified.[242] Similar is the proposal laid down by ECON in its draft report to the European Union.[243] Further, the SEC has also at various instances tried to control the functioning of a decentralised exchange.[244]

It is understandable that innovation, sustainability and compliance should go hand-in-hand, and therefore, regulators around the world are taking such extreme unorthodox stances like the ones mentioned above. Though the authors believe that regulation is necessary, it is argued that a '*de minimis*' approach is required for the same. The principle of *de minimis* is applied in circumstances where the law needs to be applied less restrictively either because the issue at hand is too

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[241] Aniruddh Vadlamani & Sarthak Sharma, *Bridging the Divide between DeFi and Regulators: Showcasing Decentralised Autonomous Governance as the Future for Self-Custody Wallet Regulation*, U. Ill. J.L. Tech. & Pol'y (2023).

[242] Financial Crimes Enforcement Network, *Requirements for Certain Transactions Involving Convertible Virtual Currency or Digital Assets*, 2020, available at https://public-inspection.federalregister.gov/2020-28437.pdf (Last visited on October 5, 2023).

[243] European Parliament, *Draft Report on the Proposal for a Regulation of the European Parliament and of the Council on Information Accompanying Transfers of Funds and Certain Crypto-Assets*, 2021/0241(COD), available at https://www.europarl.europa.eu/doceo/document/CJ12-PR-704888_EN.pdf (Last visited on October 5, 2023).

[244] Press Release, *SEC Charges EtherDelta Founder with Operating an Unregistered Exchange*, 2018-258, available at https://www.sec.gov/news/press-release/2018-258 (Last visited on October 5, 2023); Dave Michaels & Alexander Osipovich, *Regulators Investigate Crypto-Exchange Developer Uniswap Labs*, The Wall Street Journal, November 5, 2022, available at https://www.wsj.com/articles/regulators-investigate-crypto-exchange-developer-uniswap-labs-11630666800 (Last visited on October 5, 2023).

trivial or there is a need to show leniency.[245] This principle therefore would differ on a case-to-case basis.

For instance, one of the authors has applied this principle in his upcoming paper on regulation of self-custody wallets by arguing that domain of self-custody wallets needs a balancing regulatory framework based on a *de minimis* exemption.[246] The author has evidenced this *de minimis* exemption by purporting a less invasive manner of data gathering by the regulators and thereby allowing customers to interact appropriately through the self-custody wallets for lower risk proportions.[247]

In the present study, we are of the opinion that with the transfer of corporate infrastructure on blockchain, regulation is required due to the fact that some actors may take the benefit of the new technology and conduct arbitrage. However, the regulation needs to be lenient considering the nascency of such a field. Andhov's suggestion of developing a private, or a semi-private blockchain run by a central authority with other gatekeepers to govern the network of corporations on blockchain is a well thought out solution.[248] However, we opine that true leniency can only be achieved with minimum intervention of a traditional regulator. Thus, through this sub-part we propose a decentralised governance infrastructure for our sharded consortium chain. This can only be facilitated through a DAO as discussed briefly in Part IV(A).

A DAO in its truest sense is an institutional arrangement which is embedded with decentralised value creation process and the functionality to make decentralised decisions.[249] A DAO is inherently a blockchain-cased legal wrapper or construct that is entirely built on a software code and functions through smart contracts.[250] Herein, 'regulatory DAO', as is implicit from the wording, is proposed as a regulator. However, the DAO would not be a traditional regulator such as the SEC or FINCEN, rather a decentralised regulator wherein the members of the DAO come together to participate in governance and vote on laws that best suits the corporate industry.

These laws will be enforced through smart contracts. On a blockchain, a smart contract is a computer running executable program which acts as an agreement between two decentralised parties.[251] This program is conditional in na-

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[245] Legal Information Institute, *De Minimis*, CORNELL LAW SCHOOL WEX, January 2022, available at %20not%20consider%20it (Last visited on October 5, 2023).

[246] Vadlamani & Sharma, *supra* note 241.

[247] *Id.*

[248] Andhov, *supra* note 10, 33.

[249] Alexander Braun et al., *Collusion-Proof Decentralized Autonomous Organizations*, SSRN (2022).

[250] Wulf A. Kaal, *Blockchain-based Corporate Governance*, Vol. 4, STANFORD JOURNAL OF BLOCKCHAIN LAW AND POLICY, 6 (2021).

[251] Max Raskin, *The Law and Legality of Smart Contracts*, Vol. 1, GEO. L. TECH. REV., 309-310 (2017); *See also* Jeremy M. Sklaroff, *Smart Contracts and the Cost of Inflexibility*, Vol. 166, U. PA. L. REV., 263 (2017).

ture, i.e. like any other traditional contract, a smart contract is executed on the fulfilment of underlying condition. In our regulatory DAO, the governing participants would deploy a smart contract which would contain the legal proposal. The participants of the DAO acting as one regulatory body would vote on the proposal and if the consensus is reached, the smart contract's underlying condition will be fulfilled and the code will be appended with the said legal proposal.

