If Rockefeller Were a Coder

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ABSTRACT

The Ethereum Decentralized Autonomous Organization ("The DAO"), a decentralized, smart-contract-based investment fund with assets of $168 million, spectacularly crashed when one of its members exploited a flaw in its computer code and siphoned off $55 million. In the wake of the exploit, many argued that participants in The DAO could be jointly and severally liable for the loss as partners in a general partnership. Others claimed that The DAO evidenced an entirely new form of business entity, one that current laws do not contemplate. Ultimately, the technologists cleaned up the exploit by restructuring the computer code, and without engaging in any further legal analysis, many simply concluded that The DAO, other decentralized autonomous organizations, and the Ethereum protocol itself signify opportunities to do away with legal business-organizational forms as they presently exist. In this Article, I argue that precisely the opposite is true. Instead of creating a new type of corporate entity through computer code, The DAO and other smart-contract-based organizations may resurrect a very old, frequently forgotten business entity—the business trust—which Rockefeller used to solve the technology–business organization law divide of his time.

This Article offers the first analysis of blockchain-based business ventures under business organization law at three separate levels of the technology: protocols, smart contracts, and decentralized autonomous organizations. The Article first reveals the practical and theoretical deficits of using partnership as the only common-law entity option for blockchain-based business ventures. The Article then demonstrates that incorporation and limited liability company ("LLC") formation will also pose both practical and doctrinal difficulties for some such businesses. When faced with a similar conundrum in the 19th century, Rockefeller turned to the common-law business trust as a substitute business entity. This Article argues that if Rockefeller were a coder build-

ing a blockchain-based business, he would again turn to the business trust as his choice of entity. The Article concludes by considering, in light of Rockefeller's history, whether the law should anticipate any challenges with the rise of blockchain-based business trusts.

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INTRODUCTION

A 23-year-old business man in Cleveland, Ohio, began a journey in 1860 that would reshape the landscape for legally recognized busi-

ness organizations.[1] John D. Rockefeller, known for savvy negotiation, diligent saving, and smart investments,[2] began his oil business as a partnership, Rockefeller and Andrews, in 1860.[3] As the business profited, expanded, and garnered outside investors, Rockefeller incorporated the Standard Oil Company as an Ohio corporation in June of 1870.[4] Cleveland, the base of Rockefeller's operations, sat at the center of transportation technology—"By rail and water Cleveland commanded the entire Western market. It had two trunk lines running to New York, . . . and by Lake Erie and the canal it had for a large part of the year a splendid cheap waterway."[5] Rockefeller cleverly used those technologies in order to drive a price advantage in his products over his competitors.[6] Furthermore, improvements in communications technology and new production technology for distilling petroleum allowed Rockefeller to reduce production costs in areas other than transportation.[7]

Pushed to creativity by these technology innovations, at the end of 1871, Rockefeller connected with oil refiners in Pennsylvania.[8] Together, they began setting the stage for a large industry merger that would give the resulting company a competitive advantage and enable it to exert some control over prices.[9] At the time, Rockefeller needed to choose one of three business forms to serve as the surviving entity: "simple combinations, pools, and corporations."[10] Simple combinations and pools were contract-based combinations that suffered from a number of logistical difficulties.[11] As a result, Rockefeller first attempted to integrate the industry by incorporating the Southern Im-

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[1] 1 IDA M. TARBELL, THE HISTORY OF THE STANDARD OIL COMPANY 39–43 (Peter Smith reprt. 1967) (1904).

[2] *Id.* at 40–43.

[3] *Id.* at 43.

[4] *Id.* at 44, 276.

[5] *Id.* at 38; *see also* Wayne D. Collins, *Trusts and the Origins of Antitrust Legislation*, 81 FORDHAM L. REV. 2279, 2282 (2013) ("A rapidly expanding transportation network and declining real freight rates made it increasingly possible and economical to reliably ship products over long distances for distribution and sale. This, in turn, enlarged the effective geographic area a single firm could serve from its local vicinity to regional or even national markets.").

[6] TARBELL, *supra* note 1, at 45–47.

[7] Collins, *supra* note 5, at 2283–86.

[8] TARBELL, *supra* note 1, at 54–55.

[9] *Id.*

[10] Collins, *supra* note 5, at 2292.

[11] A simple combination is just an agreement among firms with "simple terms, such as not selling below a certain price, producing above a certain level, or allocating customers or sales territories to particular participating firms." *Id.* at 2293. Pools are a special type of contractual combination. *Id.* at 2307. "What makes pools unique is that they aggregate some common attributes related to production, typically profits or output, and then reallocate the common factor to

provement Company.[12] Unfortunately, the general corporation laws of the time restricted companies in ways unsuitable to large business combinations.[13] Thus, although the technology existed to fulfill Rockefeller's vision of integration in the oil refinery industry, to truly reap the potential benefits, Rockefeller needed to overcome the limitations of the corporate form of his time. In 1882, Rockefeller fully unveiled his solution: the Standard Oil Trust.[14] Rockefeller organized the Standard Oil Trust as a business trust.[15] In a business trust, one or more trustees hold property on behalf of, and manage the property for the benefit of, the beneficiaries.[16] Doing so allowed the Standard Oil Trust to act as one large company, coordinating activity in the oil refining industry across a large geographic area, something the corporation laws of the time did not allow.[17]

The story of the Standard Oil Trust reveals that technological change often powers the evolutionary history of legally recognized

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the pool members in agreed proportions, independently of what any individual firm may have actually contributed." *Id.*

[12] TARBELL, *supra* note 1, at 56.

[13] Collins, *supra* note 5, at 2312. First, businesses incorporated under general corporation statutes were "subject to low capitalization limitations." *Id.* Second, corporation statutes generally limited the existence of corporations to 25 years. *Id.* at 2312–13. Third, the general corporation statutes of Rockefeller's day generally limited the amount of money corporations could borrow to the corporation's capital stock and withheld limited liability in certain circumstances. *Id.* at 2313. Other restrictions included prohibitions on corporations conducting out-of-state business and the ability of some states to revoke corporate charters as they saw fit. *Id.*

[14] JOHN MICKLETHWAIT & ADRIAN WOOLDRIDGE, THE COMPANY 67 (2003) ("In 1882, the Standard Oil alliance, a loose federation of forty companies, each with its own legal and administrative identity (to satisfy individual state laws) metamorphosed into the Standard Oil Trust."); Collins, *supra* note 5, at 2315 ("The necessary legal innovation for large multistate combinations came in 1879 with the creation of the original Standard Oil Trust, which was rewritten in 1882."); Frederick H. Cooke, *Trust and Anti-Trust Legislation*, 7 AM. LAW. 236, 237 (1899) (explaining use of the business trust "dates from the organization of what is known as the Standard Oil Trust, the original, and in many respects, a typical trust. It was formally organized in 1882, though existing informally, so to speak, some years previously."). The trust agreements, both original and rewritten, are reprinted in INDUSTRIAL COMBINATIONS AND TRUSTS 14–26 (William S. Stevens ed., 1913).

[15] *See* MICKLETHWAIT & WOOLDRIDGE, *supra* note 14, at 67; Cooke, *supra* note 14, at 237; 2 IDA M. TARBELL, THE HISTORY OF THE STANDARD OIL COMPANY 135, 364–73 (Peter Smith reprt. 1967) (1904).

[16] Collins, *supra* note 5, at 2315; *see also infra* notes 190–218 and accompanying text. "Applied to the world of business, the trust, like a corporation, is a vehicle in which a large number of individuals can aggregate their resources in order to create and manage a large enterprise, with the trustees acting much like the directors of a corporation." Collins, *supra* note 5, at 2315–16.

[17] Collins, *supra* note 5, at 2319; Cooke, *supra* note 14, at 237 ("These trustees were thus enabled to control these previously independent properties as a unit, their position being analogous to that of trustees or directors of a corporation.").

business organizations. Although the antitrust movement[18] and the enactment of general incorporation statutes provided the corporate form we still use today,[19] new technology—such as the internet and platform technology—and new business philosophies—such as those found in the Sharing Economy—continue to push the boundaries of that corporate form.[20] This Article focuses on a specific new technology, distributed ledger technology ("DLT"),[21] and investigates its place in the evolution of business organization law. Specifically, this Article argues that business ventures undertaken entirely through DLT, often through decentralized autonomous organizations ("DAOs")[22] and smart contracts,[23] chafe against today's general incorporation statutes in the same ways that companies like the Standard Oil Trust once chafed against older versions of state incorporation statutes. As a result, this Article considers how business ventures living on the blockchain can harness the flexibility of the business trust

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[18] Concerned about the mass of wealth and power accumulated by the very successful Standard Oil Trust and other business trusts of the time, Congress passed the Sherman Antitrust Act of 1890. *See* Herbert Hovenkamp, *The Antitrust Movement and the Rise of Industrial Organization*, 68 Tex. L. Rev. 105, 105 (1989).

[19] State governments sought to decrease the attractiveness of the business-trust form by introducing the more flexible general incorporation statutes still in use today. Collins, *supra* note 5, at 2329–33; *see also* Micklethwait & Wooldridge, *supra* note 14, at 68 ("By 1901, two-thirds of all American firms with $10 million or more of capital were incorporated in the state [of New Jersey], allowing New Jersey to run a budget surplus of almost $3 million by 1905 and paying for a rash of new public works."). The Standard Oil Trust itself reorganized as a New Jersey holding company in 1899. Collins, *supra* note 5, at 2334. Ultimately, in 1911, the Supreme Court used the Sherman Act to order the dissolution of the Standard Oil Trust's corporate form. *See* Standard Oil Co. of N.J. v. United States, 221 U.S. 1, 81 (1911); *see also* James A. Dalton & Louis Esposito, *Standard Oil and Predatory Pricing: Myth Paralleling Fact*, 38 Rev. Indus. Org. 245, 245 (2011).

[20] *See generally, e.g.*, Henry Hansmann, Reinier Kraakman & Richard Squire, *The New Business Entities in Evolutionary Perspective*, 2005 U. Ill. L. Rev. 5 (explaining restrictions on the corporate form began to be relaxed in the early 19th century, making the form increasingly suitable for various types and sizes of enterprises); J. Haskell Murray, *The Social Enterprise Law Market*, 75 Md. L. Rev. 541 (2016) (outlining how over 30 states have passed social-enterprise statutes, which allow the formation of many new types of entities).

[21] This Article uses the term "DLT" to refer to "computer software that is distributed, runs on peer-to-peer networks, and offers a transparent, verifiable, tamper-resistant transaction-management system maintained through a consensus mechanism rather than by a trusted third-party intermediary that guarantees execution." Carla L. Reyes, *Conceptualizing Cryptolaw*, 96 Neb. L. Rev. 384, 390–91 (2017) (footnotes omitted). For a further description of what DLT is and how it works, see *infra* notes 27–43 and accompanying text.

[22] DAOs are distributed, peer-to-peer computer software that incorporate governance and decisionmaking rules. For a deeper explanation, see *infra* notes 68–88 and accompanying text.

[23] A smart contract is computer code that is designed to write a state change to the underlying protocol upon the fulfillment of certain predetermined conditions. See *infra* notes 44–66 and accompanying text.

in the same way as the technological giants of old. Doing so will allow such business ventures to enjoy the benefits of limited liability, perpetual existence, and legal personhood while retaining a large measure of flexibility to explore new organizational structures and economic models.

This Article offers the first theory of how business organization law applies to three different levels of the DLT ecosystem: the DLT protocol level, the smart contract level, and the DAO level. The first of a several-article series exploring the jurisprudential impact of DLT-based business entities,[24] this Article proceeds in four Parts. Part I introduces the technology that makes it possible to create asset-owning organizations out of computer code. Part II demonstrates, at each level of the DLT ecosystem (protocol, smart contracts, and DAOs), that although treatment as a corporation or LLC offers significant benefits from a policy perspective, neither form fits well for both practical and theoretical reasons fundamental to business organization law. Part II further argues that treatment as a partnership, the default option, imposes such inexplicable results on some DLT-based business ventures, which this Article refers to as Distributed Business Entities ("DBEs"), that they need another business entity option. Part III then argues that the common-law business trust (or the "Massachusetts trust")[25] offers an alternative common-law form of business organiza-

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24 In the second article, I explore the implications of legally recognized business entities for the governance of DLT protocols. The second article weighs in on debates regarding fiduciary obligations of certain actors in DLT protocols and the impact of legally recognized DLT-based business entities on DLT culture, among others. In the third article, I hope to explore the implications of legally recognized blockchain-based businesses for understanding the corporate personhood doctrine.

25 This Article uses "business trust" to refer to the business organization known as either the business trust or the Massachusetts trust. *See* Herbert B. Chermside, Jr., Annotation, *Modern Status of the Massachusetts or Business Trust*, 88 A.L.R. 3d 704, § 1[a] (1978). These business organizations are referred to in this way because "such organizations are created under the common law of contracts and do not depend upon any statute." *Id.* § 2 n.4 (citing Schumann-Heink v. Folsom, 159 N.E. 250 (1927)). The term "statutory trust" also frequently surfaces in the literature. *See, e.g.*, Peter B. Oh, *Business Trusts*, *in* RESEARCH HANDBOOK ON PARTNERSHIPS, LLCS AND ALTERNATIVE FORMS OF BUSINESS ORGANIZATIONS 268, 270–73 (Robert W. Hillman & Mark J. Loewenstein eds., 2015). The term "statutory trusts" refers to those business trusts recognized by state statute. Some statutory trust statutes require registration of the entity; others, like the Delaware Business Trust Act, do not. Tamar Frankel, *The Delaware Business Trust Act Failure as the New Corporate Law*, 23 CARDOZO L. REV. 325, 326 nn.4–5 (2001). As this Article uses the term "business trust," it is intended to include those statutory trusts in which the statute merely recognizes the common-law business trust but does not require registration. Like Professor Bayern's artificial intelligence–operated LLC, however, a DBE "incorporator" could file the necessary paperwork in states that so require. Nevertheless, the common-law business trust remains the focus of this Article as a business organization form for DBEs that does not require

tion for certain DLT protocols, smart-contract arrangements, and DAOs.[26] The business-trust form avoids the irregular results of the partnership while simultaneously providing the rights and responsibilities of corporations. Viewing this argument through a historical lens, Part IV reveals that the emergence of the business trust as a form of business organization in the DLT context should be entirely expected. Part IV also argues that, in light of history, the law should anticipate certain concerns to arise as blockchain-based business trusts emerge.

I. A SMART CONTRACT AND DECENTRALIZED AUTONOMOUS ORGANIZATION PRIMER

To enable an in-depth discussion of the implications of DLT for business organization law, this Article begins with a brief introduction to DLT,[27] smart contracts, and DAOs. This Article uses the term "DLT" to refer generally to "computer software that is distributed, runs on peer-to-peer networks, and offers a transparent, verifiable, tamper-resistant transaction-management system maintained through a consensus mechanism rather than by a trusted third-party intermediary that guarantees execution."[28] DLT protocols are distributed and

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affirmative state filings. *See* Shawn J. Bayern, *The Implications of Modern Business-Entity Law for the Regulation of Autonomous Systems*, 19 STAN. TECH. L. REV. 93, 101 (2015).

