2017

Distributed Governance

Carla L. Reyes
Southern Methodist University, Dedman School of Law

Nizan Geslevich Packin
City University of New York

Bejamin Edwards
University of Nevada, Las Vegas -- William S. Boyd School of Law

Author ORCID Identifier:

Carla L. Reyes: https://orcid.org/0000-0002-2448-8309

William & Mary Law Review Online

VOLUME 59 2017

DISTRIBUTED GOVERNANCE

CARLA L. REYES,* NIZAN GESLEVICH PACKIN** &

BENJAMIN P. EDWARDS***

ABSTRACT

Distributed ledger technology disrupts traditional business organizations by introducing new business entities without the directors and officers of traditional corporate entities. Although these emerging entities offer intriguing possibilities, distributed entities may suffer significant collective action problems and expose investors to catastrophic regulatory and governance risks. Our Article examines

* Visiting Assistant Professor, Stetson University College of Law; Faculty Associate, Berkman Klein Center for Internet and Society at Harvard University; Affiliated Faculty, Indiana University Bloomington Ostrom Workshop Program on Cybersecurity and Internet Governance. J.D., L.L.M. in International & Comparative Law, Duke University School of Law; M.P.P., Duke University Terry Sanford School of Public Policy.

** Assistant Professor of Law, Baruch College, Zicklin School of Business, City University of New York; Affiliated Faculty, Indiana University Bloomington Ostrom Workshop Program on Cybersecurity and Internet Governance. S.J.D., University of Pennsylvania, L.L.M. Columbia Law School, B.A. & L.L.B. Haifa University.

*** Associate Professor of Law, University of Las Vegas William S. Boyd School of Law. J.D., Columbia Law School; B.A., University of South Carolina.

key considerations for stakeholders and argues that distributed entities must be carefully structured to function effectively.

This Article breaks new ground by critically examining distributed entities. We argue that a distributed model is most appropriate when distributed ledger technology solves a unique corporate governance problem. We caution against ignoring the lessons painstakingly learned through past governance failures.

TABLE OF CONTENTS

INTRODUCTION

In 2016, the Decentralized Autonomous Organization (The DAO) raised more than $168 million and emerged as "the largest crowdfunded project ever."[1] Its creators pitched a radical business innovation—a leaderless, decentralized venture capital firm that would allow investors to vote on and collectively fund proposals.[2] Investors purchased digital share tokens, referred to as DAO tokens, with ether, a cryptocurrency designed to enable decentralized applications such as The DAO on the Ethereum platform.[3]

The DAO offered a novel solution to traditional agency cost problems. In corporate structures, investors suffer when management and directors divert corporate resources to themselves. The

1. Cade Metz, *The Biggest Crowdfunding Project Ever—The DAO—Is Kind of a Mess*, WIRED (June 6, 2016, 7:00 AM), https://www.wired.com/2016/06/biggest-crowdfunding-project-ever-dao-mess/ [https://perma.cc/HY3C-YUL9].

2. *See id.*

3. Much like bitcoin, ether is a decentralized crypto-token that can be used to build applications on and be transferred on the Ethereum protocol, a type of decentralized ledger technology. *See* Nathaniel Popper, *Move Over, Bitcoin. Ether Is the Digital Currency of the Moment.*, N.Y. TIMES: DEALB%K (June 19, 2017), https://www.nytimes.com/2017/06/19/business/dealbook/ethereum-bitcoin-digital-currency.html [https://perma.cc/N4SS-JF6M]. Initially, investors could buy DAO tokens only in exchange for ether. *See* Joon Ian Wong, *The Price of Ether, a Bitcoin Rival, Is Soaring Because of a Radical, $150 Million Experiment*, QUARTZ (May 20, 2016), http://qz.com/688194/the-price-of-ether-a-bitcoin-rival-is-soaring-because-of-a-radical-150-million-experiment/ [https://perma.cc/7S7S-DXJS]. However, beginning in late May of 2016, DAO tokens began trading on cryptocurrency exchanges, including through direct exchanges for dollars. *See* Ian Kar, *Coinbase Will Start Trading Bitcoin Rival Ethereum on its Cryptocurrency Exchange*, QUARTZ (May 19, 2016), https://qz.com/687482/coinbase-will-start-trading-bitcoin-rival-etherum-on-its-cryptocurrency-exchange/ [https://perma.cc/5RYS-T9DM]. We note here that we are aware of a debate in the literature and among technologists regarding whether the appropriate term is decentralized ledger technology, distributed ledger technology, and/or blockchain. Without intending to take a stand on the technical aspects of that debate, or the merits of any side, in this Article we use the term distributed ledger technology (DLT) to refer to the broadest set of technology, including: permissioned DLT, permission-less DLT, those protocols that are literally a chain of blocks (blockchains) and newly emerging protocols such as R3's Corda™. *See* Tim Swanson, *A Brief History of R3—the Distributed Ledger Group*, GREAT WALL OF NUMBERS (Feb. 27, 2017), http://www.ofnumbers.com/2017/02/27/a-brief-history-of-r3-the-distributed-ledger-group/ [https://perma.cc/B5WZ-89G5]. We do so, as legal academics, because the law, and the policies it serves, must consider the full range of the technology. We do, however, occasionally use the terms decentralized and blockchain to refer to specific protocols where the use of those more specific terms are appropriate. For a more complete discussion of DLT and distributed applications, see *infra* Part I.

DAO sidestepped this problem by substituting code for the directors and officers. Instead of relying on management's loyalty, The DAO gave investors algorithmic certainty: once investors voted to back a proposal, The DAO would operate and disperse funds as its code specified.[4] Tokenholders could even vote on governance proposals to shape The DAO's rules, much like how shareholders now vote on corporate governance matters.[5]

Investors hoped The DAO would democratize venture capital's elite processes.[6] Often, only the wealthiest and most connected place assets with venture capital firms. Even then, investors surrender control to the venture capitalists.[7] The implicit biases of these venture capitalists (who are largely white males) may even distort the economic landscape for entrepreneurs, causing female founders to behave strategically and obscure their gender.[8] Backers bet that The DAO could harness the wisdom of crowds, drive innovation, and grant developers access to capital without submitting to the constraints imposed by traditional Silicon Valley venture capital firms.[9]

More critical voices cautioned against betting on crowd-sourced wisdom. They pointed out that The DAO's governance structure created a bias toward funding even unwise projects.[10] When presented with an unwise proposal, a tokenholder faces a critical choice between exiting the governance structure and voicing her opinion.[11] Rather than voting on an unwise proposal, a tokenholder could simply leave The DAO.[12] This exit option carries less risk than losing

4. *See* Seth Bannon, *The Tao of "The DAO" or: How the Autonomous Corporation Is Already Here*, TECHCRUNCH (May 16, 2016), https://techcrunch.com/2016/05/16/the-tao-of-the-dao-or-how-the-autonomous-corporation-is-already-here/ [https://perma.cc/RQZ7-XRDY].

5. *See id.*

6. *See id.*

7. See Rolfe Winkler, *Venture-Capital Firms Draw a Rush of New Money*, WALL STREET J. (Mar. 29, 2016, 7:50 PM), http://www.wsj.com/articles/funds-flow-to-venture-firms-1459295426 [https://perma.cc/WJU4-LVB8].

8. *See* John Greathouse, *Why Women in Tech Might Consider Just Using Their Initials Online*, WALL STREET J.: THE EXPERTS (Sept. 28, 2016, 10:00 AM), http://blogs.wsj.com/experts/2016/09/28/why-women-in-tech-might-consider-just-using-their-initials-online/ [https://perma.cc/9TS5-85A9].

9. *See* Nathaniel Popper, *A Venture Fund with Plenty of Virtual Capital, but No Capitalist*, N.Y. TIMES: DEALB%K (May 21, 2016), https://www.nytimes.com/2016/05/22/business/dealbook/crypto-ether-bitcoin-currency.html [https://perma.cc/UU6M-VBUP].

10. *See* Metz, *supra* note 1.

11. *See id.*

12. *See id.*

capital to other tokenholders in the grip of foolish manias.[13] If cautious tokenholders depart instead of voting, funding decisions would show a positive bias.[14]

Despite the concerns, The DAO raised more capital than its creators had thought possible.[15] Its runaway success drove significant increases in the value of ether, which is the cryptocurrency that fuels Ethereum (the distributed application platform upon which The DAO was built).[16] While a single ether traded for approximately $0.90 in December 2015, its exchange rate rose to nearly $15 by May 2016.[17]

As The DAO collected capital, Christoph Jentzsch, its principal coder, warned that the experiment remained "fraught with risks."[18] He explained that if he had known the size it would grow to, "the tester" in him would have said "I need more testing" to check The DAO's code.[19] Given the millions at stake, investors and outside critics also scrutinized the code for security vulnerabilities that The DAO should address before moving forward.[20]

In hindsight, the code needed more testing. On June 17, 2016, an unknown person withdrew ether worth approximately $55 million from The DAO by exploiting flaws in the code.[21] While most viewed this exploit as theft, a person purporting to be responsible argued that she had rightfully appropriated The DAO's assets under The DAO's own terms.[22] In particular, The DAO's offering documentation

---

13. *See id.*

14. *See id.*

15. *See* Popper, *supra* note 9.