Nonetheless, one can argue that the DAO members may collude to gain a majority vote on a faulty law for the benefit of the few. This conundrum can be solved by implementing a stochastic based voting mechanism for the DAO token holders. Alexander Braun in his paper has contended that a DAO with stochastic voting will be collusion proof.[252] Stochastic voting is a voting scheme by which the majority is not required to enforce a decision rather the votes of all the participants are pooled and on random a single decisive vote is drawn with a probability proportional to the stake size.[253]

For instance, consider a scenario wherein there is a proposal on the DAO for a change in certain stock exchange liabilities and there are ten members voting with the original allocation being six for and four against. If we do not implement a stochastic based voting mechanism then there is a high chance that collusion can take place on the network. In a blockchain network collusion can occur when a soft or hard fork is implemented in the network.[254] Soft and hard forks are modification to the network that can be done to make the previous input on the blockchain invalid.[255] So, in our hypothetical, the four participants can collude on network and make the original voting invalid and get a majority against the proposal. However, when implementing a stochastic based voting, this particular instance of collusion would not be possible as the random ballet that decides the vote is based on a sixty-forty probability for the proposal and not the other way around. Therefore, in an event that some forces within the DAO are colluding, the actions will not reap any benefit because at the end of the day a random ballot is what decides the outcome. This will ensure efficiency in rule making.

However, a major legal concern is the regulation of the regulatory DAO. Will it be a government regulator such as the SEC or would it be another consortium blockchain of different regulators around the world on a single network with the task of being the final gatekeeper? If we opt for a government regulator to regulate our decentralised regulator, then the *de minimis* proposal would not have any value. However, if we opt for another consortium of regulators then the vicious cycle of ascertaining the final gatekeeper will continue. Therefore, future research would need to focus on solving this conundrum.

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[252] Braun, *supra* note 249.

[253] *Id.*

[254] Thibault Schrepel, *Collusion by Blockchain and Smart Contracts*, Vol. 33(1), Harv. J. Of L. & Tech., 118-151 (2019).

[255] *Id.*, 139.

Moreover, who will be liable considering that the regulatory DAO is a decentralised network where anonymous members of the DAO are coming together to formulate laws? The action against Ooki DAO has given us a starting point for this discussion.[256] Commodities Future Trading Commission's ('CFTCs') complaint specifies that in such a scenario all governance voting token holders shall be culpable.[257] However, this extreme step ultimately points towards piercing the veil of decentralisation and also showcases the extreme majors that the traditional regulators. If all the voting members of a DAO are made culpable then ultimately the people will lose confidence in such a technology and it will disincentivise participation.[258] CFTC's chairman Summer K. Mersinger dissented in the enforcement action against Ooki DAO and stated that:

> "[I] cannot agree with the Commission's approach of determining liability for DAO token holders based on their participation in governance voting… firstly, not only does this approach fail to rely on any legal authority in the CEA, it also does not rely on any case law relevant to this type of action…and secondly, the decision undermines the public interest by disincentivizing good governance in this new crypto environment."[259]

Commissioner Mersinger is right in dissenting such an enforcement action because the commission has failed to distinguish between the participants. For instance, in a DAO there may be voters who have just voted on irrelevant proposal such as naming of the DAO, logo of the DAO and not on any potentially illegal actions or collusions. Making such participants culpable will be miscarriage of justice and outrightly arbitrary and unfair.[260] Thus, we view that this instance ultimately supports our idea of advocating for a decentralised regulatory body. However, further research is warranted to address the questions posed above in order for a fool proof system to be formulated.

C. SMART CONTRACTS IMPLIES SMART SHAREHOLDERS

Decentralised autonomous consensus reaching is the most unique functionality that blockchain offers.[261] With the adoption of blockchain, shareholders will ultimately have some say in the decision making process. However,

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[256] CFTC, *CFTC Order Finds, and Complaint Alleges, Ooki DAO is Liable as an Unincorporated Association*, September 22, 2022, available at https://www.cftc.gov/PressRoom/PressReleases/8590-22 (Last visited on October 7, 2023).

[257] Cheyenne Ligon, *CFTC's Ooki DAO Action Shatters Illusion of Regulator-Proof Protocol*, COIN DESK, November 22, 2022, available at https://www.coindesk.com/policy/2022/09/26/cftcs-ooki-dao-action-shatters-illusion-of-regulator-proof-protocol/ (Last visited on October 7, 2023).

[258] *Id*.

[259] CFTC, *Dissenting Statement of Commissioner Summer K. Mersinger Regarding Enforcement Actions Against: 1) bZeroX, LLC, Tom Bean, and Kyle Kistner; and 2) Ooki DAO*, September 22, 2022, available at Last visited on October 7, 2023).