26 Technically, this means that certain decentralized autonomous applications will constitute common-law business trusts, as DAOs are a specific type of decentralized autonomous application. This subtle distinction will be explored further below in Part III.

27 William Mougayar, a blockchain investor and writer, assures his readers that although "[t]oday, we're saying blockchain does this or that, . . . tomorrow blockchains will be rather invisible; we will talk more about what they enable." WILLIAM MOUGAYAR, THE BUSINESS BLOCKCHAIN, at xxiv (2016). This is true for the internet; "the average consumer now takes the internet for granted, even if they know nearly nothing about how it works." John O. McGinnis & Kyle Roche, *Bitcoin: Order Without Law in the Digital Age* 24 (Nw. Pub. Law Research Paper No. 17-06, 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2929133 [https://perma.cc/ZDE9-DXPA]. As a result, scholars writing about legal issues arising because of the internet no longer begin every article they write with an explanation of what the internet is and how it works. *See, e.g.*, Bryan H. Choi, *The Anonymous Internet*, 72 MD. L. REV. 501 (2013); Nizan Geslevich Packin, *Too-Big-to-Fail 2.0? Digital Service Providers as Cyber-Social Systems*, 93 IND. L.J. (forthcoming 2018). Perhaps when Mougayar's tomorrow arrives, I will no longer feel obligated to start each article with a description of DLT and how it works. Until that day, however, a brief definition and description remains warranted. Because I have previously written detailed explanations of how DLT works, *see* Reyes, *supra* note 21, at 390–96, and Carla L. Reyes, *Moving Beyond Bitcoin to an Endogenous Theory of Decentralized Ledger Technology Regulation: An Initial Proposal*, 61 VILL. L. REV. 191, 196–202 (2016), and because the broader explanation of DLT is less important for the purposes of this Article than understanding smart contracts and DAOs, the explanation of DLT that follows is particularly brief.

28 Reyes, *supra* note 21, at 390–91 (footnotes omitted). I am aware of the ongoing debate as to appropriate terminology, and, in particular, the discussion around the terms "blockchain" versus "DLT." Without intending to weigh in on the substance of that debate, I adopt the term

peer-to-peer[29] because each computer that downloads and runs the software connects to several other computers to make the software work.[30] This means that each party with the software can access the full ledger and its history, and can send information directly to other nodes, without going through an intermediary.[31] DLT is transparent because "[e]very transaction and its associated value are visible to anyone with access to the system."[32] DLT protocols offer auditability and tamper-resistance because the protocol tracks the transitions between state[33] that occur with each new transaction[34] using some com-

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"DLT" because it is the broader term, encompassing both permissioned and permissionless blockchains, as well as protocols such as R3's Corda that do not strictly fit the definition of a "chain of blocks." Adopting this term is not a statement about the technical accuracy of this or any other terminology. I use it, as a legal academic, grounded in the premise that all of these protocols exist and are in use, and that any legal and policy discussion of such systems must account for the full range of implementations. For further insight into my position, see *id.*; *see also* MOUGAYAR, *supra* note 27, at 7 (concurring and explaining that "[s]ince the Internet is comprised of a public version and several private variations, blockchains will also follow that path. Therefore, we will have public and private blockchains. Some will be natively bolted to a blockchain, whereas others might be a hybrid implementation that is part of an existing Web or private application."); Tim Swanson, *A Brief History of R3—the Distributed Ledger Group*, GREAT WALL NUMBERS (Feb. 27, 2017), http://www.ofnumbers.com/2017/02/27/a-brief-history-of-r3-the-distributed-ledger-group/ [https://perma.cc/SW3T-7YZE].

29 Patrick Murck, *Who Controls the Blockchain?*, HARV. BUS. REV. (Apr. 19, 2017), https://hbr.org/2017/04/who-controls-the-blockchain [https://perma.cc/8Q58-6P2V]; *see* MOUGAYAR, *supra* note 27, at 23 ("Architecturally, the base layer of the blockchain is a peer-to-peer network."); DON TAPSCOTT & ALEX TAPSCOTT, BLOCKCHAIN REVOLUTION 6 (2016) ("Each blockchain, like the one that uses bitcoin, is *distributed*: it runs on computers provided by volunteers around the world; there is no central database to hack."); Shawn Bayern, *Of Bitcoins, Independently Wealthy Software, and the Zero-Member LLC*, 108 Nw. U. L. REV. ONLINE 257, 259 (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.").

30 *See* ANDREAS M. ANTONOPOULOS, MASTERING BITCOIN 25 (2d ed. 2017).

31 MOUGAYAR, *supra* note 27, at 23; TAPSCOTT & TAPSCOTT, *supra* note 29, at 6; Bayern, *supra* note 29, at 259; Murck, *supra* note 29.

32 Murck, *supra* note 29.

33 In technical terms, a state just means "stored information" at a specific point in time. A state machine is a computer or device that remembers the status of something at a given instant in time. Based on some inputs, that status might change, and it provides a resulting output for these implemented changes. Keeping track of transitions of these states is important and that's what the blockchain does well, and in a way that is immutable.

MOUGAYAR, *supra* note 27, at 24; *see also* HENNING DIEDRICH, ETHEREUM 33 (2016) (explaining that "state" refers to "all or part of the data that a program deals with").

34 DIEDRICH, *supra* note 33, at 33 (explaining that in the Ethereum protocol "every transaction that was ever made, every contract that was ever invoked, is re-lived by your client"); *see also* TAPSCOTT & TAPSCOTT, *supra* note 29, at 7 ("So the blockchain is a distributed ledger representing a network consensus of every transaction that has ever occurred."); Kevin Werbach

bination of three elements of cryptography science (hashes,[35] cryptographic signatures,[36] and a consensus mechanism[37]) to secure[38]

& Nicolas Cornell, *Contracts* Ex Machina, 67 Duke L.J. 313, 327 (2017) ("Anyone can view a Bitcoin's blockchain, and trace back transactions all the way to the original 'genesis block' created by Nakamoto."). Different DLT protocols approach the method of achieving its purpose as a "state machine" differently.

> In the [Bitcoin] blockchain, the transition history is a persistent part of the information about that state. In the Ethereum blockchain, a distinct "state tree" is stored, representing the current balance of each address, and a "transaction list" representing the transactions between the current block and previous blocks in each block.

Mougayar, *supra* note 27, at 24.

[35] Diedrich, *supra* note 33, at 107–08 ("Hashes are used as if they were unique identifiers. . . . And with a hash you have a useful id of anything in Cypherspace that kind of points backwards: you will know that it's the right [identifier ("id")] when you see what it points to, the original text. This id does not help you to find the text. And that's a feature. But once you see the text later, you have proof that someone meant *that* text and no other when they gave you the id.").

> One-way hash functions are a cryptographic construct used in many applications. They are used with public-key algorithms for both encryption and digital signatures. . . .
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>   . . . .
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> One-way hash functions . . . have two properties. One, they're one-way. This means that it's easy to take a message and compute the hash value, but it's impossible to take a hash value and re-create the original message. (By "impossible," I mean "can't be done in any reasonable amount of time.") Two, they're collision-free. This means that it's impossible to find two messages that hash to the same hash value.

Bruce Schneier, *Cryptanalysis of MD5 and SHA: Time for a New Standard*, Schneier on Security (Aug. 19, 2004), https://www.schneier.com/essays/archives/2004/08/cryptanalysis_of_md5 .html [https://perma.cc/JC7U-WYJN].

[36] Diedrich, *supra* note 33, at 35 (explaining that in Ethereum, "every computation executed on the blockchain is by a *signed program*, too, as all code on the blockchain—i.e. the transaction scripts *themselves*—are deployed to the blockchain as signed input parameters to a transaction"); *see also* Tapscott & Tapscott, *supra* note 29, at 39 ("Satoshi required participants to use public key infrastructure (PKI) for establishing a secure platform. PKI is an advanced form of 'asymmetric' cryptography, where users get two keys that don't perform the same function: one is for encryption and one is for decryption."); Carla L. Reyes, Nizan Geslevich Packin & Benjamin P. Edwards, *Distributed Governance*, 59 Wm. & Mary L. Rev. Online 1, 5 (2017) (noting transactions on DLT are cryptographically signed).

[37] "Consensus means that nodes agree on the same world state." Diedrich, *supra* note 33, at 142. The most well-known consensus mechanism is the proof-of-work consensus used by the Bitcoin blockchain. Tapscott & Tapscott, *supra* note 29, at 31 ("To achieve consensus, the bitcoin network uses what's called a *proof of work* (PoW) mechanism."). Commonly referred to as "mining," proof-of-work is the process by which

> Bitcoin nodes repeatedly attempt to solve cryptographic hashing puzzles based on the transactions in a proposed new block on the blockchain. These puzzles are on a sliding level of difficulty so that, roughly every ten minutes, a random node finds a solution. The new block based on that solution is broadcast across the network. Other nodes, after checking for validity, add the new block to the blockchain. . . .
> The node that successfully proposes the new block receives a financial reward.

Werbach & Cornell, *supra* note 34, at 328 (footnotes omitted).

and verify[39] transactions.[40] The combination of these three elements vary by implementation among various DLT protocols,[41] but the outcome remains the same. Ultimately, irrespective of the combination of features used, DLT software protocols allow "[c]onnected computers [to] reach agreement over shared data."[42]

DLT protocols "can incorporate limited programmable logic into transactions."[43] This enables software programmers to design more complex transactions, including decentralized applications and decentralized autonomous organizations. Smart contracts act as the building blocks of these more complex transactions and programs. The remainder of this Part offers an introduction to smart contracts and then examines the early decentralized autonomous organizations that emerged using smart contracts.

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38 DIEDRICH, *supra* note 33, at 34 ("[T]he outcome of the world state is indisputable and trustworthy because *every transaction that comes in and triggers a change to the world state is cryptographically signed by the account owner that the transaction originates from*."); Shawn Bayern, *Dynamic Common Law and Technological Change: The Classification of Bitcoin*, 71 WASH. & LEE L. REV. ONLINE 22, 24 (2014) (noting bitcoin transactions are secure because "transmitting bitcoins requires knowledge of their 'secret key,' a number that it is statistically impossible to guess").

39 DIEDRICH, *supra* note 33, at 104 ("When you digitally sign something, the algorithms involved make it easy to check for others that the signature was really made by you. But virtually impossible for others to create such signature, without knowing your random choices.").

40 Reyes, Packin & Edwards, *supra* note 36, at 9 (describing, in detail, the three elements).

41 There are, for example, any number of different ways to achieve consensus. Ethereum currently uses proof-of-work, but the Ethereum development team has considered moving to proof-of-stake consensus. Alyssa Hertig, *Ethereum's Big Switch: The New Roadmap to Proof-of-Stake*, COINDESK (updated May 16, 2017), https://www.coindesk.com/ethereums-big-switch-the-new-roadmap-to-proof-of-stake/ [https://perma.cc/7JUQ-H8UV]. Ripple and Stellar use "a unique node list of at least one hundred nodes they can trust in voting on the state of affairs." TAPSCOTT & TAPSCOTT, *supra* note 29, at 57 (emphasis omitted). There are other mechanisms as well, including proof-of-activity, proof-of-capacity, and proof-of-storage. *Id.* DLT protocols may also vary in what activity must be cryptographically signed. As alluded to above, *supra* note 36, the Bitcoin blockchain requires transactions to be cryptographically signed, whereas in the Ethereum protocol, computations and programs are also cryptographically signed. Other variations abound.

42 Peter Van Valkenburgh, *What is "Blockchain" Anyway?*, COIN CTR. (Apr. 25, 2017), www.coincenter.org/entry/what-is-blockchain-anyway; *see also* Richard Gendal Brown, *Introducing R3 Corda™: A Distributed Ledger Designed for Financial Services*, RICHARD GENDAL BROWN (Apr. 5, 2016), https://gendal.me/2016/04/05/introducing-r3-corda-a-distributed-ledger-designed-for-financial-services/ [https://perma.cc/7F75-U9PP] (defining DLT networks as "platforms, shared across the Internet between mutually distrusting actors, that allow them to reach consensus about the existence and evolution of facts shared between them").

43 Werbach & Cornell, *supra* note 34, at 333.

A.   *A Brief Introduction to Smart Contracts*

The term "smart contract" refers to decentralized computer code[44] that runs on a DLT protocol[45] and manifests some combination of the following characteristics: exerts some control over assets digitally recorded on a DLT protocol,[46] takes some action upon receipt of specified data,[47] is often, but not always, part of a DLT-based application,[48] guarantees execution,[49] and writes the resulting state change

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[44]   *See* DIEDRICH, *supra* note 33, at 167; *see also* MOUGAYAR, *supra* note 27, at 42-43 ("Smart contracts are software code representing business logic that runs a blockchain . . . ."). Others refer to smart contracts as "computer programs." *See, e.g.*, TAPSCOTT & TAPSCOTT, *supra* note 29, at 101. I prefer computer code, as it is the building block of a computer program, and as smart contracts themselves can be used as building blocks for decentralized computer programs. *See* MOUGAYAR, *supra* note 27, at 43 ("Smart contracts are usually part of a decentralized (blockchain) application. There could be several contracts to a specific application."). "Computer code," or simply "code," "is a mode of communication between computer programs, which is often described as consisting of methods, data structures, and algorithms, that allow various parties to exchange information concisely and efficiently." Christopher K. Odinet, *Bitproperty and Commercial Credit*, 94 WASH. U. L. REV. 649, 659 (2017). For further reading on computer code and other computer science terms, see generally CHARLES PETZOLD, CODE (2000) and NELL DALE & JOHN LEWIS, COMPUTER SCIENCE ILLUMINATED (5th ed. 2012).

[45]   DIEDRICH, *supra* note 33, at 174 ("Smart contracts live on the blockchain. They inherit the limitation of decentralized code: Smart contracts cannot reach information outside the blockchain."); Gideon Greenspan, *Why Many Smart Contract Use Cases Are Simply Impossible*, COINDESK (updated Apr. 18, 2016), http://www.coindesk.com/three-smart-contract-misconcep tions/ [https://perma.cc/5572-T5F9] ("A smart contract is a piece of code that is stored on a[] blockchain . . . ."); *see also* MOUGAYAR, *supra* note 27, at 43 ("Even in the Ethereum implementation, smart contracts run as quasi-Turing complete programs."); McGinnis & Roche, *supra* note 27, at 39 ("The contract then lives on the Bitcoin blockchain, and will execute when an event happens or the terms of the contract expire.").

[46]   *See* DIEDRICH, *supra* note 33, at 167 ("A smart contract is decentralized code that moves money based on a condition. Any decentralized code can move money, i.e., cryptocurrency, or effect some other type of exchange, e.g. of digital assets."); MOUGAYAR, *supra* note 27, at 42 (explaining that smart contracts "control a real-world valuable property via 'digital means'").