16. *See* Charles Bovaird, *Ether Price Surges 50% as The DAO Draws Trading Interest*, COINDESK (May 20, 2016, 10:39 PM), http://www.coindesk.com/ether-surges-dao-trading-interest/ [https://perma.cc/Z6XT-V55G].

17. *See* Wong, *supra* note 3.

18. Popper, *supra* note 9.

19. *Id.*

20. *See* Nathaniel Popper, *Paper Points Up Flaws in Venture Fund Based on Virtual Money*, N.Y. TIMES: DEALB%K (May 27, 2016), http://www.nytimes.com/2016/05/28/business/dealbook/paper-points-up-flaws-in-venture-fund-based-on-virtual-money.html [https://perma.cc/3RVP-9KJ9].

21. *See* Steven Norton, *Downfall of DAO Digital Currency Fund Shows Blockchain Reputational Risk*, WALL STREET J.: CIO J. (June 20, 2016, 6:35 PM), http://blogs.wsj.com/cio/2016/06/20/downfall-of-dao-digital-currency-fund-shows-blockchain-reputational-risk/ [https://perma.cc/F7Z6-HCWQ].

22. *See* Letter from "The Attacker" to The DAO and the Ethereum Community (June 18, 2016, 5:21 AM), http://pastebin.com/CcGUBgDG [https://perma.cc/483L-URJ7] (purporting to

had made clear that The DAO's governing terms were "set forth in the smart contract code" and that "all explanatory terms or descriptions are merely offered for educational purposes and do not super[s]ede or modify the express terms of The DAO's code."[23] From the hacker's perspective, she held legal title to funds withdrawn under The DAO's express terms.[24]

The broader community disagreed and sought to unravel the transfer. To return the funds, the community implemented a "hard fork": it created a new version of the Ethereum protocol that allowed The DAO's tokenholders to recover their funds and collectively abandoned the original version of the Ethereum protocol.[25] The move required broad consensus, and, at present, not all community members have moved to the new protocol.[26] The original Ethereum blockchain continues as "Ethereum classic" with its related ether trading at a vastly reduced price.[27]

This Article aims to learn from The DAO's failure. What are the potential strengths and weaknesses of decentralized business organizations that distribute corporate governance? This Article considers distributed entities from a corporate governance perspective. While we believe that, if carefully constructed, such entities may succeed, stakeholders should not adopt distributed governance structures merely for the sake of decentralization. Rather, stakeholders should consider distributed governance structures when doing so solves a particular structural or governance problem. Furthermore, stakeholders must structure distributed corporate entities carefully to avoid known pitfalls. To lay the groundwork, we first discuss traditional corporate governance features, as well as

---

be from "The Attacker").

23. *Id.* ("[T]o the extent you believe there to be any conflict or discrepancy between the descriptions offered here and the functionality of The DAO's code ... The DAO's code controls.").

24. *See id.*

25. *See* Michael del Castillo, *Ethereum Executes Blockchain Hard Fork to Return DAO Funds*, COINDESK (July 20, 2016, 3:23 PM), http://www.coindesk.com/ethereum-executes-blockchain-hard-fork-return-dao-investor-funds/ [https://perma.cc/3PPZ-VDQ9]. For further discussion on distributed ledgers, see *infra* Part I.

26. *See* Jacob Eliosoff, *Why Ethereum Classic Must Die*, COINDESK (Aug. 17, 2016, 12:30 PM), http://www.coindesk.com/wish-ethereum-classic-quick-painless-death/ [https://perma.cc/QS43-U4RQ].

27. *See id.*

distributed ledger technology's unique characteristics and the move towards distributed applications and governance. We then discuss key considerations for stakeholders considering distributed entities. Ultimately, stakeholders should proceed carefully and only opt for distributed entities when the benefits outweigh the risks.

I. EMERGING DISTRIBUTED LEDGER TECHNOLOGY

Significant hype surrounds cryptocurrencies and the distributed ledger technology (DLT) upon which they operate.[28] Many discussions of cryptocurrencies and DLT begin without discussing the technology's nature, its genuinely new and disruptive aspects, or why those disruptive aspects should be applied to a specific context. Because the DLT's architecture informs our consideration of disruptive corporate governance, we begin with a concise introduction to DLT and two of the disruptive structures DLT enables: distributed applications and distributed governance.

A. Distributed Ledger Technology

DLT refers to distributed computer software running on peer-to-peer networks[29] that offers a transparent[30] record management

---

28. *See, e.g.*, *The Blockchain in Finance: Hype Springs Eternal*, ECONOMIST (Mar. 19, 2016), https://www.economist.com/news/finance-and-economics/21695068-distributed-ledgers-are-future-their-advent-will-be-slow-hype-springs [https://perma.cc/G2AL-J7HR] (discussing the hype surrounding distributed ledger technologies).

29. *See* WILLIAM MOUGAYAR, THE BUSINESS BLOCKCHAIN: PROMISE, PRACTICE, AND APPLICATION OF THE NEXT INTERNET TECHNOLOGY 3 (2016) (citing SATOSHI NAKAMOTO, BITCOIN: A PEER-TO-PEER ELECTRONIC CASH SYSTEM (2008)).

30. We use the term "transparent" instead of "public" in this Article to define the nature of the ledger. Consistent with one of the coauthor's other work, we made this word choice in order to keep the definition of DLT broad enough to encompass both permission-less and permissioned ledgers. For further explanation of the rationale for the choice, see generally Carla L. Reyes, *Conceptualizing Cryptolaw*, 96 NEB. L. REV. (forthcoming 2017). The permission-less DLT are generally public ledgers, open for anyone to inspect. *See* Angela Walch, *The Bitcoin Blockchain as Financial Market Infrastructure: A Consideration of Operational Risk*, 18 N.Y.U. J. LEGIS. & PUB. POL'Y 837, 840 & n.15 (2015). Permissioned DLT, on the other hand, are developed and used on a proprietary basis and are often not public. *See id.* We are aware of objections to the idea of permissioned DLT; however, that debate is beyond the scope of this Article, which offers initial considerations on the potential disruptive impact of DLT on corporate governance. Thus, at this initial stage of inquiry, we use DLT to refer to both permissioned and permission-less DLT, and distinguish between the two by specific reference

system in which transactions are cryptographically signed and validated with timestamps using a consensus mechanism.[31] In other words, at its core, DLT is a technology that no single entity, person, or computer node owns, controls, or otherwise maintains,[32] but that nevertheless "permanently records transactions in a way that cannot be later erased but can only be sequentially updated, in essence keeping a never-ending historical trail."[33] Although the exact combination of these elements varies among specific DLT implementations, most DLTs employ cryptographic proofs and a consensus mechanism to ensure the accuracy and security of transactions.[34]

Specifically, DLTs use three concepts from the science of cryptography to secure and confirm transactions. First, DLTs use hashes as "a unique fingerprint that helps to verify that a certain piece of information has not been altered, without the need to actually see

---

where appropriate.

31. Aaron Wright and Primavera De Filippi explain that blockchains achieve these functions by "combining peer-to-peer networks, cryptographic algorithms, distributed data storage, and ... decentralized consensus mechanisms." Aaron Wright & Primavera De Filippi, Decentralized Blockchain Technology and the Rise of *Lex Cryptographia* 4-5 (Mar. 12, 2015) (unpublished manuscript), http://ssrn.com/abstract=2580664 [https://perma.cc/V2MF-JSSQ]. In other words, this Article

> uses the term[ ] decentralized ledger technology [DLT] to refer broadly to distributed network technology that (1) enables users to upload programs and to leave the programs to self-execute; (2) maintains a permanent and public record (ledger) of the current and past states of every program; (3) is decentralized; (4) uses public key cryptography for authentication; and (5) uses economic incentives to ensure that the network maintains the technology.

Carla L. Reyes, *Moving Beyond Bitcoin to an Endogenous Theory of Decentralized Ledger Technology Regulation: An Initial Proposal*, 61 VILL. L. REV. 191, 191 n.1 (2016) (emphasis omitted) (citing Vitalik Buterin, *Visions, Part 1: The Value of Blockchain Technology*, ETHEREUM BLOG (Apr. 13, 2015), https://blog.ethereum.org/2015/04/13/visions-part-1-the-value-of-blockchain-technology/ [https://perma.cc/F3RB-E4TA]).

32. *See* Shawn Bayern, *Of Bitcoins, Independently Wealthy Software, and the Zero-Member LLC*, 108 NW. U. L. REV. 1485, 1488 (2014) ("Bitcoin is a peer-to-peer software system, which means, practically speaking, that the entire system is made up of versions of the software that end-users download and run on their personal computers. There is no Bitcoin server or Bitcoin company that directly manages the system." (emphasis omitted)).

33. MOUGAYAR, *supra* note 29, at xxi; *see also* Joshua Fairfield, *Smart Contracts, Bitcoin Bots, and Consumer Protection*, 71 WASH. & LEE L. REV. ONLINE 35, 36 (2014); Kevin Werbach, Trustless Trust 2 (Aug. 14, 2016) (unpublished manuscript), https://ssrn.com/abstract=2844409 [https://perma.cc/SS2H-5MUX].