[260] Ligon, *supra* note 257.

[261] Andhov, *supra* note 10, 37.

as pointed out by Andhov, the consensus reaching process is very delicate on a blockchain suggesting that it is not always in the corporations best interest to give shareholders the right to validate.[262] In any case, our proposition of a sharded consortium blockchain requires one validating node per partition or shard. In this scenario, the shareholders will be granted the reading privileges and also the right to access past and present information so that they can make informed decisions while voting. However, the right to validate the transaction would always be with the shard node which in our case would be the companies.

Other than this a more pressing concern for the shareholders would be a decision making dilemma regarding their equity. With a corporation moving onto blockchain, the existing equity held by shareholders will not hold any value on the network. Therefore, shareholders with a huge chunk of equity would need assurances that their position is secured by the conversion of their equity into tokens through security token offering. A security token offering is a unique process of issuance of a distinct class of digital assets for financing blockchain based ventures.[263] It can alternatively be defined as an investment product that is digitally representable and subject to the securities laws.[264]

However, the question of how a corporation determines a value for their tokens and how does the shareholders safeguard themselves from the risk of corporations never issuing tokens, persists. The widespread practice in the decentralised finance industry suggests adoption of tokenomics for determining the value of a token.[265] As the name suggests, tokenomics is essentially the economics related to the value determination of a token.[266] It is a process by which the value of an asset can be expanded beyond the economic terms, including utility, voting rights, copyright and work, amongst others.[267] Therefore, during the development of sharded consortium chain and the subsequent shifting of corporate infrastructure, the drafting and adoption of a tokenomics becomes necessary. Such a process would help determine the actual value and the nature of a token which would be issued to the shareholders.

Further, with respect to the risk assessment, it is proposed that the use of Simple Agreement for Future Tokens ('SAFT') be undertaken. A SAFT is an investment contract which provides investors with the right to fully functional tokens, issued once the network is created and the tokens are functional.[268] It is a

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[262] *Id.*, 36.

[263] T. Lambert et al., *Security Token Offerings*, Vol. 59, Small Bus Econ, 300 (2022).

[264] *Id.*

[265] Lin William Cong et al, *Tokenomics: Dynamic Adoption and Valuation*, Vol. 27222, Nber Working Paper Series, 3-4 (2020).

[266] Matt Hussey, *What is Tokenomics? How Blockchain Economics Works*, Decrypt, September 19, 2023, available at https://decrypt.co/resources/tokenomics (Last visited on October 7, 2023).

[267] Pierluigi Freni et al., *Tokenomics and Blockchain Tokens: A Design-Oriented Morphological Framework*, Vol. 3, Journal of Blockchain: Research & Application, 2 (2022).

[268] Juan Batiz-Benet et al., *The SAFT Project: Toward a Compliant Token Sale Framework*, Protocol Labs, October 2, 2017, available at https://saftproject.com/static/SAFT-Project-Whitepaper.pdf

contractual investment agreement that proposes a legal strategy by which token issuers, in the present case corporations on blockchain, are able to organise an initial coin offering in exchange for discounted tokens to the investors at a future date.[269]

This technique of raising capital is widely adopted by the issuers because of it being SEC compliant.[270] For example, in our scenario a corporation shifting its operations to a consortium chain will also have to shift from the current equity stocks to tokens. The SAFT methodology will be immensely beneficial for the corporation as well as its shareholders. The companies would benefit as it could raise money for the transition from the TradFi system to the blockchain-based chain. Whereas, for shareholders, this technique would act as a protection for their existing shareholdings. The SAFT being an investment contract by nature is classified as a security.[271] This contract guarantees the shareholders that their already existing equity will either be converted to tokens on the successful transition of the corporation on blockchain, or if in any instance the transition is not successful, the SAFT being a security gives the shareholders the right to sell the investment contract in the secondary market and accordingly re-coup their investment equity.

However, the method of equity to token transition via SAFTs are likely to have its own issues. The chief problem of such a proposition is the high volatility of the tokens.[272] With the tokens being highly volatile it would be impossible for the shareholders to get the exact amount of their equity shareholding replicated into tokens. It is however argued that this issue can be solved via the SAFTs itself. We propose that the SAFTs being an investment contract will carry a condition of 'lock-in amount'. This lock-in amount will be equal to the shareholder's existing equity and in any event where the shareholder is not getting equal to/or close to her equity amount or if in the future there is any problem related to distribution of tokens, the shareholders can activate their lock-in condition in the SAFT and recoup their lost investment from the company.

Additionally, for the smooth execution of the SAFTs, it is best that all the shareholder SAFTs containing the shareholders wallet addresses, are embedded in the smart contract. This will ensure that at the time when the network is created and subsequently tokens are generated, the smart contract will automatically issue token proportional to the shareholders existing equity. This mechanism

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(Last visited on October 7, 2023).