[47]   *See* DIEDRICH, *supra* note 33, at 167 ("Smart contracts are decentralized code that [executes] after a condition is fulfilled." (emphasis omitted)); MOUGAYAR, *supra* note 27, at 42-43 ("Smart contracts are software code representing business logic that runs a blockchain, and they are triggered by some external data that lets them modify some other data. They are closer to an event-driven construct, more than artificial intelligence.").

[48]   *See* William Mougayar, *9 Myths Surrounding Blockchain Smart Contracts*, COINDESK (updated Apr. 18, 2016), http://www.coindesk.com/smart-contract-myths-blockchain/ [https://per ma.cc/UP3W-7ZDY] ("Smart contracts are usually part of a decentralized (blockchain) application. There could be several contracts to a specific application. For example, if certain conditions in a smart contract are met, then the program is allowed to update a database.").

[49]   DIEDRICH, *supra* note 33, at 168 ("A smart contract is guaranteed to execute. . . . Once things are set in motion, the blockchain underneath serves as an independent third party and makes sure that what was agreed upon in the code will be executed."); *see also* TAPSCOTT & TAPSCOTT, *supra* note 29, at 101 ("For the purposes of this discussion, smart contracts are computer programs that secure, enforce, and execute settlement of recorded agreements between

from the operation of the smart contract into the DLT's ledger.[50] The data that triggers execution of the smart contract can be internal to the DLT protocol,[51] or the smart contract can receive the data from an outside source.[52] This concept of smart contracts originated with Nick Szabo in 1994.[53] Szabo initially defined smart contracts as "a set of promises, specified in digital form, including protocols within which

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people and organizations."); Werbach & Cornell, *supra* note 34, at 333 ("With smart contracts, the transaction is irreversibly encoded on a distributed blockchain.").

50   Greenspan, *supra* note 45 ("A smart contract is a piece of code that is stored on a[] blockchain, triggered by blockchain transactions and which reads and writes data in that blockchain's database. . . . A smart contract is just a fancy name for code that runs on a blockchain, and interacts with that blockchain's state."). Vitalik Buterin defines smart contracts as "systems which automatically move digital assets according to arbitrary pre-specified rules." Vitalik Buterin, Ethereum, Ethereum White Paper: A Next Generation Smart Contract & Decentralized Application Platform 1 (2013). Others define smart contract as "a computerized transaction protocol to execute contract terms." Alex Norta, *Creation of Cross-Organizational Collaborations for Decentralized Autonomous Organizations*, 14 Persp. Bus. Informatics Res. 3, 3 (2015), https://www.researchgate.net/publication/277014751_Creation_of_Cross-Organizational_Collaborations_for_Decentralized_Autonomous_Organizations [https://perma.cc/7Z8Q-7ERG]; Richard Gendal Brown, *A Simple Model for Smart Contracts*, Richard Gendal Brown (Feb. 10, 2015), https://gendal.me/2015/02/10/a-simple-model-for-smart-contracts/ [https://perma.cc/9ZEP-4K9W] ("A smart contract is an event-driven program, with state, which runs on a replicated, shared ledger and which can take custody over assets on that ledger."). This longer definition is intended to reflect, for the nontechnical, that a smart contract is not just of a singular shape and size but, rather, is a general-purpose technology that can be put to many uses, and, as a result, some smart contracts will emphasize certain characteristics over others.

51   Diedrich, *supra* note 33, at 167–68 (explaining that smart contracts move assets after a condition has been filled and that "[t]he condition can be internal to the blockchain or fed in from the outside").

52   *Id.* at 170 (explaining that relying on external data "is the usual situation for smart contracts, they will be tied to external events and they are set in motion by receiving a signed transaction expressing what the outcome of a specific event was" (emphasis omitted)). When smart contracts receive data from outside sources, those outside sources are often referred to as "oracles." Mougayar, *supra* note 27, at 43 ("Oracles are data sources that send actionable information to smart contracts."); Werbach & Cornell, *supra* note 34, at 336 ("Sometimes a smart contract refers to facts in the world, for example, when a contract pays out if a stock exceeds a certain price on a certain date. The Bitcoin blockchain knows nothing about stock prices; it must collect that information through an external data feed. In the language of smart contracts, systems that interpret such external feeds and verify contractual performance are called 'oracles.'"); Houman Shadab, *What are Smart Contracts, and What Can We Do with Them?*, Coin Ctr. (Dec. 15, 2014), https://coincenter.org/entry/what-are-smart-contracts-and-what-can-we-do-with-them [https://perma.cc/H5DK-LTJQ].

53   S. Asharaf & S. Adarsh, Decentralized Computing Using Blockchain Technologies and Smart Contracts 45 (2017) ("The concept of smart contracts was first formally coined by Nick Szabo in 1994."); Mougayar, *supra* note 27, at 41 ("The concept was first introduced by Nick Szabo in 1994 . . . ."); Tapscott & Tapscott, *supra* note 29, at 101 ("Szabo coined the phrase in 1994, the same year that Netscape, the first web browser hit the market . . . .").

the parties perform on these promises."[54] For Szabo, the purposes guiding smart-contract design "are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, and even enforcement), minimize exceptions both malicious and accidental, and minimize the need for trusted intermediaries."[55] The technology to support Szabo's idea did not exist in 1994.[56] When the Bitcoin blockchain emerged in 2009, so did a platform for implementing smart contracts.[57] In fact, bitcoin transactions on the Bitcoin blockchain constitute a very simple form of smart contract.[58]

Clearly, then, although lawyers and other professionals frequently try to co-opt the term to always refer to some type of computer-coded legal contract,[59] the term smart contract, in fact, refers to

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[54] NICK SZABO, SMART CONTRACTS: BUILDING BLOCKS FOR DIGITAL MARKETS (1996), http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinter school2006/szabo.best.vwh.net/smart_contracts_2.html [https://perma.cc/5YPK-2765]; *see also* Nick Szabo, *Formalizing and Securing Relationships on the Public Networks*, FIRST MONDAY (Sept. 1, 1997), http://firstmonday.org/ojs/index.php/fm/article/view/548/469 [https://perma.cc/GRK3-LG2M].

[55] NICK SZABO, SMART CONTRACTS (1994), http://www.fon.hum.uva.nl/rob/Courses/Infor mationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts .html [https://perma.cc/9DJ4-MVW6].

[56] *See* J. DAX HANSEN & CARLA L. REYES, PERKINSCOIE, LEGAL ASPECTS OF SMART CONTRACT APPLICATIONS 1 (May 2017), https://www.jdsupra.com/post/fileServer.aspx?fName= 748e06b9-dd01-4c61-8e55-3bdcb3b8e8b6.pdf [https://perma.cc/8E5G-YWU7] (citing Mougayar, *supra* note 48); *see also* TAPSCOTT & TAPSCOTT, *supra* note 29, at 102 ("Back then, smart contracts were an idea all dressed up with nowhere to go, as no available technology could deploy them as Szabo described.").

[57] MOUGAYAR, *supra* note 27, at 41 ("The concept was first introduced by Nick Szabo in 1994, but it underwent a long gestation period of inactivity and disinterest, because there was no platform that could enforce smart contracts, until the advent of the Bitcoin blockchain technology in 2009.").

[58] DIEDRICH, *supra* note 33, at 115 ("Every cryptocurrency transfer is but a simple smart contract. The mechanism is one and the same, it's just a smart contract's simplest form: one signature and the money moves."); Merit Kõlvart, Margus Poola & Addi Rull, *Smart Contracts*, *in* THE FUTURE OF LAW AND ETECHNOLOGIES 133, 145 (Tanel Kerikmäe & Addi Rull eds., 2016) ("Smart contracts are automated computer agents that fulfil certain tasks, for instance, transferring digital property.").

[59] This category includes the Barclays idea of "Smart Contract Templates" as human-readable legal-prose contracts that can be enforced normally in court, but just kept and tracked on a DLT protocol.

> The aim of Smart Contract Templates is to support the management of the complete lifecycle of "smart" legal contracts. This includes the creation of legal document templates by standards bodies and the subsequent use of those templates in the negotiation and agreement of contracts by counterparties. They also facilitate automated performance of the contract and, in the event of dispute, provide a direct link to the relevant legal documentation.

Christopher D. Clack, Vikram A. Bakshi & Lee Braine, *Smart Contract Templates: Foundations,*

a much broader set of software programs.[60] Although the first applications of smart contracts involve cryptocurrency transfers, smart contracts can "apply to almost anything that changes its state over time, and could have a value attached to it."[61] Ultimately, smart contract uses are limited only by the imagination and skills of those that write the software code.[62]

To enable those with the vision for more complex smart-contract applications to implement them, the creators of Ethereum designed the protocol to enable more complex smart contracts than the Bitcoin blockchain.[63] The Ethereum protocol supports its own coding language, Solidity, intended to enable software developers to write complex smart contracts more simply.[64] Furthermore, Ethereum contracts are stateful and Turing-complete—they have "memory that they will remember the next time they are called and . . . they can have loops."[65] Smart contracts running on the Ethereum protocol are stored in the blocks of the Ethereum blockchain, not off-chain.[66] These features often make the Ethereum protocol more attractive to those interested in creating programs with smart-contract elements.

Design Landscape and Research Directions, Barclays Bank PLC 1 (rev. Mar. 15, 2017), https://arxiv.org/pdf/1608.00771v2.pdf [https://perma.cc/B5LX-SK72].

   60   *See* Mougayar, *supra* note 48 (explaining that smart contracts are not the same as a contractual agreement, but rather, "[i]f 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' "); *see also* Diedrich, *supra* note 33, at 169 ("A smart contract is not necessarily between two parties, and in reality almost never, so far, the mirror image or replacement of a legal contract."); Mougayar, *supra* note 27, at 42 ("Smart contracts are not the same as a contractual agreement.").

   61   Mougayar, *supra* 27, at 43.

   62   For a review of some of the current use cases being built, see Hansen & Reyes, *supra* note 56, at 5–13.

   63   *See* Josh Stark, *Making Sense of Blockchain Smart Contracts*, CoinDesk (updated June 7, 2016), http://www.coindesk.com/making-sense-smart-contracts/ [https://perma.cc/4LWJ-H3DU] ("To developers and others working directly with blockchain technology, the term 'smart contracts' is most often used to refer to this blockchain code. . . . The term has been particularly associated with the Ethereum project, whose primary purpose is to be a platform for smart contract code."); *see also* Mougayar, *supra* note 27, at 41 ("Since 2015, smart contracts have been gaining popularity, especially since Ethereum made programming them a basic tenet of their blockchain's power.").

   64   Mougayar, *supra* note 27, at 43 (noting Ethereum's Solidity is a specific smart-contract language that "lets you write complex processes in a few lines of code").

   65   Diedrich, *supra* note 33, at 28; *id.* at 28 n.29 ("All modern programming languages are Turing-complete, from which follows that what can be programmed in one language can be programmed in any other. It just looks and performs differently. The Bitcoin blockchain as a whole is Turing-complete, too, but its individual scripts that drive its transactions, are not, as they do not allow for loops.").

   66   *Id.* at 37.

For these reasons, the creators of the first (and most famous) DAO elected to use the Ethereum protocol as the underlying DLT.

B. *Smart Contracts Enable DAOs*[67]

A DAO is computer software, distributed across a peer-to-peer network, that "incorporat[es] governance and decision-making rules."[68] Essentially, DAOs are elaborate smart contracts or systems of smart contracts.[69] At a very general level, the smart contracts that comprise a DAO allow a certain set of DAO members to spend the digital assets held by those smart contracts or to modify the DAO's code.[70] To understand DAOs in a less abstract way, consider a DAO deployed on the Ethereum protocol. In order to operate, the DAO's code needs ether, the cryptocurrency that powers activity on Ethereum.[71] A DAO might obtain the ether it needs to operate by selling tokens.[72] Those tokens give the purchaser certain rights in the DAO.[73] The DAO, on its own, can store the ether it earned through the token sales and can use the ether in accordance with the parameters set out in its code.[74] For other activity, like building a product, the DAO needs what the industry refers to as a "Contractor."[75] Potential Contractors submit proposals to the DAO, and those proposals are voted on by tokenholders with the right to vote.[76] In at least one DAO,

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[67] I am aware of a debate about whether a distinction must be made between Decentralized Organizations ("DOs") and DAOs. *See* Vitalik Buterin, *DAOs, DACs, DAs and More: An Incomplete Terminology Guide*, Ethereum Blog (May 6, 2014), https://blog.ethere um.org/2014/05/06/daos-dacs-das-and-more-an-incomplete-terminology-guide/ [https://perma.cc/ LU54-3F76]. In this debate, a DO is "a set of humans interacting with each other according to a protocol specified in code, and enforced on the blockchain." *Id.* Meanwhile, a DAO is said to be "something that, in some fashion, makes decisions for itself." *Id.* Because much of that debate is technical in nature (some of it relating to the prevalence and importance of collusion attacks, for example), I do not *engage* that debate here. Rather, this Article uses the term DAO to refer to both possibilities, which is in keeping with general media commentary and common parlance in the industry. *See* Allen & Overy LLP, Decentralized Autonomous Organizations 2 & n.1 (2016), http://www.allenovery.com/SiteCollectionDocuments/Article%20Decentralized%20 Autonomous%20Organizations.pdf [https://perma.cc/RFN8-YUYQ].

[68] Allen & Overy LLP, *supra* note 67, at 2.

[69] Diedrich, *supra* note 33, at 31.

[70] *See* Buterin, *supra* note 50, at 1.

[71] Christoph Jentzsch, Slock.it, Decentralized Autonomous Organization to Automate Governance 1–2 (2016), https://download.slock.it/public/DAO/WhitePaper.pdf [https://perma.cc/338L-74SJ].

[72] *See id.* at 2.

[73] *See id.*

[74] *Id.*

[75] *Id.*

[76] *See id.*

tokenholders have votes weighted by the amount of tokens that they control.[77] If the proposal is approved by the required percentage of tokenholders, the DAO transfers the ether required for the project "to a smart contract representing the proposed project."[78] Tokenholders can sell their tokens and transfer the tokens and related rights to others.[79] If a DAO generates new ether through the sale of products, tokenholders are entitled to rewards proportional to the tokenholders' original contribution.[80]

Lest this all sound like science fiction, a brief review[81] of the life and swift death of a very prominent real-world DAO is warranted. Deployed on the Ethereum protocol, this DAO, referred to as "The DAO," sought to democratize venture capital.[82] The DAO issued tokens to investors in exchange for ether, with the intent of investing that ether into other cryptocurrency startup ventures, with investment decisions made by a vote of the tokenholders.[83] Initial investors purchased $168 million worth of tokens from The DAO.[84] Before The DAO ever made its first investment, on June 17, 2016, a tokenholder siphoned off $55 million worth of ether from The DAO by exploiting flaws in its code.[85] A debate erupted in the Ethereum community regarding whether the tokenholder's actions were valid, testing the frequently touted mantra that "the code is law."[86] The details of that debate and the resulting Ethereum "hard fork"[87] are beyond the scope of this Article. For our purposes, the broader point is that DAOs already exist. Further, the rise and spectacular failure of The DAO highlighted the importance of determining how DAOs map to business

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77 *Id.*

78 *Id.*

79 *See id.*

80 *See id.* at 3, 10.