34. *See* MOUGAYAR, *supra* note 29, at xxiii ("In essence, trust is replaced by cryptographic proofs, and trust is maintained by a network of trusted computers (honest nodes) that ensure its security, as contrasted with single entities who create overhead or unnecessary bureaucracy around it.").

it."[35] Second, DLT implementations use cryptographic keys to ensure only the owner of an asset recorded on DLT can access the asset.[36] Cryptographic keys will always exist "in at least a combination of two: a public and a private one."[37] The public key serves as an address that anyone can see and send transactions to, while the private key allows the owner of the key pair to decrypt the information sent to that address.[38] Thus, cryptographic keys allow DLT users to securely transact with persons and entities that they do not know or trust, without using a trusted intermediary.[39] Third, most DLTs verify entries pushed to the ledger by a cryptographic key pair through a consensus mechanism.[40] "The basic premise is that all nodes control each other all the time and they can do that because they know exactly what every other node *should* hold as truth at any given time. If all nodes agree, this is called *consensus*."[41] In other words, "[e]very node in a blockchain stores and computes the *same* data."[42] A variety of consensus mechanisms exist, including the Bitcoin blockchain's well-known proof-of-work mining consensus process, which

> allows participants to add new financial records to the authoritative sequence by demonstrating that they have expended computing power on an otherwise unimportant, repetitive task. This process, known as Bitcoin mining, confers the right to add a

---

35. *Id.* at 12.

36. *See id.*

37. *Id.*

38. *See id.*; *see also* Reyes, *supra* note 31, at 200. The public key might be thought of as an email address to which anyone may send messages, while the private key might be thought of as the password that allows the sender to originate a message from the email account. *See* MOUGAYAR, *supra* note 29, at 12.

39. *See* Michael Abramowicz, *Cryptocurrency-Based Law*, 58 ARIZ. L. REV. 359, 372 (2016) ("A mathematical technique can be used to quickly generate two keys of a specific length ... [such that] anyone who knows the relevant algorithms and the public key can conclude, with near certainty, that someone who knew the private key corresponding to the public key must have performed the encryption.").

40. *See* Sigrid Seibold & George Samman, *Consensus: Immutable Agreement for the Internet of Value*, KPMG 2 (2016), https://assets.kpmg.com/content/dam/kpmg/pdf/2016/06/kpmg-blockchain-consensus-mechanism.pdf [https://perma.cc/4HFS-JDJV]; *see also* Abramowicz, *supra* note 39, at 373 (describing the Bitcoin blockchain solution for verifying transactions by consensus).

41. HENNING DIEDRICH, ETHEREUM 20 (2016).

42. *Id.* at 33.

> record to the sequence (and also, not incidentally, it is rewarded by the creation of new bitcoins, partly as an incentive to participate in the network and partly as a way to manage the initial distribution of bitcoins). In the event of a dispute among different candidate sequences of transactions, the one that is eventually backed by the most computing power wins.[43]

The Bitcoin blockchain thus relies on the expense and difficulty of proof-of-work to deter cheating and fraudulent verification.[44] Other consensus mechanisms power other DLT variations, including "unique node list" consensus, proof-of-stake, and several others.[45] In each case, consensus replaces the traditional trusted third-party intermediary as the method for maintaining the ledger.[46]

B. Smart Contracts

In addition to disrupting the traditional centralized ledger model, DLTs also enable complex relationships to be layered into, or on top of, the underlying DLT protocol.[47] Nick Szabo first named these complex relationships enabled by computer code "smart contracts" in 1994.[48] Although the term "contract" in the "smart contract"

---

43. Bayern, *supra* note 32, at 1490-91 (footnote omitted); *see also* ANDREAS M. ANTONOPOULOS, MASTERING BITCOIN xx (2015) (defining a miner as "[a] network node that finds valid proof of work for new blocks, by repeated hashing"); PEDRO FRANCO, UNDERSTANDING BITCOIN: CRYPTOGRAPHY, ENGINEERING, AND ECONOMICS 103 (2015) ("To secure the blockchain—the distributed transaction database—Bitcoin requires proof-of-work to be performed on blocks of transactions following the Solution-Verification protocol.").

44. *See* Werbach, *supra* note 33, at 26; *see also* Walch, *supra* note 30, at 846 ("When a bitcoin is transferred to another party, all the computers that run the Bitcoin software (referred to as 'nodes') work together to verify that the party seeking to transfer that bitcoin has not already transferred it to someone else.").

45. For a more complete description of the proof-of-work consensus mechanism and the other possible forms of consensus, see Reyes, *supra* note 30 (manuscript at 8-13); *see also* MOUGAYAR, *supra* note 29, at 25; Wright & De Filippi, *supra* note 31, at 5-7.

46. *See* Sloane Brakeville & Bhargav Perepa, *Blockchain Basics: Introduction to Distributed Ledgers* (May 9, 2016), http://www.ibm.com/developerworks/cloud/library/cl-blockchain-basics-intro-bluemix-trs/index.html [https://perma.cc/UZ4F-4B3F].

47. We note here that not all DLT protocols are created equal. Some decentralized protocols support more robust smart contract functionality than others, and some distributed protocols do not support smart contracts at all. *See* Werbach, *supra* note 33, at 31.

48. *See generally* Nick Szabo, *Smart Contracts* (1994), http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html [https://perma.cc/X9WQ-53B5] (discussing what smart contracts are and their utility). Szabo defines smart contracts as "a computerized transaction protocol that

phrase often confuses lawyers, understanding Szabo's concept requires disassociating smart contracts from legal contracts.[49] Instead, a smart contract is, at its core, "a computer protocol—an algorithm—that can self-execute, self-enforce, self-verify, and self-constrain the performance of" its instructions.[50] Szabo himself considered a digital cash protocol to constitute an example of a smart contract.[51] In other words, the Bitcoin blockchain itself is a smart contract used for the transfer of digital value.[52] More complex smart

---

executes the terms of a contract." *Id.*

49. *See* MOUGAYAR, *supra* note 29, at 42 ("Smart contracts are not the same as a contractual agreement. If we stick to Nick Szabo's original idea, smart contracts help make the breach of an agreement expensive because they control a real-world valuable property via 'digital means.' So, a smart contract can enforce a functional implementation of a particular requirement, and can show proof that certain conditions were met or not met.").

50. TIM SWANSON, GREAT CHAIN OF NUMBERS: A GUIDE TO SMART CONTRACTS, SMART PROPERTY, AND TRUSTLESS ASSET MANAGEMENT 16 (2014); *see also* MELANIE SWAN, BLOCKCHAIN: BLUEPRINT FOR A NEW ECONOMY 16 (2015) ("[A] smart contract is both defined by the code and executed (or enforced) by the code, automatically without discretion.").

51. *See* Szabo, *supra* note 48.

52. *See, e.g.*, Werbach, *supra* note 33, at 30 ("Distributed ledgers are active, not passive. In other words, they do not simply record information passed to them. They are part of a consensus system, so they must ensure that recorded transactions are actually completed to match the consensus. For Bitcoin, that means the system self-enforces financial transfers. I can't initiate a transaction promising to send you Bitcoin and then renege; the synchronization that reconciles and completes the transfer is part of the process. This mechanism is known as a smart contract. Both the specification of rights and obligations, and the execution of that contractual agreement, occur through the platform." (footnotes omitted)).

contracts can be created,[53] and often software developers choose to create such complex smart contracts on the Ethereum protocol.

The Ethereum protocol's creators specifically designed it to enable smart contract functionality.[54] One writer explains, "Ethereum has its focus on smart contracts instead of being exclusively a digital currency. And as part of that, Ethereum transactions can be ... more sophisticated than Bitcoin's: full-fledged, high language programs, some many thousand lines long, which can call on each other, almost ad infinitum."[55] Smart contracts, whether on the Ethereum protocol or not, need not be limited to use in the realm of digital cash. Instead, smart contracts are tools of general application that offer unique and powerful elements of autonomy, self-sufficiency,

---

53. *See* MOUGAYAR, *supra* note 29, at 43 ("Smart contracts are not the same as blockchain applications. Smart contracts are usually part of a decentralized (blockchain) application."); SWAN, *supra* note 50, at 16 ("In the blockchain context, contracts or smart contracts mean blockchain transactions that go beyond simple buy/sell currency transactions, and may have more extensive instructions embedded into them."); Werbach, *supra* note 33, at 30-31 ("Adding richer programming capabilities to blockchain transactions adds security risks and various other complexities. On the other hand, a smart contract engine on the blockchain creates enticing possibilities. In technical terms, smart contracts are essentially autonomous software agents. With smart contracts, a distributed ledger becomes functionally a distributed computer."). Note that we use "smart contracts" in the technological sense of the term. The term "smart contracts" as used with reference to DLT is often confused with terms used to describe contracts that involve computer code in some way. Although smart contracts may be part of these other forms of computerized contracts, they are distinct concepts. For a description of one kind of computerized contract outside of the DLT context, see Lauren Henry Scholz, *Algorithmic Contracts*, 20 STAN. TECH. L. REV. (forthcoming 2017) (manuscript at 107-09). Scholz's article argues that

> algorithmic contracts are contracts in which an algorithm determines a party's obligations[, and explains that] some contracts are algorithmic because[: (1)] the parties used algorithms as negotiators before contract formation, choosing which terms to offer or accept[; and] other[s] are algorithmic because [(2)] the parties agree that an algorithm to be run at some time after the contract [is formed] will serve as a gap-filler."