[269] Ryan Strassman, *Anything But Simple: A Critique of the Proposed Simple Agreement for Future Tokens*, Vol. 38, REVIEW OF BANKING & FINANCIAL LAW, 835 (2018-2019).

[270] *Id*.

[271] Batiz-Benet et al., *supra note 268*, 1.

[272] Greta Guest, *Cryptocurrencies: High Volatility and Returns*, MICHIGAN NEWS, November 20, 2018, available at https://news.umich.edu/cryptocurrencies-high-volatility-and-returns/ (Last visited on October 7, 2023); *See also* Omid Malekan, *What Skeptics Get Wrong about Crypto's Volatility*, HARVARD BUSINESS REVIEW, July 6, 2022, available at https://hbr.org/2022/07/what-skeptics-get-wrong-about-cryptos-volatility (Last visited on October 7, 2023).

mitigates uncertainty and transaction risks to a great extent by ensuring that the shareholders' status and their right over the shares is maintained even post-transaction. The importance of this certainty cannot be underscored enough. This is because, one of the largest hurdles of incorporating companies on the blockchain has been the inability to ensure a transaction mechanism whereby the shareholder does not lose their interest in the shares or the value of the shares.

Figure-3 below depicts the process that would be undertaken to convert the equity shares of the shareholders to tokens. The smart contract is embedded with the signed SAFT and the wallet address of the particular shareholder in question. The SAFT becomes an indicator of the shareholder's willingness to raise capital for the corporation and an assurance for the future accrual of tokens. Similarly, the wallet address is necessary as when the future issuance takes place the tokens (equivalent to shareholder's equity) are directly sent to the shareholder's blockchain-based wallet. This whole process will be triggered by an "if… then…" smart contract as soon as the corporation is ready to 'go live' on the consortium chain.

Figure-3: Conversion of Equity to Tokens
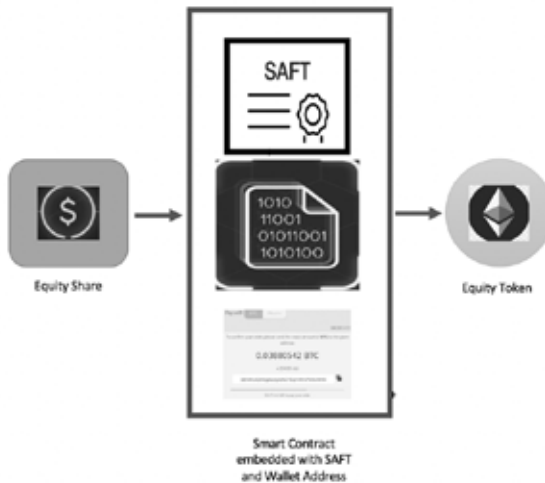
D. CORPORATE TRUST HOLDERS: A LOOK INTO LIQUID DEMOCRACY

With the corporations being the node on the sharded consortium blockchain it is apparent that all corporations will have a say in consensus reaching and simultaneously will have the publishing and reading rights on the blockchain. However, this raises a very fundamental question: If the corporate trust holders have the say in consensus and at the same time authority to govern and append the code, would it not ultimately lead to a few holding the key to corporate

treasure? This is in fact true, and if this sees the light of day, then shifting of corporate infrastructure to blockchain would inherently be of no inherent value. Therefore, we believe that liquid democracy ('LD') code could play a major role in ensuring that power is not accumulated in the hands of few.

LD, also known as 'delegative democracy', is a modern voting approach wherein voters can directly vote on a proposal or entrust their vote to their representatives.[273] LD in theory is recognised as the golden medium between the direct democracy and the representative democracy as it is based on the principles of voluntary delegation and proxy voting.[274] It is better than the former as it gives the participants an option to transfer/delegate there vote to representative who may be more familiar or knowledgeable about the issue at hand. Likewise, it is better than the latter because every voter chooses their representative and the representative in turn may choose its own delegate thereby making the whole network liquid without any single point of failure.[275]

The current proxy system that is adopted by corporations around the world is similar to the representative democracy wherein shareholders can entrust a third party firm to vote on behalf of them. However, as we have analysed in Part III, the current proxy voting system lacks transparency, verification and identification of the shareholders.[276] The difference here between an already existing proxy system and a LD system is that the latter is essentially a code-driven functionality and so the representatives can be chosen according to their expertise and their specific competence in decision making.[277] Further, the mere fact that the 'delegator' (shareholder) can revoke his delegation or change it makes it near impossible that there is hoarding of votes in the system.[278]

Another unique feature of LD that makes it more compatible with our proposal is its double delegation feature. For instance, let us assume that there is a governance proposal of corporation A related to the allocation of tokens to the shareholders. Shareholder X, Y and Z each have one vote but due to the fact that they are not knowledgeable enough in the tokenomics field they decide to delegate it to W. Now, in a proxy based system, W would have the power of these proxy votes and it can vote on behalf of these shareholders. Thus, it will formulate a top to bottom system with all the power concentrated in the hands of the few. LD system goes one step further by providing the functionality of further delegation.