81 For a very detailed review of The DAO's history, see Reyes, Packin & Edwards, *supra* note 36, at 4–7; *see also* Mark Fenwick, Wulf A. Kaal & Erik P.M. Vermeulen, *Legal Education in the Blockchain Revolution* 376–78 (Univ. Saint Thomas (Minn.) Legal Studies, Research Paper No. 17-05, 2017), https://ssrn.com/abstract=2939127 [https://perma.cc/DD4E-YMDM].

82 *See* Nathaniel Popper, *A Venture Fund With Plenty of Virtual Capital, But No Capitalist*, N.Y. Times: DealBook (May 21, 2016), https://www.nytimes.com/2016/05/22/business/deal book/crypto-ether-bitcoin-currency.html?_r=0 [https://perma.cc/RA4K-7LGP?type=image].

83 *See id.* Again, as to terminology, note that The DAO was named DAO and not DO even though it required a vote of tokenholders (humans) to select investments.

84 Reyes, Packin & Edwards, *supra* note 36, at 4.

85 *Id.* at 6 (citing Steven Norton, *Downfall of DAO Digital Currency Fund Shows Blockchain Reputational Risk*, Wall St. 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/Q7X6-V26L]).

86 *Id.* at 7.

87 *See id.*

organization law. The question "Who is liable for the hack?" quickly led to broader questions of whether DAOs should generally be considered partnerships with unlimited joint and several personal liability for partners or some form of recognized business entity with limited liability and separate legal personhood.[88]

II. Decentralized Business Entities Need a Different Entity Form

Professor Dwight Drake refers to business organizations as legally "immortal" beings, focusing on the fact that as a result of the operation of state law, corporations are viewed as a separate being, can have offspring, feature a perpetual existence, and can assemble capital.[89] Surprisingly, technologists describe DAOs in similar language, defining them as "self-sustaining, economic entities that 'live' on the chain and offer real-world services . . . which [are] programmed to perpetuate its existence."[90] DAOs can be programmed to "marshal resources—that is, raising funds by providing services or issuing equity, and spending them on needed resources, such as processing power or storage."[91]

As a result, several theories regarding the legal nature of DAOs as business organizations emerged. Some writers maintained that DAOs constitute general partnerships.[92] Professor Shawn Bayern proposed,[93] and Professor Lynn M. LoPucki further explored,[94] the idea

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[88] *See, e.g.*, Ronald D. Smith & David E. Barrett, *The DAO's Wild Ride: Where Does Blockchain Go From Here?*, Forbes (July 1, 2016), https://www.forbes.com/sites/realspin/2016/07/01/the-daos-wild-ride-where-does-blockchain-go-from-here/#4f1e637e3e5c [https://perma.cc/8B2S-BYFT] ("Needless to say, participants are scrambling to understand their legal rights. Among the most important issues to determine are what The DAO is legally, what it could be under current law, and whether changes are needed to existing law to accommodate the concept. From available information, it does not appear that The DAO created any formal legal entity. If this is the case, American courts may treat The DAO as a general partnership as stakeholders share profits, own The DAO jointly, and manage the business of The DAO. This could lead to many unwanted consequences, including the potential for individual liability for the acts of other stakeholders and obligations of The DAO.").

[89] Dwight Drake, Business Organizations in A Planning Context 136–37 (2013).

[90] Diedrich, *supra* note 33, at 31.

[91] Melanie Swan, Blockchain 16 (2015).

[92] *See, e.g.*, Stephen D. Palley, *How to Sue a Decentralized Autonomous Organization*, CoinDesk (updated Mar. 21, 2016), http://www.coindesk.com/how-to-sue-a-decentralized-autonomous-organization/ [https://perma.cc/XNT6-XGC4].

[93] *See* Bayern, *supra* note 25; Bayern, *supra* note 29, at 263–64; *see also* Shawn Bayern et al., *Company Law and Autonomous Systems: A Blueprint for Lawyers, Entrepreneurs, and Regulators*, 9 Hastings Sci. & Tech. L.J. 135, 136 (2017).

[94] Lynn M. LoPucki, *Algorithmic Entities*, 95 Wash. U. L. Rev. 887 (2018). Professor LoPucki also explores how algorithmic entities, potentially including fully autonomous DLT-

that autonomous computer software, including those operating on DLT, can operate an LLC created for it by a human incorporator. Others declared that the legal question of the corporate form of DAOs represents a new and unpredictable frontier.[95] Still others indicated that the legal characterization of a DAO will ultimately rest on facts and circumstances.[96] This Article argues that DAOs should strive to avoid automatic treatment as a general partnership, that an alternative treatment need not rest on something new and unpredictable, and that DAOs need not rely on a human incorporator to confer legal personhood upon them. Rather, this Article makes the novel argument that certain DAOs, and certain decentralized or distributed business entities ("DBEs") at other levels of the technology, fit the definition of an exceedingly old alternative to the registered corporation—the common-law (or "Massachusetts") business trust.

This Part first uncovers the mismatch between partnership law and DBEs. Specifically, this Part argues that partnership treatment of such business ventures results in undesirable results, both for participants in the DLT system and society at large. Concluding that strong policy reasons exist for providing limited liability and separate legal personhood to certain DBEs, this Part next reveals the practical and theoretical mismatch between the corporate and LLC forms and DBEs. Finally, this Part describes a possible alternative form for DBEs: the common-law business trust. Importantly, this Article is the first to theorize about DBEs at three separate levels of DLT—the protocol, smart contract, and DAO levels. This approach, rooted in systems analysis,[97] allows the law to embrace the complexity of DLT and, inversely, enables deeper understanding of how business trusts may impact governance models for public, open-source DLT protocols.

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based entities, might layer a corporate or partnership form on top of Professor Bayern's LLC "dyad" idea. *Id.*

95 *See* Seth Bannon, *The Tao of "The DAO" or: How the Autonomous Corporation Is Already Here*, TᴇᴄʜCʀᴜɴᴄʜ (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/NA4Q-KBLL].

96 Jᴇɴᴛᴢsᴄʜ, *supra* note 71, at 1 ("Ultimately, how a DAO functions and its legal status will depend on many factors, including how DAO code is used, where it is used, and who uses it.").

97 For an introduction to systems analysis and its potential use in legal study, see Tamara Belinfanti & Lynn Stout, *Contested Visions: The Value of Systems Theory for Corporate Law*, 166 U. Pᴀ. L. Rᴇᴠ. 578, 580 (2018); Lynn M. LoPucki, *The Systems Approach to Law*, 82 Cᴏʀɴᴇʟʟ L. Rᴇᴠ. 479 (1997).

A. *Partnership Treatment Results in Undesirable Results*

The oldest business entity with multiple owners,[98] the partnership,[99] exists when there is an "association of two or more persons to carry on as co-owners of a business for profit . . . , whether or not the persons intend to form a partnership."[100] As a default entity, when a business venture with multiple owners fails to file paperwork to operate the business in some other form (such as an LLC or corporation), a partnership is automatically formed.[101] Each owner of the business (each partner) faces personal joint and several liability with every other owner for the liabilities of the partnership.[102] Further, each partner possesses the authority, as an agent of the partnership, to act on behalf of the partnership in the ordinary course of business, subject to certain exceptions.[103] Because DBEs frequently do not file formal documents electing another business entity, many may constitute partnerships. As further described below, such treatment at the protocol, smart contract and DAO levels lead to unexpected, and often undesirable, results for both entrepreneurs individually and society generally.

1. *DLT Protocols as Partnerships*

Without considering business entity law, Vitalik Buterin, founder of the Ethereum protocol, described the Bitcoin blockchain as a corporation:

> Bitcoin has 21 million shares, and these shares are owned by what can be considered Bitcoin's shareholders. It has employees, and it has a protocol for paying them: 25 BTC to one random member of the workforce roughly every ten minutes. It even has its own marketing department, to a large extent made up of the shareholders themselves.[104]

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98   D RAKE, *supra* note 89, at 42.

99   A partnership is "also called a general partnership to distinguish it from a limited partnership." W ILLIAM K. S JOSTROM, J R., B USINESS O RGANIZATIONS 5 (2d ed. 2016).

100   R EVISED U NIF. P'SHIP A CT (RUPA) § 202(a) (U NIF. L AW C OMM'N 2013).

101   *See* S JOSTROM, *supra* note 99, at 5.

102   *See* RUPA § 306(a); D RAKE, *supra* note 89, at 45; S JOSTROM, *supra* note 99, at 7–8 (noting that under the Uniform Partnership Act ("UPA"), joint and several liability exists for torts, but not contracts, while joint and several liability exists for both torts and contracts under RUPA).

103   *See* RUPA § 301.

104   Vitalik Buterin, *Bootstrapping A Decentralized Autonomous Corporation: Part I*, B ITCOIN M AG. (Sept. 19, 2013, 10:31 PM) https://bitcoinmagazine.com/articles/bootstrapping-a-decentralized-autonomous-corporation-part-i-1379644274/ [https://perma.cc/Q758-SUDQ].

Daniel Larimer, founder and lead developer of the BitShares blockchain,[105] similarly described the Bitcoin blockchain as a Decentralized Autonomous Corporation ("DAC"):

> Think of a crypto-currency as shares in a [DAC] where the source code defines the bylaws. The goal of the DAC is to earn a profit for the shareholders by performing valuable services for the free market. With this goal in mind set out to maximize shareholder value at every stage as you design the bylaws that govern operation of the DAC.[106]

In reality, Satoshi Nakamoto[107] did not register the Bitcoin blockchain as a corporation under any state law. Without such incorporation, the Bitcoin blockchain is not a corporation, regardless of the theoretical comparisons made by Buterin and Larimer. That reality does not, however, prevent a DLT protocol from being recognized as a general partnership if the elements of the protocol are mapped against the elements of partnership slightly differently.

A DLT protocol can be viewed as an asset managed by multiple parties in the pursuit of a profit through the provision of services to the public. Take the Bitcoin blockchain, for example. Conceptualizing the Bitcoin blockchain as an asset of a business venture would render those that profit from activities conducted on the protocol partners in

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105   *See* Bebeto Nyamwamu, *Who is Daniel Larimer? The EOS Shotgun*, 101 Blockchains (June 21, 2018), https://101blockchains.com/who-is-daniel-larimer-eos-founder/ [https://perma.cc/3F5B-8V26]. For more information on BitShares, *see* Bitshares, https://bitshares.org/ [https://perma.cc/N9J7-GCLE]. Notably, "[t]he developers of BitShares formed Cryptonomex," an incorporated entity, "to monetize the technology, experience, reputation and good will they accumulated during their first two years of development and operations." *Graphene Technical Documentation*, Bitshares, http://docs.bitshares.eu/ [https://perma.cc/QZ56-PSLW]. Cryptonomex is billed as "an independent blockchain development company founded by the core developers of the BitShares blockchain" with a mission "to facilitate the growth and adoption of industrial blockchain technology." Cryptonomex, https://cryptonomex.com/ [https://perma.cc/X3ED-8Y5V]. Perhaps the founders of BitShares read reports that without the benefit of a registered corporation law they may face unlimited liability as participants in a general partnership.

106   Daniel Larimer, *Overpaying for Security: The Hidden Costs of Bitcoin*, Let's Talk Bitcoin (Sept. 7, 2013), https://letstalkbitcoin.com/is-bitcoin-overpaying-for-false-security#.Ujt iUt9xy0w [https://perma.cc/DGY9-2LCH].

107   Satoshi Nakamoto is the mythic-like creator of bitcoin and the Bitcoin blockchain. Speculation abounds as to whether Satoshi Nakamoto is a single person or a group of several people. Several claim to have discovered Satoshi Nakamoto's identity, but proof of such claims remains elusive. *See, e.g.*, Leah McGrath Goodman, *The Face Behind Bitcoin*, Newsweek (Mar. 6, 2014, 6:05 AM), http://www.newsweek.com/2014/03/14/face-behind-bitcoin-247957.html [https://perma.cc/L48X-TP4A]; Michael Safi, *Australian Craig Wright Claims He Is Bitcoin Founder Satoshi Nakamoto*, Guardian (May 2, 2016), https://www.theguardian.com/technology/2016/may/02/craig-wright-bitcoin-founder-satoshi-nakamoto-claim [https://perma.cc/7DXM-CBJ8].

the business venture. Those that profit from activities conducted on the Bitcoin blockchain include both miners[108] and bitcoin holders.[109] This profit is generated by other entrepreneurial activities conducted on the blockchain.[110] The more companies build bitcoin and blockchain-based businesses, the higher the value of bitcoin soars.[111] So, if the Bitcoin blockchain is managed well, entrepreneurs will turn to it for their businesses, and the value of bitcoin will increase, along with the number of transactions upon which fees can be earned. Thus, the management of the Bitcoin blockchain by miners and the investment in bitcoin by bitcoin holders can be viewed as an association of multiple parties to carry on activity in the pursuit of a profit. Nevertheless, viewing those working with the Bitcoin blockchain as a partnership strains policy sentiment in several ways.

First, while bitcoin miners make an affirmative choice to undertake economic activity in pursuit of profit, arguably at least some of the bitcoin holders do not. Although some invest in bitcoin holdings as a form of currency speculation,[112] others purchase and hold bitcoin for use as a medium of exchange,[113] just as residents of the United States regularly use the dollar as a medium of exchange. Just as unsuspecting consumers of the U.S. Dollar would not expect to be partners in the minting and management of currency, neither do the consumers of bitcoin, intentional investors or otherwise, expect to be partners in the business of managing the Bitcoin blockchain. Notably, partnership law does not care whether the participants in the venture expect to form a partnership or not.[114] In other words, partnerships may "be

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108 *See* ANTONOPOULOS, *supra* note 30, at 214 ("Miners receive two types of rewards in return for the security provided by mining: new coins created with each new block, and transaction fees from all the transactions included in the block.").

109 *See id.* at 1 ("Bitcoin can be purchased, sold, and exchanged for other currencies at specialized currency exchanges.").

110 *See, e.g.*, Kashmir Hill, *The People Making Real Money on Bitcoin*, FORBES (July 8, 2013, 9:00 PM), https://www.forbes.com/sites/kashmirhill/2013/07/08/the-people-making-real-money-on-bitcoin/#559e42a33e39 [https://perma.cc/SRN8-99HH].

111 *See* Joseph Young, *Bitcoin Price Will Reach $10,000, Might Take Another Year: Tim Draper*, COINTELEGRAPH (Jan. 31, 2017), https://cointelegraph.com/news/bitcoin-price-will-reach-10000-might-take-another-year-tim-draper [https://perma.cc/5JW3-Z9CV].

112 *See* Young, *supra* note 111 ("For currency traders that hold Bitcoin as a direct investment, they will benefit from the short-term increase in Bitcoin value. . . . Some currency traders are also holding Bitcoin as digital gold and see[] it as a safe haven asset rather than a settlement system.").