Id. (manuscript at 101).

54. *See* MOUGAYAR, *supra* note 29, at 43 (noting that Ethereum uses a specific smart contract language (Solidity), enabling coders to write complex processes in a short span of code); Werbach, *supra* note 33, at 31 ("Newer blockchain platforms remove Bitcoin's limitations on smart contracts. The most prominent is Ethereum, which launched in 2015. Ethereum offers a Turing-complete programming language, meaning that in theory, any application that runs on a conventional computer can be executed on the distributed computer of its consensus network. Ethereum is designed as a complete smart contract platform, including development tools and a browser." (footnotes omitted)).

55. DIEDRICH, *supra* note 41, at 39.

and distributed architecture.[56] Essentially, smart contracts enable parties to structure relationships in a self-enforcing way, such that the parties no longer need a trusted intermediary to carry out the mandates of the relationships or to ensure that the mandates are properly interpreted. In short, complex layers of interacting smart contracts may enable distributed governance.

C. Distributed Governance

Corporate governance refers to the mechanisms within business organizations for addressing "managerial accountability, board structure and shareholder rights."[57] Typically contemplating the default statutory model of a multi-member body that acts collegially rather than a single hierarch,[58] "the corporate governance industry influences (and in some cases effectively controls) the votes of trillions of dollars of equity."[59] Accordingly, it impacts "the governance policies and fortunes of countless companies through proxy voting recommendations and governance ratings."[60] The reason for this is that corporate governance is the mechanism by which business organizations oversee, execute, and maintain a complex series of interacting agreements between the organization's different stakeholders.[61] In examining these agreements throughout the years, corporate governance scholars have focused considerable attention on attempting to design methods of assessing whether a business

56. *See* Reyes, *supra* note 31, at 16-17.

57. *See* Brian R. Cheffins, *The History of Corporate Governance*, *in* THE OXFORD HANDBOOK OF CORPORATE GOVERNANCE 46, 46 (Mike Wright et al. eds., 2013).

58. *See* Stephen M. Bainbridge, *Why a Board? Group Decisionmaking in Corporate Governance*, 55 VAND. L. REV. 1, 45 (2002).

59. Paul Rose, *The Corporate Governance Industry*, 32 J. CORP. L. 887, 887 (2007).

60. *Id.*

61. In examining these issues over the last couple of decades, much of the corporate governance scholarship has focused on the connection between better corporate governance and firm market value, firm performance, stock market development, and economic growth. *See, e.g.*, Lucian Bebchuk et al., *What Matters in Corporate Governance?*, 22 REV. FIN. STUD. 783, 786 (2009) (finding that certain provisions entrenching managers appear to also negatively influence "firm valuation and stockholder returns"); Rafael La Porta et al., *Legal Determinants of External Finance*, 52 J. FINANCE 1131, 1139 (1997) (finding that "the results on debt, like those on equity, suggest that legal rules influence external finance"); Ross Levine, *Law, Finance, and Economic Growth*, 8 J. FIN. INTERMEDIATION 8, 24 (1999) ("[T]he legal and regulatory environment materially affect financial intermediary development.").

organization has good governance mechanisms and agreements in place.[62]

DLT and smart contracts may disrupt traditional structures for managing these interacting agreements. Smart contracts, embedded in and layered upon DLT, offer the opportunity for autonomously operating software to oversee, execute, and maintain a series of interacting agreements, "not as an intermediary for individuals or companies, but rather, in a functionally meaningful sense, in its own right."[63]

Early experiments with this and related (but subtler) forms of distributed governance mechanisms are already underway. For example, the Robin Hood Coop, based in Tampere, Finland, is a legally organized investment cooperative that uses DLT-based software to manage cooperative assets to generate wealth for its members.[64] The Robin Hood Coop "use[s] financial technologies to democratize finance, expand financial inclusion and generate new economic space."[65] In another example, a company based in Germany, KOINA, AG, uses "a proprietary smartchain" to offer a contractual monetary system that "enables producers to issue credit which

---

62. Many believe that corporate governance rankings and indices offer a uniform scale for evaluating a company's governance. *See, e.g.*, Sanjai Bhagat et al., *The Promise and Peril of Corporate Governance Indices*, 108 COLUM. L. REV. 1803, 1807 (2008) ("Today, a market for corporate governance ratings exists."); Simeon Djankov et al., *The Law and Economics of Self-Dealing*, 88 J. FIN. ECON. 430, 432-33 (2008) (analyzing the Anti-Self-Dealing Index); Ronald J. Gilson, *Corporate Governance and Economic Efficiency: When Do Institutions Matter?*, 74 WASH. U. L.Q. 327, 329 (1996) (analyzing "the hypothesized link between corporate governance and economic efficiency through two different lenses that highlight the role of national institutions: path dependency and industrial organization"); Rafael La Porta et al., *Law and Finance*, 106 J. POL. ECON. 1113, 1127 (1998) (analyzing the Antidirector Rights Index); Jonathan R. Macey, *Measuring the Effectiveness of Different Corporate Governance Systems: Toward a More Scientific Approach*, *in* THE REVOLUTION OF CORPORATE FINANCE 579, 588 (Joel M. Stern & Donald H. Chew, Jr. eds., 4th ed. 2003) ("[S]uggest[ing] [three] ways for measuring the performance of a corporate governance system."); Robert Daines et al., *Rating the Ratings: How Good Are Commercial Governance Ratings?* 11 (Stanford Univ. Sch. Law & Econ. Research Paper Series, Paper No. 360, 2009), http://ssrn.com/abstract=1152093 [https://perma.cc/R4DC-UJJZ] (exploring governance ratings from three rating firms).

63. Bayern, *supra* note 32, at 1486. In other words, smart contracts and DLT "make way for software that could be programmed to act as if it were conducting business on its own account." *Id.* at 1492.

64. *See* David Bollier, *The Robin Hood Coop, an Activist Hedge Fund*, DAVID BOLLIER: NEWS AND PERSPECTIVES ON THE COMMONS (Nov. 20, 2015, 12:02 PM), http://www.bollier.org/blog/robin-hood-coop-activist-hedge-fund [https://perma.cc/7HF9-Y7LQ].

65. *Id.*

allows them to finance their future production independently."[66] These are examples of attempts to use forms of distributed governance enabled by smart contracts and DLT to radically alter the economic model pursued by current governance structures. Other efforts offer subtler forms of distributed governance. Otonomos, based in Singapore, uses a DLT-enabled platform to offer online business incorporation, capital raising, and governance.[67] Otonomos's software replaces each paper process required for incorporation, raising capital, and corporate governance with secure software keys and smart contracts.[68] Calling a business incorporated through their software a "Blockchain Chartered Company," Otonomos ensures that the result of the wholly online, DLT-based process is the legally valid incorporation of the company.[69]

These examples offer insight into the breadth and depth of the disruption that DLT-enabled distributed governance may introduce to the commercial system. However, this disruption should not be pursued for disruption's sake. Recognizing the potential for disruption but wary of adopting new technology merely because it is new, this Article offers an initial investigation into both the areas where DLT may benefit corporate governance models and the risks inherent in applying DLT in this context.

II. THE PROMISE AND THE PERILS

Much like the Internet before it, DLT may significantly alter law and the business environment. While some skeptics may view focusing on law relevant to DLT as useful as focusing on the "law of the horse,"[70] we believe that useful insights come from considering how

---

66. KOINA, https://koina.cc/ [https://perma.cc/KRC8-X9NZ].

67. *See* OTONOMOS, https://www.otonomos.com [https://perma.cc/9MQY-W38H].

68. *See id.*

69. *See* Han Verstraete, *Decentralisation: The "Stargate" Between Pushing Paper Locally and Moving Data Globally*, OTONOMOS (Jan. 26, 2009), https://www.otonomos.com/decentralisation-the-stargate-between-pushing-paper-locally-and-moving-data-globally/ [https://perma.cc/NP9U-WP8W]. Currently, Otonomos offers its services for creating and incorporating companies in five jurisdictions (Singapore, Hong Kong, United Kingdom, BVI, and the Cayman Islands) with announced plans to expand to offer C-Corporation services in Delaware. *See Start Now*, OTONOMOS, https://www.otonomos.com/start-now/ [https://perma.cc/58YR-R3TS].