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[273] Anson Kahng et al., *Liquid Democracy: An Algorithmic Perspective*, Vol. 32(1), AAAI (2018).

[274] Chiara Valsangiacomo, *Claryfying and Defining the Concept of Liquid Democracy*, Vol. 28, SWISS POLIT SCI REV., 61 (2022); *See also* Joseph Campbell et al., *Liquid Democracy: Two Experiments on Delegation in Voting*, Vol. 1, ARXIV, 1 (2022).

[275] David Ernst, *What is Liquid Democracy*, THE LIQUID BLOG, September 21, 2016, available at https://blog.liquid.us/2016/09/21/what-is-liquid-democracy/ (Last visited on October 7, 2023).

[276] *See supra* note 132.

[277] Campbell, *supra* note 274, 2.

[278] Xuepeng Fan et al., *Implement Liquid Democracy on Ethereum: A Fast Algorith For Realtime Self-Tally Voting System*, Vol. 2, ARXIV, 2-3 (2020).

Hence, in an event where W voter is not able to vote on a given proposal, it can delegate its vote and the three other votes to another representative V. Moreover, the fact that the shareholders can override their representative and directly vote on proposal and can change their delegates at any point of time makes such a system liquid in nature.[279] This brings dilution of power into the system and can change the overall dynamic of the corporations on blockchain.

As for the practicality of such a technical nuance, we will now analyse various of case studies wherein LD system has had a successful implementation. For instance, in 2010, the German Pirate Party adopted the LD software called 'Liquidfeedback'.[280] The Pirate Party had approximately 30,000 members and the high volume of people made it difficult to manage the general meetings of the party as it was becoming difficult for the party to scale participation without depriving the members of their equal say in the party proposals.[281] LD was seen as the perfect solution for this problem. Its transitive delegation ensured that members were able to delegate their votes and still have the right in the decision making process.[282] Further, its double delegation property made the voting procedure much scalable as the actual voting members were considerably reduced.

Another instance wherein LD has played a major role is the e-Google Votes system developed by Google on its Google+ social network.[283] It was developed as an experiment to ascertain whether liquid democracy would be preferred by the voters over direct or representative democracy.[284] The study on Google Votes proposed a general framework of LD which they termed as "The General Rule of Liquid Democracy".[285] They believed that LD provided the network with an all-encompassing vote-transparency which ensured that every user could see all the votes which were casted on their behalf making the system absolutely transparent and trustworthy.[286] The fact that delegator's were able to spot what the delegates were doing with their votes made the system much more complaint. These results enable one to conclude that it is possible to implement a liquid democracy system on a corporate network in a more scalable manner than direct or representative democracy.[287]

On a separate note, the authors agree with Andhov's argument that shareholder recordkeeping and vote tabulation management should not be

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[279] Steve Hardt & Lia C.R. Lopes, *Google Votes: A Liquid Democracy Experiment on a Corporate Social Network*, Defensive Publications Series, 3 (2015).

[280] Marco Deseriis, *Is Liquid Democracy Compatible with Representative Democracy? Insights from the Experience of the pirate Party Germany*, The Open Journal of Sociopolitical Studies, 467 (2022).

[281] *Id.*, 474.

[282] *Id.*

[283] Hardt & Lopes, *supra* note 279, 3.

[284] *Id.*

[285] *Id.*, 4.

[286] *Id.*

[287] *Id.*

maintained by the corporation because of the obvious manipulation risks. However, the authors also believe that the party that is entrusted with recordkeeping should not be an off-chain third party. As evaluated by us in Part III, there have been numerous instances of chaotic vote tabulation and inaccurate voter list by third party firms. Therefore, it is suggested that decentralised Oracles be used to handle the responsibility to overlook the corporate voting and recordkeeping. This will ultimately increase efficiency and legitimacy of the election process.

An Oracle is essentially a decentralised service which is used to obtain off-chain information and thereby bridge the outside world with block-chains.[288] It is pertinent to note that these Oracles are not data sources but rather middleware's that authenticate and validate extrinsic information and make it accessible to smart contracts for seamless execution of transactions.[289] We believe that this functionality can be used on-chain as a third party system acting as the recordkeeper of corporate voting. In our proposal these decentralised Oracles would bridge the gap between shareholders and the corporations.