113 *See* ANTONOPOULOS, *supra* note 30, at 1 ("Users can transfer bitcoin over the network to do just about anything that can be done with conventional currencies, including buy and sell goods, send money to people or organizations, or extend credit.").

114 *See* SJOSTROM, *supra* note 99, at 130 ("No formalities are required to form a partnership. A partnership is formed when (1) two or more people associate to carry on as co-owners a

formed 'accidentally' by parties" that effectively "act as co-owners of a business."[115] Under the doctrine of inadvertent partnership, each of these actors could be considered a partner, subject to joint and several personal liability for the actions of the partnership.[116] Treatment of DLT protocols as partnerships would thus run contrary to the express interest of many regulators in protecting consumer bitcoin holders from unexpected effects of transacting with bitcoin and other DLT protocols.[117] Bitcoin users, viewing themselves as consumers, should not assume joint and several liability for the obligations of the Bitcoin blockchain[118] accidentally under the law of partnership.[119] Partnerships offer a poor business entity form for DBEs at the protocol level.

Second, the law of partnership may view the mysterious creator of the Bitcoin blockchain, Satoshi Nakamoto, as a partner in the enterprise as well. Nakamoto created the protocol, released it to the world under an open-source license,[120] and retained significant bitcoin holdings from mining early blocks of the protocol.[121] Nakamoto's ac-

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business for profit, and (2) they do not file the paperwork (e.g., articles of incorporation or organization) to operate the business in some other form. If these elements are met, the people involved have created a partnership even if they had no idea they were doing so. This situation is called an inadvertent partnership." (footnote omitted)).

115   Shawn Bayern, *Three Problems (and Two Solutions) in the Law of Partnership Formation*, 49 MICH. J.L. REFORM 605, 608 (2016).

116   *See id.* at 607 ("Participants in business activities face unlimited contractual and tort liability for the debts of the business unless the business chooses, in advance, to opt out of such liability." (citing UNIF. P'SHIP ACT (UPA) § 306(a), (c) (UNIF. LAW COMM'N 1997))).

117   *See, e.g.*, *Bitcoin Consumer Alert*, WASH. ST. DEP'T FIN. INSTITUTIONS (rev. May 15, 2014), https://dfi.wa.gov/consumer/alerts/bitcoin-consumer-alert [https://perma.cc/ER4M-LQ79] (providing bitcoin related advice to consumers); *Bitcoin: More Than a Bit Risky*, FIN. INDUSTRY REG. AUTHORITY (May 7, 2014), http://www.finra.org/investors/alerts/bitcoin-more-bit-risky [https://perma.cc/7AQ4-ZNC2] (warning consumers of risk of bitcoin investment); *Guidance: Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies*, FIN. CRIMES ENFORCEMENT NETWORK (Mar. 18, 2013), https://www.fincen.gov/sites/default/files/shared/FIN-2013-G001.pdf [https://perma.cc/35C5-4Z4L] (excluding users from regulation).

118   Losses resulting from a hard fork in the protocol represent an example of a liability that might arise in the management of the asset (the protocol). *See* William Suberg, *Bitcoin Will Likely Lose Value with Hard or Soft Fork: Wealth Daily*, COINTELEGRAPH (June 27, 2017), https://cointelegraph.com/news/bitcoin-will-likely-lose-value-with-hard-or-soft-fork-wealth-daily [https://perma.cc/4WYX-JNMC].

119   I have been using the Bitcoin blockchain as an example, but the rationale holds true for other DLT protocols as well. Many of their users will view themselves as mere consumers, not as partners, and would certainly have no expectation of joint and several liability.

120   SATOSHI NAKAMOTO, BITCOIN—A PEER-TO-PEER ELECTRONIC CASH SYSTEM (2008), *reprinted in* ANTONOPOULOS, *supra* note 30, at 305.

121   *Who Is Satoshi Nakamoto?*, COINDESK (Feb. 19, 2016), https://www.coindesk.com/information/who-is-satoshi-nakamoto/ [https://perma.cc/3SAA-NABF] (stating that "Satoshi mined many of the early blocks in the bitcoin network, and that he had built up a fortune of around 1

tivity, therefore, could be characterized as contributing to a joint en-
terprise in pursuit of a profit, and Nakamoto arguably fits the bill of a
partner under the inadvertent partnership doctrine. This reveals a sec-
ond undesirable result from treating DBEs as partnerships at the pro-
tocol level. Imposing personal liability upon the creator of a public,
open-source protocol runs contrary to the common understanding and
ethos of the open-source-software community.[122] In fact, the choice to
conduct economic activity on an open-source basis can be understood
as an explicit economic choice: "[W]hen the cost of organizing an ac-
tivity on a peered basis is lower than the cost of using the market or
hierarchical organization, then peer production will emerge."[123] As a
result, treating the developer of an open-source protocol as a partner
would run directly contrary to the economic choice made at the time
of the protocol's creation. Such a result makes little legal or economic
sense and would likely stifle innovation in important emerging tech-
nology.[124] Theorizing about DLT protocols as business entities thus
reveals the need for a business entity option that carries limited liabil-
ity and separate personhood. Limited liability and separate per-
sonhood would protect unsuspecting users and open-source software
creators from unexpected unlimited personal liability and would ar-
guably further encourage innovation through peer production when
doing so is the economically rational choice.

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million unspent bitcoins" (citing Sergio Lerner, *The Well Deserved Fortune of Satoshi
Nakamoto, Bitcoin Creator, Visionary, and Genius*, BITSLOG (Apr. 17, 2013), https://bitslog.word
press.com/2013/04/17/the-well-deserved-fortune-of-satoshi-nakamoto/ [https://perma.cc/32RX-
EC4S])).

[122] *See, e.g.*, Karim R. Lakhani & Robert G. Wolf, *Why Hackers Do What They Do: Under-
standing Motivation and Effort in Free/Open Source Software Projects*, *in* PERSPECTIVES ON FREE
AND OPEN SOURCE SOFTWARE 3, 3, 4–7 (J. Feller, B. Fitzgerald, S. Hissam & K. Lakhani eds.,
2005) (finding that "enjoyment-based intrinsic motivation[,] . . . user need, intellectual stimula-
tion derived from writing code, and improving programming skills" are the top reasons for con-
tributing to open-source software projects).

[123] Yochai Benkler, *Coase's Penguin, or, Linux and the Nature of the Firm*, 112 YALE L.J.
369, 403 (2002).

[124] *See* Siva Vaidhyanathan, *Open Source as Culture—Culture as Open Source*, OPEN
SOURCE JAHRBUCH 359, 361 (2005) (Ger.), http://www.opensourcejahrbuch.de/download/jb2005/
OpenSourceJahrbuch2005_online.pdf [https://perma.cc/H8EX-VNZ8] ("In fact, as economist
Richard Adkisson argues, the veneration of forceful intellectual property rights as the founda-
tion of innovation and creativity above all other forms has promoted an unhealthy cultural and
social condition, [one] which can generate suboptimal levels of investment, asset allocation, and
policy choices." (citing Richard V. Adkisson, *Ceremonialism, Intellectual Property Rights, and
Innovation Activity*, 38 J. ECON. ISSUES 459 (2004))).

2. Smart Contracts as Partnerships

Many smart contracts manage and control assets on behalf of others.[125] Such contracts are often created by two or more persons who contribute the assets that the smart contract manages and controls, and then the smart contract is left to run autonomously.[126] Such an arrangement might be viewed as an agreement between co-owners to carry on a business for profit in which the smart contract manages the assets. Under such circumstances, Professor Bayern thinks partnership law would recognize a partnership, despite its odd configuration.[127] Occasionally, however, a single person or a single legal entity will create a smart contract to manage and control assets on behalf of others. Under such circumstances, a partnership, which requires the joint association of two or more persons in pursuit of a profit,[128] would not be formed. Further, under such circumstances, partnership treatment may not be appropriate as a policy matter.

Take, for example, the smart contract often referred to as Ethereum's "killer app," a smart contract for an "initial coin offering" ("ICO").[129] A wave of very successful ICOs recently drew attention from the media, regulators, and entrepreneurs alike. At the end of May 2017, Brave Browser, a company intent on disrupting the internet-advertising industry,[130] raised $36 million in roughly 30 seconds.[131] Distributed cloud-storage service provider Storj[132] also

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[125] DIEDRICH, *supra* note 33, at 167 ("A smart contract is decentralized code that moves money based on a condition. Any decentralized code can move money, i.e. cryptocurrency, or effect some other type of exchange, e.g. of digital assets."); MOUGAYAR, *supra* note 27, at 42 (explaining that smart contracts "control a real-world valuable property via 'digital means'").

[126] *See* Josh Stark, *Making Sense of Blockchain Smart Contracts*, COINDESK (June 7, 2016), https://www.coindesk.com/making-sense-smart-contracts/ [https://perma.cc/FWT7-56FU].

[127] Bayern, *supra* note 25, at 101 (arguing that two legal persons can form a partnership and RUPA offers great flexibility in shaping partnership agreements and noting that although there remains some dispute over whether a partnership can operate without partners, "it is possible for general partnerships under RUPA to encapsulate autonomous systems" (citing UPA §§ 103(a), (b)(8), 202(a) (UNIF. LAW COMM'N 1997)). *See generally* Robert W. Hillman & Donald J. Weidner, *Partners Without Partners: The Legal Status of Single Person Partnerships*, 17 FORDHAM J. CORP. & FIN. L. 449 (2012) (debating whether a partnership with a single member remains a partnership).

[128] RUPA § 102(11) (UNIF. LAW COMM'N 2013).

[129] *See, e.g.*, Brian Patrick Eha, *Why this Venture Capitalist Wants to Make Traditional VC Obsolete*, AM. BANKER (Apr. 3, 2017, 2:32 PM), https://www.americanbanker.com/news/why-this-venture-capitalist-wants-to-make-traditional-vc-obsolete [https://perma.cc/X4CC-SCB8] ("Ethereum is still in many ways a prototype. But we have finally figured out what its first killer application is: ICOs.").

[130] *See generally About*, BRAVE BROWSER, https://www.brave.com/about/ [https://perma.cc/2A5N-EPSH].

[131] Jonathan Nieh, *Brave Browser's ICO Raises $36 Million in 30 Seconds*, CROWDFUND

raised $30 million through an ICO in May 2017, attracting institutional investors such as Iterative Instinct Management.[133] 1,072 ICOs raised roughly $21.5 billion in 2018,[134] which is a far larger number than the 453 ICOs that raised over $6.5 billion in 2017,[135] and the 51 ICOs that raised just under $100 million during 2016.[136] ICOs often take place through a smart contract. The smart contract sets the number of tokens available in the offering, sets the token price, and is made publicly available for potential purchasers to see.[137] When a purchaser buys tokens, he or she sends the purchase price in cryptocurrency to the smart contract,[138] which triggers the transmission of the corresponding number of tokens.[139]

Consumer protection in ICOs emerged as a central policy consideration in 2017.[140] Many of the individuals investing in ICOs are con-

INSIDER (June 2, 2017, 7:08 AM), https://www.crowdfundinsider.com/2017/06/101301-brave-browsers-ico-raises-36-million-30-seconds/ [https://perma.cc/L9A6-FR7H]; Jon Russell, *Former Mozilla CEO Raises $35M in Under 30 Seconds for His Browser Startup Brave*, TECHCRUNCH (June 1, 2017), https://techcrunch.com/2017/06/01/brave-ico-35-million-30-seconds-brendan-eich/ [https://perma.cc/8TKZ-XSXS].

133 STORJ, https://storj.io/ [https://perma.cc/M2F7-JLZB].

133 Ari Levy, *There's a New Way for Casual Investors to Get in on the Cryptocurrency Craze*, CNBC (June 4, 2017), http://www.cnbc.com/2017/06/04/bitcoin-and-ethereum-rallies-have-led-to-funds-like-for-storj-ico.html [https://perma.cc/32VJ-PGZM].

134 *Cryptocurrency ICO Stats 2018*, COINSCHEDULE, https://www.coinschedule.com/stats/ Jan+01%2C+2018+to+Dec+31%2C+2018 [https://perma.cc/Q885-SY65].

135 *Cryptocurrency ICO Stats 2017*, COINSCHEDULE, https://www.coinschedule.com/stats/ Jan+01%2C+2017+to+Dec+31%2C+2017 [https://perma.cc/SC4U-R6FT].

136 *Cryptocurrency ICO Stats 2016*, COINSCHEDULE, https://www.coinschedule.com/stats/ Jan+01%2C+2016+to+Dec+31%2C+2016 [https://perma.cc/LEN6-9X3B]; *see also* Connie Loizos, *How to Stage an ICO (and Answers to Other Lingering Questions You Might Have)*, TECHCRUNCH (May 24, 2017), https://techcrunch.com/2017/05/24/how-to-stage-an-ico-and-other-related-questions-you-might-like-answered/ [https://perma.cc/56HG-4T3Y].

137 *See* Michael Oved, *The Blockchain Killer App: Ethereum Tokens*, CONSENSYS MEDIA (Apr. 26, 2017), https://media.consensys.net/the-blockchain-killer-app-ethereum-tokens-c3f5e6f4ce7f [https://perma.cc/A2AF-P6BN].

138 *See id.*

139 Note that, at present, ICOs are often conducted by DAOs or by other business entities. In such circumstances, the appropriate system for analysis would be the DAO or the other business entity. However, in the near term, next-generation ICOs are expected to emerge, which will be automated. The goal of using ICOs as an example is to demonstrate that autonomous smart contracts can be considered a business venture standing alone, under the right circumstances. However, I recognize, as does the methodological approach I use in this Article, that not all smart contracts used in DBEs will rise to the level of business entities standing alone.

140 *See generally, e.g.*, Munchee, Inc., Securities Act Release No. 10445, 2017 SEC LEXIS 4005 (Dec. 11, 2017); *see also* Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, Exchange Act Release No. 81207, 2017 SEC LEXIS 2194 (July 25, 2017) [hereinafter The DAO Report], https://www.sec.gov/litigation/investreport/34-81207 .pdf [https://perma.cc/429B-AZW5] (concluding that The DAO tokens were securities); Office of Inv'r Educ. & Advocacy, Sec. & Exch. Comm'n, *Investor Alert: Public Companies Making ICO-*

sumers. Although many such consumers invest in ICOs in pursuit of a profit,[141] few likely intend to assume unlimited joint and several liability when purchasing a token. Imposing a partnership structure upon tokenholders who participated in an ICO would thus run contrary to the clearly articulated policy interest in protecting consumer interests in the ICO context. If an ICO smart contract might be treated as a business entity by operation of law, ICO creators should have the option of forming a different entity under common law—one that offers, at the very least, limited liability status.