70. The "law of the horse" is a term Frank Easterbrook coined in reference to the law of cyberspace, quipping that the law of cyberspace is merely a specialized endeavor to which

these emerging entities differ and may challenge traditional legal structures.[71] Specifically, we believe that, like the lessons that have emerged from the study of the interaction between "law and cyberspace," examining the interaction between existing corporate governance law and DLT-enabled distributed governance mechanisms will teach "about the limits on law as a regulator and about the techniques for escaping those limits," and it will require us to take a closer look at "the collection of tools that a society has at hand for affecting constraints upon behavior"[72] of corporations.

A. Unique Benefits

1. New Business and Political Governance Structures

Writing about the biased nature of technologies, political scientist Langdon Winner's controversial thesis, that technologies have politics embodying social relations, has inspired significant debate.[73] Winner argued that technology both emerges from and creates social foundations.[74] While some technologies may promote democratic social relationships, others favor autocracy.[75] Winner's ideas provide a frame for considering how DLT and smart contracts may shape business entities. Under Winner's thesis, technologies have politics in two ways: either (1) "the invention, design, or arrangement of a specific technical device or system becomes a way of settling an issue in the affairs of a particular community"; or (2) the systems are "inherently political technologies," which "appear to require or to be strongly compatible with particular kinds of political relationships," technical arrangements, and social order.[76]

general legal rules could be applied as problems arise on a case by case basis, rather than a separate area of law. *See* Frank H. Easterbrook, *Cyberspace and the Law of the Horse*, 1996 U. CHI. LEGAL F. 207, 207 ("[T]he best way to learn the law applicable to specialized endeavors is to study general rules.").

71. *See* Lawrence Lessig, *The Law of the Horse: What Cyberlaw Might Teach*, 113 HARV. L. REV. 501, 502 (1999) ("[T]here is an important general point that comes from thinking in particular about how law and cyberspace connect.").

72. *Id.*

73. *See* LANGDON WINNER, THE WHALE AND THE REACTOR: A SEARCH FOR LIMITS IN AN AGE OF HIGH TECHNOLOGY 21-22 (1986).

74. *See id.*

75. *See id.* at 25.

76. *Id.* at 22.

This is hardly surprising. As people adapt to technologies, their everyday practices, feelings, and even their identities and senses of self may shift, often in unanticipated ways. The most commonly cited example from Winner's work involves the segregationist politics embodied in the "height ... of the bridges over the park ways on Long Island, New York."[77] According to Winner, Robert Moses designed these bridges to "discourage the presence of buses."[78] "One consequence was to limit access of racial minorities and low-income groups to Jones Beach, Moses' widely acclaimed public park."[79] Nevertheless, Winner argues that "to recognize the political dimensions in the shapes of technology does not require that we look for conscious conspiracies or malicious intentions."[80] There are many cases in which "the technological deck has been stacked in advance to favor certain social interests," although this stacking was not necessarily consciously designed by anyone.[81] One example Winner gives for such a situation is the failure to accommodate for disabled individuals that resulted "more from long-standing neglect than from anyone's active intention."[82]

DLT may offer new dimensions to Winner's paradigm by being both a technology that can be used to settle a community's issues and a technology that can be shaped and used for any number of political relationships. First, DLT may be used to settle corporate governance disputes by enabling all stakeholders to participate and all leaders to manage and conduct their affairs in broad daylight as a peer among peers. In other words, DLT offers a mechanism for

---

77. *Id.* at 22-23.

78. *Id.* at 23.

79. *Id.* Winner gives other examples of consciously political design, such as (1) "Baron Haussmann's broad Parisian thoroughfares, engineered at Louis Napoleon's direction to prevent any recurrence of street fighting of the kind that took place during the revolution of 1848," (2) "concrete buildings and huge plazas constructed on university campuses in the United States during the late 1960s and early 1970s to defuse student demonstrations," and (3) Cyrus McCormick's introduction of pneumatic molding machines into his Chicago reaper manufacturing plant in the 1880s, in order to "'weed out' ... the skilled workers who had organized [a local union]." *Id.* at 23-24.

80. *Id.* at 25.

81. *Id.* at 26.

82. *Id.* at 25. Another notable example is the introduction of mechanical tomato harvesters, which inspired the breeding of "new varieties of tomatoes that are" able to better handle the machinery's rough motion. *See id.* at 26. The combination of new equipment and new tomato breeds has had a dramatic effect on farm communities, which have been displaced by large agri-businesses. *See id.* at 26-27.

radical transparency that puts governance actions on display in an immutable ledger.[83] Such transparency can also help change undesired corporate governance norms and culture in business organizations.[84] Second, DLT may change the way we think about corporate governance decision-making altogether. DLT enables business governance structures that are more transparent, more flat, and more participatory.[85] For example, Backfeed offers a decentralized protocol based in DLT that allows people to govern, collaborate, and cooperate without a centralized authority or agency.[86] Backfeed incorporates a peer-to-peer evaluation mechanism called the Reputation Score, and participants earn increasing rewards corresponding to their contributions.[87] The protocol's algorithm takes data from these elements and "ensure[s] a fair distribution of the generated value to each individual, according to the perceived value of their respective contribution to the organization as a whole."[88] The Backfeed protocol thus enables new business governance structures: they originate among the workers but are objectively valued by management in light of the clear data evidence in the protocol.[89]

---

83. *See* Alex Tapscott, *Blockchain Democracy: Government Of The People, By The People, For The People*, FORBES (Aug. 16, 2016, 2:38 PM), https://www.forbes.com/sites/alextapscott/2016/08/16/blockchain-democracy-government-of-the-people-by-the-people-for-the-people/#39e35d6e1fb5 [https://perma.cc/55XK-7RW3] (listing other types of democratic improvements that can result from using the new technology).

84. On the importance of corporate culture as it relates to transparency, corporate governance, and a business organization's success, see Nizan Geslevich Packin & Benjamin P. Edwards, *Regulating Culture: Improving Corporate Governance with Anti-Arbitration Provisions for Whistleblowers*, 58 WM. & MARY L. REV. ONLINE 41, 64 (2016) (arguing, inter alia, that a focus on corporate culture has emerged as a regulatory, public, and media priority, and explaining that "[g]iven the importance of business culture in our modern society, and the consequences that such culture and behavioral norms have, it is extremely important to nudge individuals as well as businesses to promote increased norms of accountability and transparency.").

85. Yochai Benkler and others have written about how technology now enables peers to produce goods without traditional hierarchical structures. *See generally* Yochai Benkler et al., *Peer Production: A Form of Collective Intelligence*, *in* HANDBOOK OF COLLECTIVE INTELLIGENCE (Thomas Malone & Michael Bernstein eds., 2015) (exploring the development of peer production literature). Distributed entities may advance this dynamic further.

86. *See Explore in Depth*, BACKFEED, http://backfeed.cc/explore-in-depth [https://perma.cc/C4AT-NQLK].

87. *See id.*

88. *See* BACKFEED, DECENTRALIZED VALUE DISTRIBUTION SYSTEM FOR BLOCKCHAIN-BASED APPLICATIONS 1, http://backfeed.cc/assets/docs/TechnicalSummary.pdf [https://perma.cc/5YV4-N22D].

89. *See generally* David Shamah, *Backfeed Seeks to Make the Workplace—and the*

Backfeed's creators believe that working under governance structures of their own design will make people more invested in their work and drive increases in both production and quality.[90]

New technologies may also promote democratic agendas. For example, solar power may be a particularly democratic technology because of its decentralized nature.[91] Solar power can operate at multiple sites and needs little monetary investment per site and far less technical expertise than other systems.[92] Winner argues that no hierarchical social structures need to be created or maintained to deploy solar technology.[93] It is indeed inherently democratic and populist.[94] Similarly, scholars have argued that DLT may also promote democratic goals by lowering the social and economic barriers certain populations face. Notably, women in developing countries often lack social and financial freedom.[95] DLT may grant increased independence to these populations by allowing them to bypass traditional intermediaries and gatekeepers.[96] Likewise, many believe that the new "technology can be applied to help modernize the democratic process" and "usher in digital democracy" by removing barriers to and improving the governance of voting systems.[97]

World—More Fair, TIMES OF ISRAEL (Dec. 3, 2015), http://www.timesofisrael.com/backfeed-seeks-to-make-the-workplace-more-fair/ [https://perma.cc/UQ8T-A55U] (discussing management models that emulate the Backfeed decentralized system).

90. *See id.*

91. *See* WINNER, *supra* note 73, at 32.

92. *See id.* at 32-33.

93. *See id.*

94. *See id.*

95. *See* Tanaya Macheel, *How Bitcoin Helps Afghan Girls Achieve Financial Freedom*, COINDESK (June 7, 2014, 1:00 PM), http://www.coindesk.com/how-bitcoin-helps-afghan-girls-achieve-financial-freedom/ [https://perma.cc/BVB4-JK27].

96. *See id.* ("If [we] can provide a platform in which women can have their own income—a platform which pays out in bitcoin, a truly pseudonymous protocol which can truly conceal the identity, I think that we have the potential to really shake things up."). Many also hope that

> by earning a salary independently, the girls' families might see their education as a source of income and become more supportive of it.... With bitcoin, no one other than the payee has to know that she has a bitcoin wallet. WAF can pay the girls in a timely manner with minuscule fees. This eliminates the need to open a bank account, which would require extensive documentation and the need for legal guardian approval if they are underage, which could result in more difficulties.