Figure-4 below showcases the model of a Oracle based corporate voting and recordkeeping. The corporate nodes on the blockchain would broadcast the voting on the network. The decentralised Oracle will pass this information from the corporations to its shareholders who will then participate in the voting on the mainchain. The votes are recorded by the Oracles and then processed after which the outcome is relayed to the corporation. The benefit of this model is that it does not need any oversight or human engagement as everything is code-driven and automated. Moreover, this process keeps the anonymity of the shareholders intact as their response to the voting is recorded in a hash form. Lastly, the process is transparent at every stage as the corporation broadcast the governance proposal on the mainchain followed by the broadcasting of the results on the mainchain by the oracle.

Figure-4: Oracle based Corporate Voting and Record keeping

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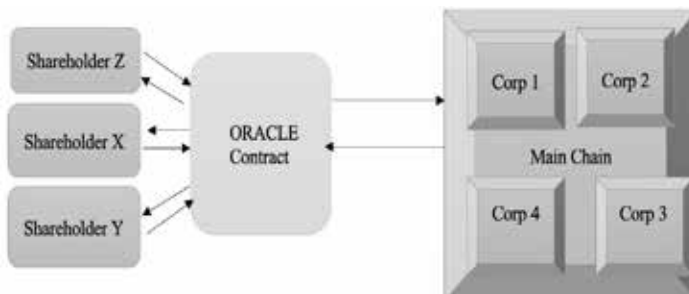
[288] Abdeljalil Beniiche, *A Study of Blockchain Oracles*, 2020, available at https://arxiv.org/pdf/2004.07140.pdf (Last visited on October 7, 2023).

[289] George John Chavady, *A Study of Oracle Systems for the QTUM Blockchain Eco-System*, 2020, available at https://www.scss.tcd.ie/publications/theses/diss/2020/TCD-SCSS-DISSERTATION-2020-098.pdf (Last visited on October 7, 2023).

E. THE RISE OF DECENTRALISED EXCHANGES

In the current global financial ecosystem, stock exchanges play a very critical role of a Self-Regulatory Organisation ('SRO'), serving as the gate-keeper by bringing the companies and shareholders together.[290] These exchanges also provide the investors with a platform to trade securities of the publicly listed companies.[291] The stock exchange's functionality as an SRO becomes very quin-tessential from a corporate governance point-of-view. Hence, the shifting of cor-porate infrastructure on a blockchain raises certain important questions. How would the stock exchanges function on a blockchain? Would the exchanges retain their regulatory nature? Will the exchanges be custodial in nature considering the fact that blockchain is a trustless system? Andhov has provided a starting point for this analysis. She has relayed instances of stock exchanges around the world which have moved or are in the process of moving to a blockchain-based trading system.[292]

However, Andhov's analysis falls short because she does not consider the situation wherein the whole corporate structure is moving on-chain. Her cur-rent analysis provides strictly the instances and examples of emerging digital stock exchanges.[293] We opine that in lieu of this shifting infrastructure, the current con-cept of centralised stock exchanges would fail to work in a decentralised setting. The main drawback would be the custodial nature of the current exchanges. At present, the traditional exchanges operate via an order book functionality through which the buyer and the seller of the securities are matched.[294] This matching is not automatic, rather both the buyer and the seller have to operate through a trusted third-party called the broker.[295] Thus, the question arises as to how such a custodial system would operate in a trustless system wherein there is no trusted third-party.

Therefore, it is proposed that DEXs should be the future of trading for a blockchain-based corporation because of it being non-custodial, transparent and censorship resistant in nature.[296] DEXs are non-custodial in nature because of three underlying features: *firstly*, DEXs use smart contracts to operate the trading platform. The smart contract helps the DEX operate in absence of a trusted party.[297] For instance, an investor looking to buy tokens of company X would initiate a

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[290] George S. Dallas, *Stock Exchanges and Shareholder Rights: A Race to the Top, not the Bottom*, The Harvard Law School Forum On Corporate Governance, December 28, 2018, available at https://corpgov.law.harvard.edu/2018/12/28/stock-exchanges-and-shareholder-rights-a-race-to-the-top-not-the-bottom/ (Last visited on October 7, 2023).

[291] *Id*.

[292] Andhov, *supra* note 10, 33-35.

[293] *Id*.

[294] Renaud Joseph, *Decentralized Exchanges: The Future of Exchanges?*, White paper, 7 (2022).

[295] *Id*., at 8.

[296] *Centralised* v. *Decentralized Exchanges*, October 31, 2022, BCB Group, available at https://www.bcbgroup.com/centralized-vs-decentralized-exchanges/ (Last visited on October 7, 2023).

[297] Makarov & Schoar, *supra* note 230, 16.

transaction from his personal wallet (blockchain based non-custodial wallet)[298] and place a buy order for a certain amount. The smart contract being a conditional contract would process this transaction on satisfaction that the investor has carried out the underlying condition and complete the transaction by automatically sending the tokens to the investors wallet.