3.   *DAOs as Partnerships*

Some DAOs, created as a tool for two or more persons to carry on a joint association for the pursuit of profit, neatly fit the classic default business-entity form of a partnership. The DAO offers a clear example of such a venture. Participants in The DAO contributed assets and entered into an agreement with other contributors as to how they would work through The DAO to manage and profit from those assets.[142] The DAO participants agreed on how to share profits generated from their activities.[143] Without more, The DAO represented a classic case of the inadvertent partnership—creation of a partnership even though the participants did not realize the legal consequences of doing so under business entity law.[144] If the only available common-law[145] business form is a general partnership, however, some DAOs created for entirely different ends would be forced to labor under a structure of unlimited joint and several liability and lack of separate

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Related Claims, INVESTOR.GOV (Aug. 28, 2017), https://www.investor.gov/additional-resources/news-alerts/alerts-bulletins/investor-alert-public-companies-making-ico-related [https://perma.cc/DSU2-PCUF] (warning of potential fraud in the ICO market); Press Release, Sec. & Exch. Comm'n, SEC Emergency Action Halts ICO Scam (Dec. 4, 2017), https://www.sec.gov/news/press-release/2017-219 [https://perma.cc/72SD-5LHJ]; Press Release, Sec. & Exch. Comm'n, SEC Exposes Two Initial Coin Offering Purportedly Backed by Real Estate and Diamonds (Sept. 29, 2017), https://www.sec.gov/news/press-release/2017-185-0 [https://perma.cc/J9ZM-42YT].

141   *See* Jeff John Roberts, *Why Tech Investors Love ICOs—and Lawyers Don't*, FORTUNE (June 26, 2017), http://fortune.com/2017/06/26/ico-initial-coin-offering-investing/ [https://perma.cc/NR7M-27AE].

142   Bannon, *supra* note 95.

143   *Id.*

144   *Supra* note 114. In fact, in its recent ruling on The DAO token sale, the Securities Exchange Commission referred to The DAO as "an unincorporated organization," which might be read as recognition of The DAO's partnership status. *See* The DAO Report, *supra* note 140, at *1.

145   For more detail on why an additional common-law entity, rather than a statutory entity, is needed, see *infra* Section II.B.

legal personhood. Such outcomes are likely to stifle innovation in an area of technology with unique potential to encourage it.

Take, for example, the remarkable case of the Plantoid. "A Plantoid is the plant equivalent of an android; it is a robot or synthetic organism designed to look, act and grow like a plant."[146] Each Plantoid exists in two parts: the metallic sculpture the public sees and appreciates and the smart contract code that exists on the Ethereum protocol and powers the Plantoid.[147] Essentially, each Plantoid is a metallic sculpture displayed in a public place.[148] This metallic sculpture is powered by a set of smart contracts, a DAO, that resides on the Ethereum protocol and manages the Plantoid's life cycle and affairs.[149] When a passerby appreciates the Plantoid's beauty, he or she can send a token of appreciation to the Plantoid by sending cryptocurrency to the Plantoid's wallet.[150] The Plantoid will respond with a display of some kind—a mechanical dance or small light show.[151] The funds received then belong to the DAO powering the Plantoid; that is, the funds belong to the Plantoid itself.[152] The smart contracts running the DAO require that when the Plantoid accumulates sufficient funds, the Plantoid will request proposals from artists to create a new Plantoid.[153] The creators of Plantoids view Plantoids and the DAOs that operate them as an opportunity to change the way the public thinks about art, its creation, and the value passed to artists for their contributions.[154]

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[146] *A Bionic Creature*, OKHAOS, http://okhaos.com/plantoids/ [https://perma.cc/TN2M-Y3MY].

[147] *Id.*

[148] *Id.*

[149] Giulio Prisco, *Plantoids: The First Blockchain-Based Artificial Life Forms*, BITCOIN MAG. (Dec. 26, 2016, 11:15 AM), https://bitcoinmagazine.com/articles/plantoids-the-first-blockchain-based-artificial-life-forms-1482768916 [https://perma.cc/864G-5MPX].

[150] *Id.*

[151] Grace Caffyn, *This Robot Plant Needs You and Bitcoin to Reproduce*, COINDESK (updated Nov. 4, 2015), http://www.coindesk.com/this-robot-plant-needs-you-and-bitcoin-to-reproduce/ [https://perma.cc/HNA5-BJSN].

[152] *See id.*

[153] *See id.*; Prisco, *supra* note 149.

[154] Etienne Verbist, *Primavera De Filippi: "As an Artist, I Try to Challenge the Current State of the World . . . ,"* ARTDEPENDENCE MAG. (May 19, 2017), https://www.artdependence.com/articles/primavera-de-filippi-as-an-artist-i-try-to-challenge-the-current-state-of-the-world [https://perma.cc/94BJ-RLH7] ("My dream is to show that it is nowadays possible to shift away from traditional conception of copyright law, which is based on the notion of scarcity and exclusivity. With blockchain technology, the model of copyright can be shifted around. Instead of funding an artist, with the expectation that the artist will continue to produce new works that we enjoy, it now becomes possible to fund directly the art piece itself, which will be in charge of selecting and hiring the artists that will be responsible for its reproduction." (emphases omitted)).

The Plantoid creators also believe that Plantoids "do not have any legal personality—because the law does not (yet) recognize them as a legal entity."[155]

A case could be made, however, that because all contributing artists are compensated not only with the funds for their specific Plantoid sculpture, but also with perpetual future royalties from the enterprise, that the Plantoid DAOs represent partnerships. A Plantoid DAO represents the joint association of two or more artists for the pursuit of profit through Plantoid creation. The result would be unlimited joint and several liability for each Plantoid creator. Faced with such realities, artists would reasonably be expected not to contribute to Plantoid art, and the greater social experiment represented by the Plantoid will go unfulfilled. In other words, DAOs enable economic activity to be structured in ways that fill radically different functions than are historically filled by the typical general partnership. For such DAOs, partnership treatment makes little sense as a policy matter. Instead, such DAOs would benefit from a common-law form that offers both limited liability and separate legal personhood.

B.   *Practical Obstacles to Incorporation or LLC Formation*

As the above discussion makes clear, granting limited liability and legal personhood to DBEs would resolve the tensions created by treatment as a partnership. While it is true that modern statutes made corporate or LLC formation simple and inexpensive,[156] practical considerations may cause those creating or contributing to DBEs not to do so. For example, if the sole concern of a DBE developer is reduction of tort liability for potential programming mistakes, incorporation or formation of an LLC will do little to reduce that risk.[157] As a result, the paperwork may be more trouble than it is worth,[158] pointing to the

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155   *A Bionic Creature*, *supra* note 146.

156   Whether commenters view the grant of limited liability only to those who file forms with the state wise or not, all agree that the filings are easy. *See, e.g.*, MODEL BUS. CORP. ACT § 2.04 cmt. (AM. BAR ASS'N 2005) ("Incorporation under modern statutes is so simple and inexpensive that a strong argument may be made that nothing short of filing articles of incorporation should create the privilege of limited liability."); Bayern, *supra* note 115, at 607 ("Given how easy it is to avoid this liability by means of entirely formal planning, it is unclear why the law should preserve it at all." (footnote omitted)).

157   *See* Bayern, *supra* note 29, at 270 ("Too often, people misunderstand the liability-shielding role of an LLC; while it does shield members from vicarious liability as members, it does not exempt individuals from liability for their own torts." (citing SHAWN J. BAYERN, CLOSELY HELD ORGANIZATIONS 245 (2014))).

158   *See id.* ("As a result, a selfish software developer may have little reason to go through the trouble of establishing an LLC.").

importance of a common-law option that offers the same rights and responsibilities of corporations.

Moving beyond questions of risk, current corporate statutes will simply struggle to accommodate the incorporation of many DBEs. For example, modern corporation statutes require that a corporation's board of directors be composed of natural persons.[159] Further, even where applicable law allows a shareholders agreement to eliminate the board of directors, "corporate law still appears to impose a requirement that there be at least one shareholder[, a]nd shareholders must be legal persons."[160] As a result, it may be "impossible to create an autonomous corporation—that is, one that does not require an ongoing association with any natural persons."[161] While some DBEs at each level of the technology (DLT protocols, smart contracts, and DAOs) will have human operators that can take advantage of modern corporation statutes,[162] any fully autonomous DBEs, standing alone, will be excluded from incorporation.[163]

Although Professor Shawn Bayern's work demonstrates that LLC laws offer the flexibility for a human incorporator to create an LLC and turn operation of that LLC over to an autonomous al-

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[159]   *See, e.g.*, DEL. CODE ANN. tit. 8, § 141(b) (2011) ("The board of directors of a corporation shall consist of 1 or more members, each of whom shall be a natural person."); MODEL BUS. CORP. ACT. § 8.03(a) (AM. BAR ASS'N 2010) ("A board of directors must consist of one or more individuals . . . ."); *id.* § 1.40(13) ("'Individual' means a natural person."). Note that Professor LoPucki argues that having a board at all, at least in Delaware, is a waivable provision, and an entity could appoint another DBE to manage the corporation. *See* LoPucki, *supra* note 94, at 907. However, given the low practical likelihood of some DBE creators to engage the state to form a business entity at all, the likelihood that those same creators would create a layered entity structure seems even more remote.

[160]   Bayern, *supra* note 25, at 100 (footnote omitted); *see* MODEL BUS. CORP. ACT § 6.01(b) (AM. BAR ASS'N 2005) ("The articles of incorporation must authorize . . . one or more classes or series of shares that together have unlimited voting rights . . . ."); *id.* § 1.40(21) ("'Shareholder' means the person in whose name shares are registered . . . .").

[161]   Bayern, *supra* note 25, at 98. *But see generally* LoPucki, *supra* note 94, for a possible layered approach that could potentially resolve Bayern's objection.

[162]   In fact, some DLT protocol creators have created human-managed corporations to manage the technology. Consider, for example, Symbiont, a Delaware corporation that created its own protocol, called Assembly, and R3 CEV LLC, the distributed database technology company that leads a consortium of financial institutions in developing the Corda protocol. *See Technology*, SYMBIONT ASSEMBLY, https://symbiont.io/technology/ [https://perma.cc/SDU3-V422]; *Team*, SYMBIONT ASSEMBLY https://symbiont.io/team/ [https://perma.cc/P3LY-4KPX]; *The R3 Story*, R3, https://www.r3.com/about/ [https://perma.cc/8DLH-BZVQ]. I do not know, as of this writing, of any smart contracts or DAOs that are operated by people who incorporated their business venture.

[163]   *See, e.g.*, *Learn About Tezos*, TEZOS, www.tezos.com, and the Bitcoin blockchain. For LoPucki's theory to work, the DBE would need at least one other layered DBE. *See* LoPucki, *supra* note 94. Therefore, a DBE, standing alone, could not incorporate.

gorithm,[164] the reality of the Cypherpunk culture[165] underlying many DBEs is that some will simply prefer not to form an LLC under state laws. Normally, such a choice would earn the default treatment of a general partnership, however, in light of the policy considerations discussed above, partnership treatment is counterproductive in this context. Furthermore, in certain circumstances, it will be practically impossible to form the DBE as an LLC. Ultimately, then, to escape the undesirable results of general partnership treatment, those DBEs that are unable, for one reason or another, to take advantage of general corporation or LLC statutes need a different common-law-entity option.

C.   *Considering DBEs Within Prevailing Theories of the Firm Points to an Alternative Entity Option*

Examining DBEs through the lens of many of the prevailing theories of the nature and purpose of the firm reveals both incongruities and synergies. The idea that prevailing theories of the corporation and other formal entities only incongruously map to business ventures relying on emerging technology is not a new phenomenon. Just as the first DLT protocol (the Bitcoin blockchain) emerged in 2009, the "Sharing Economy"[166] hit mainstream, with companies like Uber, Lyft, and Airbnb striving to "democratiz[e] how we produce, consume, govern, and solve social problems."[167] Sharing Economy businesses experiment with organizational models that "reduce the need for capital-intensive infrastructure (such as hotels) and durable goods (such as cars) since the excess capacity in these spaces and goods is exploited."[168] The Sharing Economy challenges the present under-

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164   *See* Bayern, *supra* note 25, at 100; Bayern, *supra* note 29, at 268.

165   The Cypherpunks were a group of cryptographers working in a multistakeholder, collaborative manner to produce technologically innovative tools allowing for regulation without sacrificing privacy. *See* DIEDRICH, *supra* note 33, at 253–55. The Bitcoin blockchain was born from the Cypherpunk work and carries with it a strong flavor of the Cypherpunk culture of civil disobedience and libertarianism. *Id.* at 259–60; *see also* Eric Hughes, *A Cypherpunk's Manifesto* (Mar. 9, 1993), https://www.activism.net/cypherpunk/manifesto.html [https://perma.cc/PVN6-LCAW].

166   Although it is clear that a definitional debate persists in the literature regarding the Sharing Economy, this Article borrows the definition of Sharing Economy used by Abbey Stemler, as follows: "all businesses that utilize platforms to connect people who have goods and services to offer with those who are willing to purchase them." Abbey Stemler, *The Myth of the Sharing Economy and Its Implications for Regulating Innovation*, 67 EMORY L.J. 197, 199 n.12 (2017).

167   *About*, SHAREABLE, https://www.shareable.net/about [https://perma.cc/ACY8-KKF3].

168   Stemler, *supra* note 166, at 202.

standing of the nature and purpose of the corporation.[169] DBEs, as a potential new wave of corporate decentralization and an extension of the peer-to-peer roots of the Sharing Economy,[170] also present a new challenge to prevailing theories of the firm. Notably, however, DBEs also converge with elements of several theories of the firm. Those convergences are most prevalent in theories that emphasize contracts, complexity, and flexibility. Those three characteristics, in turn, point toward making an alternative common-law business entity form available to DBEs—the business trust.

Theories of the nature of corporations abound.[171] In sum, "the corporation has been described as: (1) an entity; (2) an aggregate of people; (3) a web of contracts; (4) a government concession or 'franchise government'; (5) a collection of specific investments; . . . (6) the property of its shareholders";[172] and (7) a complex system.[173] The emergence of DBEs may provide support for the rise of systems thinking in relation to the nature of the firm because DBEs do not fit neatly into any of the other theories. DBEs challenge the entity theory of the corporation because they represent legally recognized business entities with all the hallmarks of a corporation but are not a "Frankenstein monster which States have created by their corporation laws."[174] DBEs also strain the government concession theory of the corporation because their creators ground their "constitutionalDNA"[175] in computer code rather than state incorporation laws and many DBE structures purport to avoid perceived inefficiencies and undesirable elements of state governments.[176]

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[169] *See* Orly Lobel, *The Law of the Platform*, 101 Minn. L. Rev. 87, 89–90 (2016) ("[T]he platform economy is radically changing the traditional equilibria of supply and demand, blurring the lines between owners and users, producers and consumers, workers and contractors, and transcending the spatial divides of personal and professional, business and home, market and leisure, friend and client, acquaintance and stranger, public and private.").

[170] *See* discussion and citations *infra* Section IV.C.

[171] *See generally* David Million, *Theories of the Corporation*, 1990 Duke L.J. 201.

[172] Belinfanti & Stout, *supra* note 97, at 586; *see also* Lynn Stout, *The Economic Nature of the Corporation*, *in* 2 The Oxford Handbook of Law and Economics 337, 343–48 (Francesco Parisi ed., 2017).