Id.

97. Danny Bradbury, *How Block Chain Technology Could Usher in Digital Democracy*, COINDESK (June 16, 2014, 11:05 PM), http://www.coindesk.com/block-chain-technology-digital-democracy/ [https://perma.cc/CSS5-KX3J].

For example, distributed governance systems might make it more difficult for management to suppress information, as often occurs through the current shareholder proposal settlement process.[98]

2. Decreased Cost of Financial Intermediation

In recent studies, scholars and financial institutions have found that application of "DLT has the potential to transform capital market structure by encouraging new business development, improving operational efficiency, and contributing to cost reduction."[99] In early 2016, experts estimated that "IT and operations expenditure in capital markets ... [were] close to [$]100-[$]150 billion per year among banks."[100] Additionally, "post-trade and securities servicing fees" were estimated at $100 billion, and tremendous "capital and liquidity costs are also incurred as a result of current delays and inefficiencies within market operations."[101] However, many of these costs are the result of "redundant or duplicative systems [and] operational overheads," which DLT can eliminate or reduce.[102] Moreover, DLT can enable "cost-sharing across institutions," which would be financially and operationally efficient and help to lower businesses' "financial resource requirements" by, for example,

98. *See* Sarah C. Haan, *Shareholder Proposal Settlements and the Private Ordering of Public Elections*, 126 YALE L.J. 262, 295 (2016) ("Social and environmental shareholder proposals generally highlight specific societal harms caused by corporate activity, information the company would likely prefer to suppress.").

99. Atsushi Santo et al., *Applicability of Distributed Ledger Technology to Capital Market Infrastructure* 5-6 (Japan Exch. Grp., Working Paper No. 15, 2016), https://www.finextra.com/finextra-downloads/newsdocs/e_jpx_working_paper_no15.pdf [https://perma.cc/7QDR-UP2D]; *see also* PETER EVANS-GREENWOOD ET AL., DELOITTE, BITCOIN, BLOCKCHAIN & DISTRIBUTED LEDGERS: CAUGHT BETWEEN PROMISE AND REALITY 7 (2016), https://www2.deloitte.com/content/dam/Deloitte/au/Images/infographics/au-deloitte-technology-bitcoin-blockchain-distributed-ledgers-180416.pdf [https://perma.cc/GXP7-YVGL] ("[C]apital markets will be made faster and more efficient once moved *onto the blockchain*. There are even proposals for creating ownerless companies that live *on the blockchain*, giving these companies sovereignty over their own assets via technologically enforced contracts—bypassing today's sprawling and inefficient financial back offices and legal systems.").

100. EUROCLEAR & OLIVER WYMAN, BLOCKCHAIN IN CAPITAL MARKETS: THE PRIZE AND THE JOURNEY 20 (2016), http://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf [https://perma.cc/7P5W-QYPB].

101. *Id.*

102. *Id.*

minimizing "counterparty credit risk[] [so as] to drive down economic costs of business."[103]

Overstock.com (Overstock) created the T Zero (T0) distributed ledger platform for capital markets for precisely these reasons.[104] The platform uses "cryptographically secure distributed ledgers with existing market processes to reduce settlement time and costs, increase transparency, efficiency and auditability."[105] T Zero takes its name from the improvement it offers over traditional mechanisms in terms of settlement time. "Equity transactions generally settle three days after trade date," often referred to as T+3.[106] Overstock's platform offers same day settlement, or T+0.[107] Nasdaq began developing its own DLT-enabled platform, Linq, to "offer efficient, fully-electronic services that facilitate the issuance, transfer, and management of private company securities" in mid-2015.[108] Meanwhile, any number of companies are pursuing DLT-based solutions for "payments, lending or remittances," with the aim

103. *Id.*

104. *See* T ZERO, https://tzero.com [https://perma.cc/65ZL-SMYF]. Note that Overstock initially used the T Zero platform to sell a $5 million bond, or "cyptobond," to FNY Managed Accounts. Press Release, Overstock.com, Inc., Overstock.com and FNY Capital Conclude $5 Million Cryptobond Deal (July 31, 2015), http://investors.overstock.com/mobile.view?c=131091&v=203&d=1&id=2073583 [https://perma.cc/25YK-NMJM]. Later, after obtaining SEC approval, Overstock began using T Zero for crypto-equity. *See* Michael del Castillo, *Overstock Just Closed its First Day of Blockchain Stock Trading*, CoinDesk (Dec. 16, 2016, 10:48 PM), https://www.coindesk.com/overstock-first-day-blockchain-stock-trading/ [https://perma.cc/KHL6-2TKK]. Technically speaking, "Overstock's t0 platform uses the blockchain to attach a digital token to a borrowed share of stock. The use of cryptographic token to track the activity of the underlying share of stock gives the stock holder the ability to closely track each transaction involving their loaned share of stock." Working Group on Cryptographic Token, *A Primer on Cryptosecurities* 2 (COALA Blockchain Workshops, Working Draft Version 1.0, 2015), http://coala.global/uploads/COALA-A-Primer-On-Cryptosecurities-Dec-2015.pdf [https://perma.cc/5CBQ-CN5C].

105. *See* T ZERO, *supra* note 104.

106. Press Release, T Zero, T0 Platform Successfully Employed in the World's First Public Issuance of a Blockchain Equity (Dec. 22, 2016), https://tzero.com/news/2016/12/22/t0-platform-successfully-employed-in-the-worlds-first-public-issuance-of-a-blockchain-equity [https://perma.cc/8A6G-MUAV].

107. *See id.*

108. Press Release, Nasdaq, Nasdaq Launches Enterprise-Wide Blockchain Technology Imitative (May 11, 2015), http://ir.nasdaq.com/releasedetail.cfm?releaseid-912196 [https://perma.cc/5UD6-SLU5]. "Nasdaq's Linq project will allow private companies to issue stock in the form of cryptographic tokens to founders and investors. Issuance and transfer of the tokens will be managed using the Linq dashboard." Working Group on Cryptographic Token, *supra* note 104, at 2.

of reducing market inefficiencies, reducing cost, and increasing access to financial services among the underserved.[109] For example, in the remittance context, "the cost of remitting money averages 8.4 percent globally, driven in large part by the legacy brick-and-mortar distribution networks and multi-bank settlement chains of incumbents like Western Union and MoneyGram."[110] Companies like Abra use DLT-enabled remittance protocols to offer remittances free from sending and receiving fees.[111] The hope is that such services "will not only lead to more value accretion to remitting customers, but it will also be the kind of radical value proposition improvement that will be required to attract customers and break them from established habits around sending and receiving money."[112]

3. Selectively Incorporate Stakeholder Communities

DLT offers a community-based approach. It grants stakeholders access to a shared content ledger, often revealing all changes made by each party.[113] This significantly reduces the cost of accessing information for minority stakeholders.[114] Depending on the elements of corporate governance shifted to DLT, the need for a "books and records" action with distributed entities may diminish.

It is not surprising, therefore, that DLT's most common applications "require the input and joint effort of multiple stakeholders, such as industrial supply chains and financial services."[115] The technology serves "open communities of practice, including open markets or trade platforms, ... collaborative work environments, such as large-scale, multiple-stakeholder and international projects, as well as governmental projects and processes involving many

---

109. *See* Jackie Hyland, *Unlocking Blockchain for the Underbanked*, TECHCRUNCH (Mar. 14, 2016), https://techcrunch.com/2016/03/14/unlocking-blockchain-for-the-underbanked/ [https://perma.cc/7JZ5-BSB3] (pointing to companies such as BitPagos, Bitex.la, Bitso, Volabit, Wayniloans, Blinktrade, BitPesa, Atlas, Switchless, Coins.ph, Abra, and Allaire).

110. *Id.*

111. *See* ABRA, https://www.goabra.com/ [https://perma.cc/GYW9-YM6L]

112. Hyland, *supra* note 109.

113. *See* Schalk Burger, *Blockchain Technology Can Improve Multistakeholder Process Integrity*, ENGINEERING NEWS (Aug. 12, 2016), http://www.engineeringnews.co.za/article/blockchain-technology-to-improve-multi-stakeholder-process-integrity-wipro-2016-08-12/rep_id:4136 [https://perma.cc/S2N4-K6JD].

114. *See id.*

115. *Id.*

agencies or departments."[116] Moreover, the benefit of the DLT "arises mainly from the shared, common ledger or 'chain of blocks,'"[117] which allows all stakeholders to be assured that all parties in the chain rely on the same set of verified "shared facts."[118] The fact that "all stakeholders[ ] have[ ] access to the chain of events and [its] changes makes the process transparent, which establishes trust while working in a 'trustless' environment."[119]

Radical transparency may not be useful in all corporate governance circumstances. As such, an entity may choose to adopt DLT-based governance for some areas of its operations but not others. Further, an entity may choose among DLT solutions to find the technology with a level of transparency best suited to its purposes. For example, the entity adopting elements of distributed governance may opt to grant only selective stakeholders access to corporate information and records stored in DLT. Although public blockchains such as the Bitcoin blockchain or the Ethereum platform dominate the discussion, it is possible to code new DLT platforms that are structured to meet specific needs. For example, R3 CEV built its Corda™ distributed ledger for financial transactions to restrict access to data held within smart contracts to only the parties with a need to know such information.[120] In other words, even entities seeking to increase the level of multi-stakeholder collaboration within its governance structures need not adopt wholesale elements of DLT that would act as a detriment or burden to the entity. It is possible to customize the technology such that its most useful aspects are adopted while its least useful aspects are minimized.