Secondly, the DEXs use Automated Market Maker's ('AMM') instead of a traditional order book to match the trade orders.[299] The AMM functionality as the name suggests is automated in nature and with the help of smart contracts it identifies a seller and buyer on the DEX and pair them together to complete the trade.[300] *Thirdly*, the data of the DEX (including the trade orders by the participants) is available on the mainchain because ultimately the DEX is based on blockchain technology and therefore the DEX upholds the characteristic of transparency in trading.

However, this proposal is also not without its demerits. At present, widescale adoption of DEXs for trading by corporations would appear like an ill-informed measure because of the sophisticated nature of the technology, its regulation, hacks and bugs, the problem of impermanent loss and the manipulative and deceptive trading practices such as the Maximal Extractable Value ('MEV') practice.[301] The problem of MEV is a significant one specifically to our proof-of-concept. According to the Bank for International Settlements, MEV is deemed to be an additional profit made by the miners by manipulating the market prices via a specific re-ordering of transactions or censoring of pending transactions.[302]

In DLTs, front-running of a transaction is not illegal and is not considered to be an offense as opposed to its centralised counterpart wherein every jurisdiction has laws specifying front-running or manipulative trading practices as a crime. Our model can be susceptible to such a threat, as the nodes will have access to the memory pool which is a transaction pool where all the transactions are stored before they are processed and validated by the validators.[303] Through this insider knowledge about the specifics of a corporate transaction or any investor transactions, the nodes would have the inherent power to manipulate trade transactions that might take place on the DEX.[304]

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[298] For the explanation on non-custodial wallets, *see* Vadlamani & Sharma, *supra* note 241.

[299] Vijay Mohan, *Automated Market Makers and Decentralized Exchanges: A DeFi Primer*, Vol. 20, J. of Financial Innovation, 2 (2022).

[300] Joseph, *supra* note 294, 9.

[301] Ledger Academy, *Impermanent Loss Meaning*, July 18, 2023, available at https://www.ledger.com/academy/glossary/impermanent-loss (Last visited on October 7, 2023).

[302] Raphael Auer et al, *Miners as Intermediaries: Extractable Value and Market Manipulation in Crypto and DeFi*, Vol. 58, Bis Bulletin, 1 (2022).

[303] Blocknative, *What is a Mempool?*, Blocknative, 2020, available at https://perma.cc/P3ND-F94N (Last visited on October 7, 2023); *See also* Mikołaj Barczentewicz et al., *Blockchain Transaction Ordering as Market Manipulation*, Vol. 20, Ohio State Tech. L. J. (2023).

[304] *Id.*

These substantial flaws could limit the widespread adoption of block-chain technology and may perhaps be looked as an unviable solution to current corporate governance inefficiencies. However, development in the blockchain and decentralised finance spectrum is ongoing and the current flaws in blockchain continue to develop with new variations that can offer unprecedented solutions. For instance, to counter the issue of MEV extraction, Zero-Knowledge Proof ('ZKPs') have been developed. ZKPs are fascinating cryptographical constructs wherein one party (the prover) sends in the data on the network and the other party (the verifier) verifies such data without learning anything other than the fact that the information/data provided is true.[305] This interactive proof can help our model as it formulates an extra layer of security for all the corporate and individual share-holder transactions that are taking place. These roll-ups take the form of an off-chain governance mechanism whereby instead of multiple separate transactions in a memory pool, the nodes are required to roll-up a bunch of transactions into one single consolidated bond. This construct, thereby, offers extra security as now the nodes would not be able to front-run a transaction as the specificities of such a transaction are not visible to them.

Once the user base over time is knowledgeable enough to understand the complexities of the underlying technology and the developers have identified a concrete solution to make the DEXs MEV resistant and impermanent loss proof, it could be argued that trading on a DEX would be a more efficient and optimal choice.[306]

V. CONCLUSION

Throughout the course of history, countless technologies have emerged and disrupted society in ways previously unimaginable. One such technology that has made a significant impact in recent years is blockchain. With its lofty goal of achieving a decentralised society, blockchain has captured the attention of individuals and businesses alike, particularly in relation to Bitcoin and its potential to provide a secure, scalable, and decentralised peer-to-peer system. While much of the discourse on the impact of blockchain has been limited to cryptocurrencies, it is important to acknowledge that blockchain is a state-of-the-art technology with manifold potential applications that have yet to be explored. The benefits of blockchain are not limited to Bitcoin or other digital currencies, and it has the potential to transform many industries. In particular, corporate governance is an area where blockchain technology could have a transformative impact. By

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[305] Aleksander Berensten et al., *An Introduction to Zero-Knowledge Proofs in Blockchains and Economics*, Vol. 105(4), Federal Reserve Bank Of St. Louis Rev., 280-294 (2023); *See also* Shobha Tyagi & Madhumita Khaturia, *Role of Zero-Knowledge Proof in Blockchain Security*, Vol. 10, Com-It-Con Ieee, 738 (2022).