[173] Belinfanti & Stout, *supra* note 97, at 630 (arguing that systems theory "provides an approach to understanding the nature and purpose of corporate entities that is not only consistent with elements of many otherwise-conflicting visions of the firm, but also with important features of corporate law and practice").

[174] Ligget v. Lee, 288 U.S. 517, 567 (1933) (Brandeis, J., dissenting).

[175] *See, e.g.*, *infra* note 239.

[176] "The state concession theory of the corporation and its modern descendant, the political franchise theory, recognizes the role of the state in granting a corporation legal personhood and acknowledges that a corporation's internal governance structures in many ways mirror governance structures of a political state." Belinfanti & Stout, *supra* note 97, at 588.

Similarly, as the cases of the Plantoid and ICO demonstrate, not all DBEs are made up entirely of natural persons. Computer code may autonomously operate key aspects of DBEs, without further human involvement, leaving DBEs to cut against the aggregate theory.[177] DBEs challenge the team production theory of corporations because DBEs disintermediate the role of the "mediating hierarchy."[178] All types of DBEs (DAOs, smart contracts, and DLT protocols) entrust protection of specific investments made in the DBE to both the manager and to the protocol, rather than solely to a board of directors.[179] Unlike the relationship between a board of directors and a corporation's articles of incorporation and bylaws, a manager of a DBE cannot act contrary to the principles of the underlying DLT protocol.[180] In other words, in the DBE context, it is not business organization or corporation law that "fill[s] in the gaps where team members have found explicit contracting difficult or impossible";[181] the DLT protocol and the DBE smart contracts do. Finally, when viewed as a DBE, a DLT protocol represents a bold example of the failure of the shareholder-ownership model of corporations. It is undisputed, for example, that no one person or entity owns the Bitcoin blockchain.[182] Certainly, no holder of bitcoin believes that she or he owns the Bitcoin blockchain, nor expects to receive any residual value from the Bitcoin blockchain if it ever fails entirely.[183]

The two existing theories of the firm that best map to DBEs are the nexus-of-contracts and systems theories. The nexus-of-contracts theory "views the corporation as a web or 'nexus' of explicit and im-

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[177] The aggregate theory "describe[s] corporations as being 'composed' of human beings." Stout, *supra* note 172, at 344.

[178] Margaret M. Blair & Lynn A. Stout, *A Team Production Theory of Corporate Law*, 85 VA. L. REV. 247, 250 (1999) ("We argue that public corporation law can offer a second-best solution to team production problems because it allows rational individuals who hope to profit from team production to overcome shirking and rent-seeking by opting into an internal governance structure we call the 'mediating hierarchy.'" (footnote omitted)).

[179] *See* TAPSCOTT & TAPSCOTT, *supra* note 29, at 40.

[180] At least, they could not do so easily. Acting contrary to the protocol would require the trustees to gain control of more than the required consensus level of nodes. In the Bitcoin blockchain context, this is referred to as the "51% attack." *See* TAPSCOTT & TAPSCOTT, *supra* note 29, at 269.

[181] *See* Blair & Stout, *supra* note 177, at 254.

[182] Murck, *supra* note 29, at 1–2 ("[B]lockchain networks rely on a decentralized infrastructure that can't be controlled by any one person or group. . . . No single party controls the data or the information."); *see also* TAPSCOTT & TAPSCOTT, *supra* note 29, at 6 (explaining the Bitcoin blockchain is "*distributed*: it runs on computers provided by volunteers around the world").

[183] Belinfanti & Stout, *supra* note 97, at 590 (describing the idea that shareholders own corporations and that shareholders are the residual claimants in corporations as two of three common justifications for the shareholder-value theory of corporations).

plicit contracts between and among various parties associated with the firm, including shareholders, directors, officers, employees, and creditors."[184] If the term "contract" expands to include smart contracts (computer code that takes action based on the fulfillment of predefined conditions), the nexus-of-contracts theory offers a relatively strong fit. The default rules in the realm of DBEs are not defined by state corporation statutes, but rather by the rules of the underlying DLT protocol.[185] Like a choice between corporate statutes, DBE creators choose the basic rules of their venture by selecting a DLT protocol from the menu of choices available. Like the popular Delaware statute, many DBEs select Ethereum for its robustness and flexibility. As recognized by the nexus-of-contracts theory of corporations, after that initial choice, creators of DBEs may elect the governance system and organizational structure that best fits their goals. DBEs will hire "Contractors"—persons or entities external to the DBE that will provide some service—in order to take action. In addition to the nexus-of-contract theory, systems theory, with deep roots in computer science, also maps extremely well to DBEs. Systems theory encourages analysis of the multiple levels of DBEs introduced in this Article and offers the cognitive space to view them as simultaneously independent and interlocking entities.

Both the nexus-of-contract and system theories of the firm, as applied to DBEs, point to a need for a legally recognizable business entity that is rooted in contracts and offers the flexibility necessary to accommodate the complexity of the underlying technology. Meanwhile, the incongruous results from applying partnership law to DBEs make typical corporate constructs of limited liability and separate legal personhood a necessity. Under modern statutes, those who find it worthwhile and situationally appropriate to do so might choose to form an LLC and then turn operation of the LLC over to the DBE.[186] In some circumstances, the DBE creator will choose not to do so. In other circumstances, it will be technically impossible to do so. When Rockefeller was in a position where the corporate statutes did not recognize his business model and the other common-law forms were inappropriate for one practical reason or another, but he still wanted the benefits of incorporation, Rockefeller turned to the business trust.

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184   Stout, *supra* note 172, at 346; *see also* Belinfanti & Stout, *supra* note 97, at 586–87 (citing Frank H. Easterbrook & Daniel R. Fischel, *Limited Liability and the Corporation*, 52 U. Chi. L. Rev. 89 (1985); Melvin A. Eisenberg, *The Conception that the Corporation Is a Nexus of Contracts and the Dual Nature of the Firm*, 24 J. Corp. L. 819, 822 (1998)).

185   *See* Tapscott & Tapscott, *supra* note 29, at 269.

186   *See generally* Bayern, *supra* note 25; Bayern, *supra* note 29.

If Rockefeller were a coder developing a DBE, he would structure the DBE as a business trust.

III.   A Taxonomy of Decentralized Business Trusts as an Alternative Business-Entity Option

This Part first outlines the structure of the business trust, illustrating its use through Rockefeller's Standard Oil Trust and detailing elements required to create a business trust today. This Part then builds a taxonomy of decentralized business trusts, arguing that DBEs at each level of DLT can be constructed as business trusts in order to resolve the difficulties associated with structuring DBEs as partnerships, LLCs, or corporations. To do so, this Part starts at the protocol level and then considers smart contracts and DAOs. Examining the three levels of technology separately structures the discussion within the framework offered by systems analysis.

Systems analysis views a system as consisting of coordinated and interconnected elements that "operate as a unified whole to serve a given function or purpose."[187] Systems analysis recognizes that these interconnected elements influence each other even as they work together.[188] Furthermore, systems theory teaches that each system may be part of another, larger system.[189] Thus, examining each level of DBEs separately reveals areas where each system and subsystem influences the function of other systems and subsystems. Allowing analytical space to capture the complexity inherent in DBEs enables further analysis of broader, complex effects that DBEs should be expected to have on the law.

A.   *The Structure of a Business Trust*

Historically, the business trust offered profit-seeking associations of persons "limited liability, entity shielding, capital lock-in, tradable shares, [and] legal personhood"—just as though the owners had formed a corporation.[190] Unlike the traditional trust, which centers on

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187   Belinfanti & Stout, *supra* note 97, at 599.

188   *Id.* at 600.

189   *Id.* at 601 ("A second fundamental principle of systems thinking is that systems can be fractal, in the sense that they can be comprised of subsystems, which, in turn, are comprised of other subsystems, and so on, *ad infinitum*. Conversely, a system typically can also be described as a subsystem of another larger system." (footnote omitted)).

190   John Morley, *The Common Law Corporation: The Power of the Trust in Anglo-American Business History*, 116 Colum. L. Rev. 2145, 2146 (2016). The idea that one or more of these characteristics—limited liability, entity shielding, capital lock-in, transferable shares, and legal personhood—constitute the hallmark of a corporation is deeply embedded in corporate-law

a gift from a settlor to one or more beneficiaries,[191] "the business trust is similar to a corporation in its 'general scheme of organization and business operations,' and is 'established to run a business enterprise.'"[192] Although the business trust enjoyed its height of popularity when law made incorporation cumbersome and placed severe restrictions on the corporate form,[193] many state laws preserve the institution of the business trust.[194] Today, business trusts remain in common usage for "the structuring of mutual funds, in real estate investment trusts, and in asset securitization."[195]

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literature. *See, e.g.*, Stout, *supra* note 172, at 338–43; Lynn A. Stout, *On the Nature of Corporations*, 2005 U. Ill. L. Rev. 253, 254 (citing Robert Charles Clark, Corporate Law 2 (1986); Steven A. Bank, *Federalizing the Tax-Free Merger: Toward an End to the Anachronistic Reliance on State Corporation Laws*, 77 N.C. L. Rev. 1307, 1364–65 (1999)).

191 Chermside, *supra* note 25, § 2 ("The courts have frequently taken note of distinctions between the Massachusetts or business trust and the conventional private trust. A fundamental difference lies in the fact that the Massachusetts or business trust is primarily a vehicle for the conduct of commercial enterprise, whereas the traditional trust is generally a device to conserve and protect property. The Massachusetts or business trust also differs from the conventional trust in the manner in which it is created. Investors in a business trust in effect pool their resources in a mutual, consensual, contractual relationship as between themselves and with the trustees. On the other hand, in the conventional private trust the interests of the beneficiaries arise from the gift or grant of the settlor of the trust, and no element of mutual contract contributes to the creation of the trust relationship.").

192 Jonathan J. Ossip, *Diversity Jurisdiction and Trusts*, 89 N.Y.U. L. Rev. 2301, 2313 (2014) (footnote omitted) (quoting 16A Fletcher Cyclopedia of the Law of Corporations § 8227 (rev. 2003); Thales Alenia Space Fr. v. Thermo Funding Co., 989 F. Supp. 2d 287, 296 (S.D.N.Y. 2013)).

193 *See* Morley, *supra* note 186, at 2164 ("The business trust was thus widespread in the United States as a regulation-light alternative to the corporate form."); Thomas E. Rutledge & Christopher E. Schaefer, *The Trust as an Entity and Diversity Jurisdiction: Is* Navarro *Applicable to the Modern Business Trust?*, 48 Real Prop., Tr. & Est. L.J. 83, 87 (2013).

194 These states include, at a minimum, Arkansas, California, Colorado, Delaware, Georgia, Indiana, Massachusetts, Michigan, Mississippi, North Carolina, Rhode Island, South Carolina, Tennessee, Utah, Vermont, and Washington. *See* Ark. Code Ann. § 4-31-401 (2016); Betts v. Hackathorn, 252 S.W. 602 (Ark. 1923); Goldwater v. Oltman 292 P. 624, 627 (Cal. 1930)); Colo. Rev. Stat. § 15-10-201(6.5) (2017); Del. Code Ann. tit. 12, § 3801 (2018); Ovrevik v. Ovrevik, 527 S.E.2d 586, 588 (Ga. Ct. App. 2000); Ind. Code § 23-5-1-2 (2017); Williams v. Milton, 215 Mass. 1 (1913); Mich. Comp. Laws Ann. § 700.7402 (West 2010); Peoples Bank v. D'Lo Royalties, Inc. 235 So. 2d 257 (Miss. 1970)); N.C. Gen. Stat. § 55-1-40(9) (2017); Roberts v. Aberdeen-S. Pines Syndicate, 151 S.E. 865 (N.C. 1930); Courtemanche v. Bibbo, No. 03-6649, 2004 R.I. Super. LEXIS 178 (R.I. Super. Ct. Oct. 5, 2004)); S.C. Code Ann. § 62-7-105 (2007); Tenn. Code Ann. § 48-101-202 to -203 (2012); Utah Code Ann. § 48-3a-1001 (LexisNexis 2015); Carriage House, Inc. v. Gabelhart, 146 B.R. 352 (D. Vt. 1992); Wash. Rev. Code Ann. § 23.90.020 (West 2013).

195 Oh, *supra* note 25, at 268 ("Yet no one doubts that trusts are the dominant form for massive employee pensions and mutual funds, as well as for a myriad of asset securitization and structured finance transactions."); Rutledge & Schaefer, *supra* note 193, at 90 (footnote omitted) (citing Tamar Frankel, Securitization: Structured Financing, Financial Asset Pools, and Asset-Backed Securities (1991 & Supp. 1995)); Steven L. Schwarcz, Structured

Generally, states that continue to recognize the common-law business trust view it as an unincorporated association carried on for profit[196] created at common law by an agreement.[197] Under the agreement creating the trust, property is held and managed by trustees for the benefit and profit of the owners of the trust.[198] Owners of the trust hold freely transferable certificates representing their ownership stake in the trust property.[199] The certificate-holders are often referred to as "shareholders,"[200] and many states recognize limited liability for the certificate holders.[201] Notably, this limited-liability grant is generally limited by the rule that

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Finance, A guide to the Principles of Asset Securitization (3d ed. 2002); Sheldon A. Jones, Laura M. Moret & James M. Storey, *The Massachusetts Business Trust and Registered Investment Companies*, 13 Del. J. Corp. L. 421 (1988); Steven L Schwarcz, *The Alchemy of Asset Securitization*, 1 Stan. J.L. Bus. & Fin. 133 (1994) [hereinafter Schwarcz, *The Alchemy of Asset Securitization*]); Steven L. Schwarcz, *Commercial Trusts as Business Organizations: Unraveling the Mystery*, 58 Bus. Law. 559, 559 (2003) [hereinafter Schwarcz, *Commercial Trusts as Business Organizations*] ("In a seeming incongruity, trusts have come to dominate certain types of modern business and financial transactions.").

196 Ossip, *supra* note 192, at 2313 ("The primary characteristic of the business trust is that it is organized 'as a device for profit making through the combination of capital contributed by a number of investors.'" (quoting 5 Amy M. Hess, George G. Bogert & George T. Bogert, The Law of Trusts and Trustees § 247 (3d ed. 2007))).

197 *Id.* at 2312 (quoting 13 Am. Jur. 2d *Business Trusts* § 1 (rev. 2013)); *see also, e.g.*, Wash. Rev. Code Ann. § 23.90.020 (West 2013) (defining a business trust as follows: "A Massachusetts trust is an unincorporated business association created at common law by an instrument . . . for the benefit and profit of such persons as may be or may become the holders of transferable certificates evidencing beneficial interests in the trust estate"); Chermside, *supra* note 25, § 2 ("Modern cases support the view that a business trust is an unincorporated business organization created by an instrument by which property is to be held and managed by trustees for the benefit and profit of such persons as may be or become the holders of transferable certificates evidencing the beneficial interests in the trust estate."); John H. Langbein, *The Secret Life of the Trust: The Trust as an Instrument of Commerce*, 107 Yale L.J. 165, 178 (1997) ("[T]he data leaves me on solid ground in asserting . . . that well above 90% of the wealth in trusts in the United States is held in commercial as opposed to personal trusts.").