B. Governance Risks

Counterbalancing the benefits discussed above, distributed business organizations also face significant governance challenges, which should not be ignored. Nevertheless, careful planning and

116. *Id.*
117. *Id.*
118. *See* Richard Gendal Brown, *Introducing R3 Corda™: A Distributed Ledger Designed for Financial Services*, R3. (Apr. 5, 2016), https://www.r3cev.com/blog/2016/4/4/introducing-r3-corda-a-distributed-ledger-designed-for-financial-services [https://perma.cc/BQ48-KYDR].
119. Burger*, supra* note 113.
120. *See* Brown, *supra* note 118.

structuring may allow these emerging entities to overcome these challenges and be successful. We detail some of the key governance concerns below.

1. Difficulty of Smart Contract Coding

As The DAO's demise illustrates, distributed business entities face significant technical challenges, which, for the most part, are not easily resolved. Writing about their experience in teaching smart contract coding to undergraduate students, a group of University of Maryland professors explained: "In contrast to traditional software development tasks where bugs such as buffer overflows are often benign (except in rare or contrived scenarios), in our lab, we observed several bugs and pitfalls that arise due to the unique nature of smart contract programs and lead to clear and immediate exploits."[121] Without the presence of officers or directors to oversee and intervene in the event of a flaw or an exploit, distributed organizations may hemorrhage assets. Most notably, a third of The DAO's assets escaped shortly after its launch.[122] To mitigate this risk, future distributed entities may build in additional safeguards, such as phased rollouts or sandboxing that allow for more strenuous testing of the code. Even with such additional precautions, use of a smart contract may be a risky endeavor that investors should carefully assess. Notably, the programmer behind The DAO, Christoph Jentzsch, was himself "an Ethereum veteran with a university degree in theoretical and mathematical physics."[123] Jentzsch understood Ethereum and previously worked "as a software tester[,] [b]ut decentralized code can be exceedingly hard to test. That even he can trip up, predicts that a lot of people trying their hands at smart contracts will."[124]

---

121. Kevin Delmolino et al., *Step by Step Towards Creating a Safe Smart Contract: Lessons and Insights from a Cryptocurrency Lab*, *in* FINANCIAL CRYPTOGRAPHY AND DATA SECURITY 79, 80 (Jeremy Clark et al. eds., 2016). In this documentation, the researchers explained how their lab exposed "numerous common pitfalls in designing safe and secure smart contracts," and they "document[ed] several typical classes of mistakes students made"; yet they also suggested methods to fix or avoid these types of mistakes "and advocate[ed] best practices for programming smart contracts." *Id.* at 79.

122. *See* Norton, *supra* note 21.

123. DIEDRICH, *supra* note 41, at 54.

124. *Id.*

Nevertheless, distributed organizations may be well-situated to mitigate risks inherent in building smart contract code structures. In contrast to more traditional firms, the early stage backers of distributed business organizations often possess significant technical sophistication. Their contributions give them a stake in the organization's continued success and a strong incentive to test and prove the entity's code. Importantly, traditional business entities also face hacking risks and may have more vulnerable points than distributed entities.[125] Traditional organizations also face continual threats from social engineering or social hacking, where hackers manipulate human personnel to gain critical information and access.[126]

2. *Free-Rider Problems*

Distributed organizations may face free-rider problems.[127] A diffuse entity with many small stakeholders may not function effectively without managing small stakeholder incentives.[128] If small stakeholders reap small benefits from exercising governance rights, it may be irrational for them to incur the information gathering and analysis costs necessary for the organization to function effectively.[129]

---

125. *See, e.g.*, Nizan Geslevich Packin, *Too-Big-To-Fail 2.0? Digital Services Providers as Cyber-Social Systems*, 93 IND. L.J. (forthcoming 2017) (manuscript at 31-36), https://ssrn.com/abstract=2988284 [https://perma.cc/DH4C-6F7X] (describing why the potential collapse of certain nonbank entities might have similar impact to that of the too-big-to-fail business organizations, and describing some of the more acute recent hacks, cybersecurity attacks, and risks that traditional business entities faced).

126. *See* CHRISTOPHER HADNAGY, SOCIAL ENGINEERING: THE ART OF HUMAN HACKING 10 (2011) (defining "social engineering" as "the art or better yet, science, of skillfully maneuvering human beings to take action in some aspect of their lives").

127. For a discussion of the free-rider problem in the labor context, see Matthew Dimick, *Labor Law, New Governance, and the Ghent System*, 90 N.C. L. REV. 319, 349 (2012) ("Whenever the benefits of group action are collective—they cannot be provided to some without providing them to all—there is an incentive for a member of the group to 'free ride' on the contributions of others and not join or support the group's efforts.").

128. *Cf. id.* at 324-25 (examining the role of labor leadership in encouraging unionization and preventing the free-rider problem).

129. Even institutional investors with larger holdings often hesitate to incur costs associated with the exercise of governance rights. *See* Ronald J. Gilson & Jeffrey N. Gordon, *The Agency Costs of Agency Capitalism: Activist Investors and the Revaluation of Governance Rights*, 113 COLUM. L. REV. 863, 867 (2013) ("The governance problem that arises from the 'separation of ownership from control' is the undervaluation of the vote as a mechanism to

Smart contracts may create incentives for stakeholders to mitigate free-rider problems. One possibility might be to offer reputational benefits or other rewards for stakeholders incurring governance costs.[130] For example, if stakeholders discuss decisions through forums, the community could implement mechanisms to recognize and appropriately reward insightful contributions.[131] Another possible strategy might be to adopt a structure with a mix of large and small stakeholder blocks. The owners of larger stakes would face stronger incentives to devote resources to governance issues and somewhat mitigate free-rider problems.

Still, the extent to which the free-rider problem will affect distributed organizations may depend on their business environments. In businesses demanding constant attention and decisions, distributed organizations may struggle because these entities must make frequent decisions. These elevated decision-making costs may either cause small stakeholders to sell their stakes, or shirk their decision-making responsibilities and free ride on the decisions made by others.[132]

Distributed entities might also seek to mitigate collective action problems by relying on predictive algorithms to generate recommendations. In one notable example, a venture capital fund appointed a predictive computer algorithm to its board, giving it the authority to vote on funding decisions.[133] Still, relying on predictive algorithms carries significant risk as well: using predictive algorithms to guide decisions may simply elevate the biases of the persons that designed the predictive algorithms.[134]

---

impose change. The reconcentration of ownership through institutions adds only marginally to the value of the vote.").

130. *See, e.g.*, BACKFEED, *supra* note 86.

131. *See, e.g.*, *id.*

132. *See, e.g.*, Metz, *supra* note 1.

133. *See* Rob Wile, *A Venture Capital Firm Just Named an Algorithm to Its Board of Directors—Here's What It Actually Does*, BUS. INSIDER (May 13, 2014, 11:19 AM), http://www.businessinsider.com/vital-named-to-board-2014-5 [https://perma.cc/JM9D-398N].

134. *Cf.* Julia Angwin, *Make Algorithms Accountable*, N.Y. TIMES (Aug. 1, 2016), https://www.nytimes.com/2016/08/01/opinion/make-algorithms-accountable.html [https://perma.cc/85A3-UASB] ("We found the scores ... were biased against black defendants, who were falsely labeled ... at almost twice the rate of white defendants.").

3. Regulatory Risk

Paradigm-breaking distributed organizations also face significant risks from existing regulatory frameworks, such as federal securities laws.[135] Created in the aftermath of the Great Depression, the federal securities laws sought to increase transparency in the marketplace and to protect investors from the worst of the Depression-era abuses.[136] Unless authorized to be sold under an exemption, securities must be registered with the federal government—something that adds substantial expense to any offering.[137]

Interests in a distributed organization may qualify as securities.[138] The answer in particular cases will depend on how courts and regulators apply the well-worn *Howey* test to the new offerings.[139] An investment contract qualifies as a security if: (1) "individuals were led to invest money"; (2) "in a common enterprise"; (3) "with the expectation that they would earn a profit"; (4) "solely through the efforts of the promoter or of some one other than themselves."[140] Judicial decisions have added a substantial interpretive gloss to the test.[141] Importantly, to avoid classification as a security, offerings to join distributed business entities only need to avoid one of the elements.[142] Analysis of whether such offerings successfully avoid one of the elements

---

135. In some instances, new entrants may need to alter the regulatory regime to succeed. For a discussion of this dynamic, see generally Elizabeth Pollman & Jordan M. Barry, *Regulatory Entrepreneurship*, 90 S. CAL. L. REV. 383 (2017) (discussing recent developments in regulatory entrepreneurship).