[306] Andrew Cross et al., *The Next Progression of Derivatives Markets: Distributed Ledger Technologies and Decentralized Exchanges*, FIA Resources, June 20, 2019, available at https://www.fia.org/sites/default/files/2019-09/Decentralized_Exchanges_0.pdf (Last visited on October 7, 2023).

leveraging the power of blockchain, corporations could create more efficient and trustworthy systems, ultimately benefiting both the company and its stakeholders.

This paper is written in pursuance of a similar vision wherein it aims to demonstrate how the benefits of blockchain can be leveraged to further corporate governance. As the concept of blockchain is slowly becoming a part of our everyday vocabulary, it is still eclipsed by the influence of bitcoin and quite often the two are construed as synonymous. This paper aimed to flag this misconception and sheds light on the various uses of blockchain. However, it is imperative to state that blockchain technology is still at a very nascent stage and its uses are relatively unexplored. While this paper does highlight its uses in the context of enhancing corporate governance, the advantages stated above are not exhaustive in nature and further research and analysis could be undertaken to add to the contributions of this paper. Having highlighted the implications of blockchain, the paper thereafter recognised the limitations of existing systems of corporate governance and pressed on the importance of finding a remedy. Subsequently, the paper assuaged the foregoing urgency by proposing solutions to two principal problems.

Firstly, the paper proposed a solution to address the growing shackles on the power of shareholders to actively participate in corporate democracy. Shareholder absenteeism has plagued corporate governance structures for quite some time and the paper focused on how blockchain, through its characteristics of transparency, immutability and interoperability, has forged an impregnable structure which has the capacity to inspire shareholders to participate in the AGM and enliven the corporate democracy. Further, the reliance on proxy firms has created a 'group think' syndrome in the minds of the shareholders, and blockchain through its transparent and dynamic ledger can be used to restore the cohesiveness among the shareholders to vote themselves.

Secondly, this paper focused on the rising agency costs in start-up financing that have sullied the reputation of start-ups that were once considered the litmus test of a nation's entrepreneurial spirit. Having established the root of the problem in start-up financing as agency costs arising out of informational asymmetry and dearth of enforcement mechanisms, the paper proposed the adoption of smart contracts in investment agreements and demonstrated a mechanism by which the principal has to no longer rely on the agent's disclosures for the satisfaction of conditions precedent and subsequent to the investment. Furthermore, the mechanism also empowered the principal to enforce the conditions without having to rely on a third party such as courts.

Apart from the shareholder aspect of corporate governance and the principal-agent relationship, this paper technically analysed the feasibility of blockchain in accommodating corporate structures on-chain. Alexandra Andhov's proposal was used as a baseline to understand of how, or if even, blockchain can accommodate corporations. This paper went the extra mile and proposed a solution

for bringing corporate structures on to the chain and determined the appropriate technicalities that are necessary for the system to flourish.

There are three considerations that arise when implementing such a model. *First*, in a bid to ensure scalability, decentralisation and security this paper advocates the development of a sharded consortium blockchain which checks all the three boxes. *Second*, in order to ensure that technological development and regulation go hand-in-hand, the idea of a 'regulatory DAO' has been endorsed which helps in maintaining a *de minimis* regulation standard. *Third*, with the help of SAFTs and smart contracts we believe that it is possible for the corporations to conduct a seamless transition on-chain. *Fourth*, with the LD code present in the system, shareholders can be assured that their voice will matter in corporate voting and other governance related mechanisms. *Fifth*, the DEXs dispense a more robust network by providing a non-custodial, transparent and censorship resistant framework for securities trading for the corporations on the consortium chain.

In terms of future research, this paper could be the foundation for empirical studies on corporation's deployment of blockchain. Future research could also question whether the current limitation of DEXs, i.e. the problem of impermanent loss and MEV would restrict blockchain-based corporations to trade via a decentralised exchange in the future and stick to the conventional stock exchanges off-chain with Oracles being the medium to carry information on-chain or *vice versa*. Further, extensive research is required to solve the conundrum of determining the final gatekeeper in case of governance of the consortium blockchain and the DAO.

Moreover*,* keeping in mind DAOs autonomous code driven functionality, there is no means to identify the wrongdoer in the system and therefore necessitating the need to be regulated. The idea of a regulatory DAO furthered through this proposal will be rewarding once one has answers to the question posed in the above part. With reference to the sharded consortium chain there is a requirement to conduct further technical research to make the model fool proof. Lastly, although solutions have been envisaged at a broader level to address agency problems in corporate governance models, more complexities exist in actual practice. Although the solutions proposed in this paper serve as the base for any further solutions, more layered and nuanced strategies would have to be deployed in addressing problems that are localised to jurisdictions or industries. The authors' believe that this paper serves as the base on which more sophisticated approaches towards adopting blockchain for resolving agency problems in corporate governance can be built.