136. *What We Do*, U.S. SECURITIES AND EXCHANGE COMMISSION, https://www.sec.gov/Article/whatwedo.html [https://perma.cc/A3LZ-QZ2N].

137. *See* 15 U.S.C. § 77f (2012) (providing registration requirements).

138. *See* Report of Investigation Pursuant to Section 21(a) of the Sec. Exch. Act of 1934: The DAO, Exchange Act Release No. 34,81207, 1-2 (July 25, 2017) (concluding that DAO tokens were securities).

139. *See* SEC v. W.J. Howey Co., 328 U.S. 293, 298 (1946).

140. *Id.*

141. *See generally* Jeffrey Allen Tew & David Freedman, *In Support of* SEC v. W.J. Howey Co.*: A Critical Analysis of the Parameters of the Economic Relationship Between an Issuer of Securities and the Securities Purchaser*, 27 U. MIAMI L. REV. 407 (1973) (surveying case law developments of securities law in the wake of *Howey*).

142. *See id.* at 410 (noting that to be defined as a security, all of the elements from *Howey* must be present).

> is complicated by the fact that the issuance of digital tokens is often not accompanied by a legally binding document that clearly spells out the various rights of the token buyer, meaning the character of the relationship between a token issuer and a token owner may be governed in large part by disparate representations, by implication or by common usage.[143]

In the context of The DAO, for example, the code that operated The DAO was said to be the contract between The DAO token holders.[144] That computer code may or may not be useful for determining whether the elements of the *Howey* test are present in The DAO's token offering.

Without a written agreement to turn to, the analysis will center on other facts. In some instances, distributed entities may be able to solicit new members without requiring them to invest "money." While the exchange of a cryptocurrency for a token would likely qualify as an investment of money, a contribution of computational power might not.[145]

While the common enterprise and expectation of profit elements may be more difficult to avoid, distributed entities with substantial stakeholder participation may not qualify as securities. The *Howey* test requires that expected profits derive "solely from the efforts" of another.[146] Despite the use of the term "solely," subsequent decisions have clarified investment contracts that call for marginal amounts of investor participation will still qualify as securities.[147] The more

143. Working Group on Cryptographic Token, *supra* note 104, at 3.

144. *See* Matt Levine, *Blockchain Company's Smart Contracts Were Dumb*, BLOOMBERG (June 17, 2016, 5:46 PM), https://www.bloomberg.com/view/articles/2016-06-17/blockchain-company-s-smart-contracts-were-dumb [https://perma.cc/MG85-A6H8] ("The terms of The DAO Creation are set forth in the smart contract code existing on the Ethereum blockchain at [code address]. Nothing in this explanation of terms or in any other document or communication may modify or add any additional obligations or guarantees beyond those set forth in The DAO's code. Any and all explanatory terms or descriptions are merely offered for educational purposes and do not supersede or modify the express terms of The DAO's code set forth on the blockchain." (quoting The DAO website)).

145. One possibility to avoid an investment of money would be to require new members of the collective to acquire their interests by contributing computational power and "mining" their stake. *See* Marco Santori, *Appcoin Law: ICOs the Right Way*, COINDESK (Oct. 15, 2016, 2:04 PM), http://www.coindesk.com/appcoin-law-part-1-icos-the-right-way/ [https://perma.cc/U83L-CELP].

146. SEC v. W.J. Howey Co., 328 U.S. 293, 299 (1946).

147. *See, e.g.*, United States v. Leonard, 529 F.3d 83, 88-91 (2d Cir. 2008); Robinson v.

involved stakeholders become, the less likely it will be that a court will treat an offering as a security.[148]

4. *Public Accountability Concerns*

DLT poses unique challenges to traditional government enforcement mechanisms. While a court can order an officer or a director to take an action, courts may struggle to enforce rulings against distributed entities.[149] When a distributed entity spans the globe and operates on a consensus basis, an order from one jurisdiction may not be followed by nodes outside that jurisdiction.[150]

This creates issues for distributed entities seeking to do business with more traditional entities. While traditional entities trust that courts possess the power to enforce most agreements with most counterparties, distributed entities may share characteristics with sovereign states.[151] If a distributed entity declines to comply with a court order, it may be difficult to compel its compliance through ordinary processes.[152] Of course, traditional processes with jurisdiction over individual members of a distributed entity may compel the individual members to act in particular ways.[153]

Limited access to public enforcement will not affect all distributed entities equally. The concern for enforcement applies with less force to distributed entities that primarily interact with other DLT-driven counterparties.[154] Because these entities interact on even terms, they may experience lower transaction costs.[155] Distributed entities may face higher costs when interacting with

---

Glynn, 349 F.3d 166, 169-70 (4th Cir. 2003).

148. *See Robinson*, 349 F.3d at 169-70 ("What matters more than the form of an investment scheme is the 'economic reality' that it represents.").

149. *Cf.* Bayern, *supra* note 32, at 1498-99.

150. *See* Reggie O'Shields, *Smart Contracts: Legal Agreements for the Blockchain*, 21 N.C. BANKING INST. 177, 191 (2017).

151. *See generally* JOSEPH CUTLER ET AL., PERKINS COIE, SELF-SOVEREIGN IDENTITY AND DISTRIBUTED LEDGER TECHNOLOGY: FRAMING THE LEGAL ISSUES (2017), https://www.virtualcurrencyreport.com/wp-content/uploads/sites/13/2017/05/Perkins-Coie-Self-Sovereign-Identity-and-Distributed-Ledger-Technology_Framing-the-Legal-Issues-1.pdf [https://perma.cc/3BES-CUPC] (examining the development of DLT and its accompanying legal issues).

152. *Cf.* Bayern, *supra* note 32, at 1498-99.

153. *Cf. id.*

154. *Cf.* O'Shields, *supra* note 150, at 177-78.

155. *See id.*

more traditional organizations because traditional entities may demand a direct means to seize collateral.[156]

CONCLUSION

As DLT and smart contracts continue their rapid development, more distributed business organizations will undoubtedly emerge. Their success will depend on their ability to draw upon the unique strengths of the model while mitigating the significant governance and enforcement risks posed by broad diffusion of power. After all, traditional corporate governance principles have served our society for years in part to accommodate the corporate form within contract law and, in substantial part, to address the agency problems that are associated with the agreements that enable the creation of the corporate form. Distributed business organizations should therefore consider the role of traditional corporate governance principles in structuring corporate affairs to achieve these goals.

Such goals should also be kept in mind because, as these technologies change the business environment, they will also alter the larger social and political environment. While DLT offers significant pro-democratic advantages, the technology may also carry unforeseen political risks. For example, Bitcoin's critics have characterized it as a tool for amplifying and empowering right-wing extremism and charged that it is designed to instantiate the forms of social power that make the rich more powerful and keep the poor powerless.[157] Even if not specifically driven by right-wing extremism, some

---

156. *Cf. id.* at 185-99.

157. *See* David Golumbia, *Bitcoin as Politics: Distributed Right-Wing Extremism*, *in* MONEYLAB READER: AN INTERVENTION IN DIGITAL ECONOMY 117 (Geert Lovink et al. eds., 2015), http://networkcultures.org/wp-content/uploads/2015/04/MoneyLab_reader.pdf [https://perma.cc/HT65-W7WK]. Golumbia explains:

> The lack of any valid, non-conspiratorial analysis of our existing financial systems means that Bitcoin fails to embody any substantial alternative to them. The reasons for this have little to do with technology and everything to do with the financial systems in which Bitcoin and all other cryptocurrencies are embedded, systems that instantiate the forms of social power that cannot be eliminated through either wishful thinking or technical or even political evasion: the rich and powerful will not become poor and powerless simply because some people decide to operate alternate exchange economies. Lacking a robust account of transforming these systems of power, even without Bitcoin's flaws, a "perfect" cryptocurrency would exacerbate, rather than address, the existing serious

scholars recognize that society always pays a price for technology; the greater the technology, the greater the price.[158]
Importantly, significant technological changes may be more ecological than additive.[159] Instead of simply adding a new tool to the box, DLT may shift social development into different directions. Given the risks, policymakers and stakeholders should carefully consider the different types of worlds DLT might create. These decisions must be made at the outset. Technology tends to become mythic as time passes because it is perceived as "part of the natural order of things,"[160] and then it is almost impossible to go back and run our lives the way we did before the new technology was adopted.

> problems with our monetary and financial systems. Because it operates without such an account, Bitcoin's real utility and purpose (and that of the cryptocurrency movement in general) can be better understood as a "program" for recruiting uninformed citizens into a neoliberal and (nominally) anti-government political discourse, understanding the nature and effects of which requires just the attention to political theory and history that Bitcoin enthusiasts rail against.

Id. at 120.

158. *See* Neil Postman, Five Things We Need to Know About Technological Change, Remarks at The New Technologies and the Human Person Conference in Denver, Colorado (Mar. 28, 1998), http://web.cs.ucdavis.edu/~rogaway/classes/188/materials/postman.pdf [https://perma.cc/T2J2-VQEH].

159. *See id.*

160. *Id.*