198 *See, e.g.*, Ryan A. Christy, *Redefining the Juridical Person: Examining the Business Trust and Other Unincorporated Associations for Citizenship Purposes*, 6 Duq. Bus. L.J. 137, 138 (2004) ("A business trust is an unincorporated association created by a voluntary act, based on contract, of the owners of property or property interests for the purpose of carrying on some kind of business or commercial activity for profit." (footnote omitted)); Ossip, *supra* note 192, at 2312–13 (explaining "property is to be held and managed by trustees . . . 'as a device for profit making'" for the owners of the trust (quoting Hess, Bogert & Bogert, *supra* note 196)).

199 *See, e.g.*, Christy, *supra* note 198, at 138 ("Beneficial interests in the trust estate and in the profits produced by the trust are evidenced by transferable certificates, similar to corporate shares . . . ."); Ossip, *supra* note 192, at 2314 ("[Beneficiaries of business trusts] hold 'certificates evidencing beneficial interests in the trust estate,' and these certificates are typically transferrable." (footnote omitted)).

200 *See* Ossip, *supra* note 192, at 2314 (citing 16A Fletcher Cyclopedia of the law of Corporations, *supra* note 192, § 8240; Jones, Moret & Storey, *supra* note 195, at 423).

201 *See, e.g.*, Wash. Rev. Code Ann. § 23.90.020 (West 2013) ("[T]he holders of . . . certifi-

> [w]here, under the declaration of trust, the unit holders re-
> tain control over the trustees and have authority to control
> the management of the business, the partnership relation ex-
> ists. On the other hand, where the declaration of trust gives
> the trustees full control in the management of the business of
> the trust and the certificate holders are not associated in car-
> rying on the business and have no control over the trustees,
> then there is no liability as partners.[202]

Business-trust certificate-holders basically possess the same role as
shareholders—they possess the power to "elect, control, and remove
the trustees, and also to amend the trust instrument."[203] The trustees
act as directors, offering centralized management similar to that found
in a corporation[204] and owing fiduciary duties to the certificate-hold-
ers.[205] In particular, trustees owe the same duty of care that directors
owe a corporation—that of an ordinarily prudent person under the
circumstances.[206]

Examining the organization of Rockefeller's Standard Oil Trust
illuminates the elements of the business trust. Those companies inter-
ested in participating in the Standard Oil Trust created a Standard Oil
Company in the state where their assets were located.[207] Participating
companies then transferred their assets to those Standard Oil Compa-
nies.[208] The shareholders of the Standard Oil Companies in each state
then contributed their Standard Oil Company stock to the Standard
Oil Trust.[209] Thus, the shareholders of each Standard Oil Company

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cates [evidencing beneficial interests in the trust estate] are entitled to the same limitation of
personal liability extended to stockholders of private corporations."); Goldwater v. Oltman, 292
P. 624, 629 (Cal. 1930).

[202] Schumann-Heink v. Folsom, 159 N.E. 250, 253 (Ill. 1927) (citations omitted); *see* Peoples
Bank v. D'Lo Royalties, Inc., 235 So. 2d 257, 264 (Miss. 1970). For early academic assessments of
the dividing line between a partnership and a Massachusetts business trust, see Henry J. Aaron,
The Massachusetts Trust as Distinguished from Partnership, 12 ILL. L. REV. 482, 482–83 (1918);
Robert C. Brown, *Common Law Trusts as Business Enterprises*, 3 IND. L.J. 595, 598–603 (1928).

[203] Ossip, *supra* note 192, at 2314 (citing 16A FLETCHER CYCLOPEDIA OF THE LAW OF
CORPORATIONS, *supra* note 192, § 8240).

[204] *Id.* (citing 13 AM. JUR. 2D *Business Trusts*, *supra* note 197, § 6).

[205] Chermside, *supra* note 25, § 2 ("Trustees of a Massachusetts or business trust occupy a
fiduciary relationship toward the holders of certificates of beneficial interests therein."); *id.*
§ 40[a] (citing cases). Promoters of the business trust also owe fiduciary duties to the certificate-
holders and to the trust. *Id.* §§ 2, 42.

[206] *Id.* § 2.

[207] Collins, *supra* note 5, at 2316. This allowed each company to comply with that state's
general incorporation laws, which prohibited ownership of assets outside of the state.

[208] *Id.*

[209] *Id.*

became the beneficiaries of the Standard Oil Trust.[210] In return for each contribution of stock valued at $100, the beneficiaries received one Standard Oil Trust certificate.[211] The beneficiaries elected nine trustees to manage the trust. Because the Standard Oil Trust controlled the stock of the Standard Oil Companies, the trustees effectively controlled all the Standard Oil Companies.[212] Standard Oil Company dividends were paid to the Standard Oil Trust, and the trustees distributed dividends according to the trust certificates held by the beneficiaries.[213] The Standard Oil Trust organization demonstrates the practical impact of the business-trust form: The beneficiaries are entitled to profits proportional to their contribution in the trust, but the trustees hold the sole power to direct the operations of the trust. Under the law of contract, of course, the beneficiaries retain the right to amend the contract that comprises the trust agreement.

Where properly created, many states also treat business trusts as separate entities, recognizing a form of (un)corporate personhood.[214] Thus, business trusts can sue and be sued.[215] Some states explicitly provide that business trusts receive the full benefit of the law applicable to corporations.[216] Although some of these states require a business trust operating within their jurisdiction to file the declaration of trust or some other form with the state,[217] other states do not.[218] Ulti-

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210 *Id.*

211 *Id.*

212 *See id.*

213 *See id.*

214 *See, e.g.*, Portico Mgmt. Grp., LLC v. Harrison, 136 Cal. Rptr. 3d 151, 159 (Cal. Dist. Ct. App. 2011); 13 Am. Jur. 2d *Business Trusts*, *supra* note 197, § 3 (noting several courts and statutory schemes recognize business trusts as distinct legal entities); Recent Case, *Trusts—The Business Trust as a Legal Entity*, 9 Tex. L. Rev. 299, 300 (1931) ("[A] Massachusetts trust is held . . . to be a legal entity, owning a note in its own name, on which it alone, and not the trustees, could sue.").

215 *See, e.g.*, First Union Nat'l Bank *ex rel.* Se. Timber Leasing Statutory Tr. v. Pictet Overseas Tr. Corp., 351 F.3d 810, 814 (8th Cir. 2003) ("Some states also now recognize the so-called 'business' or 'Massachusetts' trust. Unlike traditional trusts, this form of business organization gives the trust powers to sue and be sued in its own name and usually subjects trust assets to execution and attachment in the same manner as corporate assets." (citations omitted)); *Harrison*, 136 Cal. Rptr. 3d at 159; Boyd v. Boulevard Nat'l Bank, 306 So. 2d 551, 553 (Fla. Dist. Ct. App. 1975) (holding that a Massachusetts business trust is "a separate legal entity for the purpose of being sued").

216 *See, e.g.*, Wash. Rev. Code Ann. § 23.90.040(4) (West 2013); State *ex rel.* Combs v. Hopping Inv. Co., 269 P.2d 997 (Okla. 1954).

217 *See, e.g.*, Del. Code Ann. tit. 12, § 3801(g)(2) (2018); Miss. Code Ann. § 79-16-33 (West 2014); Tenn. Code Ann. § 48-101-204 (2012); Wash. Rev. Code Ann. § 23.90.040(1).

218 *See, e.g.*, Ark. Code Ann. § 4-31-401 (2016); Me. Rev. Stat. Ann. tit. 18-B, § 106 (2017); N.C. Gen. Stat. Ann. §§ 1-69.1, 55-1-40(9) (2017); Utah Code Ann. § 48-3a-1001 (LexisNexis 2015).

mately then, when two or more persons entrust assets to one or more trustees, giving the trustees complete control to manage the assets for their profit, and the owners merely retain a certificate of ownership entitling them to distribution of profits, the common law of many states continues to recognize the creation of a separate legal entity with limited liability, personhood, and agency—the business trust. If DBEs can be formed to fit the business trust construct, then DBE entrepreneurs will, like Rockefeller before them, have an alternative business entity to rely upon—one that retains the flexibility of a partnership without the incongruous results and enjoys the benefits of a corporation or LLC without enduring the practical and theoretical mismatch.

B.   DLT Protocols[219] *as Business Trusts*[220]

If, as introduced above, instead of thinking of the DLT protocol as the corporation, we consider the protocol to be the assets of the business organization, the case for viewing DLT protocols as business trusts crystalizes. Take the example used by Buterin and Larimer—the Bitcoin blockchain.[221] If the Bitcoin blockchain is the asset of the business trust, the nodes with the power to validate transactions (generally, the miners) are the trustees.[222] Such nodes possess the sole power to vote on how to manage the asset.[223] The nodes that validate transactions decide when to adopt a hard fork and are responsible for

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[219]   Recognizing that there are many ways to build and launch a DLT protocol and a variety of underlying motivations for doing so exist, this analysis is particularly relevant for the organization of public, open-source DLT protocols. Nevertheless, there are also situations in which a consortium or company may be interested in organizing their permissioned protocol as a business trust in order to further insulate the consortium members or the company from liability.

[220]   At this juncture, I would like to again thank Vlad Zamfir for bringing the original idea of trying to map trust law to smart contracts to my attention. In a conversation around a table at the Radisson Hotel in Nairobi, Kenya, after a full day of the COALA Blockchain Workshops, Vlad chatted with Ryan Singer and me about his initial thoughts that trust law may map to smart contracts. In that conversation, we considered what I have later learned was largely a donative-trust model. Upon return from Nairobi, I determined that for a variety of reasons, the donative-trust model did not map as well as we had hoped it would during that initial conversation in Nairobi. The remainder of Part III details the model that I believe best maps to certain DAOs and smart contracts, and that will (often) not require additional steps or interaction with the government. For a different view, see Robert Herian, *Trusteeship in a Post-Trust World: Property, Trusts Law & the Blockchain* (unpublished manuscript), https://www.academia.edu/23 964505/Trusteeship_in_a_Post-Trust_World_Property_Trusts_Law_and_the_Blockchain [https:// perma.cc/TD38-EAWX].

[221]   *See supra* notes 104–06 and accompanying text.

[222]   Note that not all nodes are operated by miners, and not all nodes run what is referred to as a "full node." *See* ANTONOPOULOS, *supra* note 30, at 172–75.

[223]   *See id.* at 172.

reaching consensus on the evolution and existence of the present state of the Bitcoin blockchain.[224] As trustees, some nodes (the miners) periodically receive remuneration for their services, pursuant to the rules of the protocol.[225] Under this conception, individuals holding bitcoin act as certificate holders. As Buterin and Larimer indicate, bitcoins act as shares in the business trust—they represent the holder's proportional entitlement to value generated by the Bitcoin blockchain through the services it provides to the public. Bitcoin holders do not have any right to manage the primary asset of the trust, the Bitcoin blockchain. Bitcoin holders can only transfer their certificates to others interested in buying into the business trust. The value of the bitcoin, the certificate of proportional entitlement to value generated by the Bitcoin blockchain, will depend upon the relative success of the Bitcoin blockchain and the services it provides at any given time. As a result, the Bitcoin blockchain itself could have been formed as a decentralized business trust.[226]

Admittedly, there are challenges to this construction of viewing DLT protocols as business trusts.[227] First, what exactly, constitutes the trust instrument? Does the protocol code itself serve as the trust instrument, as intimated by Larimer when he analogizes it to the bylaws of a corporation? Is it the white paper that sets out the vision for the DLT protocol? Is it the genesis-block code which displays for the public the specifications of the DLT protocol? Would any of these options be recognized by a court as sufficient to satisfy the common-law requirement that a trust instrument exist among the parties? Even if not, there is no apparent reason that the creators of new DLT proto-

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224 *Cf.* Primavera De Filippi & Benjamin Loveluck, *The Invisible Politics of Bitcoin: Governance Crisis of a Decentralized Infrastructure*, INTERNET POL'Y REV., Sept. 30, 2016, at 1, 15.

225 ANTONOPOULOS, *supra* note 30, at 214.

226 I qualify this statement with "could have been" because arguably a clear contractual commitment to forming a business trust should have been made at the initial launch of the Bitcoin blockchain for a business trust to form. As Bayern said of LLCs, it might be difficult to unwind the clock at this point. Nevertheless, the example stands—there is no reason that new public, open-source protocols could not be formed as a business trust. *See* Bayern, *supra* note 29, at 268.

227 I also recognize that the theory of decentralized business trusts, generally, faces a jurisdictional challenge. How do participants in a decentralized business trust determine the applicable common-law jurisdiction? What happens when certificate-holders of the decentralized business trust reside in international jurisdictions? What happens when one or more of the trustees resides in international jurisdictions? How do plaintiffs seeking to hold the decentralized business trust accountable determine where to file suit? Given the diversity of state common law and state statutes recognizing business trusts, what happens as the decentralized business trust's economic activities cross state or national boundaries? These are big, important questions. As such, I reserve them for separate and further research.

cols, whether public, private, decentralized, or distributed, could not specifically negotiate a trust agreement to accompany the new protocol.

Second, do DLT protocol tokenholders endanger the business-trust form when they use their tokens for utilitarian purposes rather than for the purpose of transferring their economic interest in the DLT protocol? For example, in the Ethereum protocol, programs running on Ethereum require ether, the Ethereum protocol token, to function. Ether is regarded as fuel for economic activity on Ethereum as much as evidence of ownership interest in some economic right. When those holding ether use it to engage in economic activity on the protocol, do they inadvertently cross the common-law test dividing business trusts from partnerships? If so, does it destroy the limited liability of all ether-holders, or only as to those putting their tokens to economic use? Irrespective of these challenges, the possibility that if designed with these issues in mind, a DLT protocol could assume the organizational form of a business trust results in an astounding proposition: a DLT protocol may be recognized as having legal personality. In other words, a blockchain may be recognized as a person. Even the mere possibility for this proposition to come to fruition opens unique and important lines of inquiry for issues of corporate governance, DLT protocol governance, and the doctrine of corporate personhood.

C.   *Smart Contracts as Business Trusts*

Smart contracts, even when they do not rise to the level of complexity of a DAO, "can own tokens, participate in crowdsales, and even be voting members of other contracts."[228] If the smart contract itself, using internal, predetermined, coded logic, holds assets on behalf of tokenholders, then the smart contract itself could act as the trustee in a business trust. Here, investors in the business trust would commit assets to the smart contract in exchange for certificate tokens. The certificate tokens would represent the holder's proportional ownership interest in the profits of the business trust and would entitle the holder to vote on proposals to alter the smart contract's underlying code under certain circumstances.[229] The smart contract, for its part, would hold the assets committed to it on behalf of, and would exploit those assets for the profit of, the certificate tokenholders. The smart

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228 *Decentralized Autonomous Organization*, ETHEREUM, https://www.ethereum.org/dao [https://perma.cc/2KXE-3MYU].

229 Assuming, of course, that doing so is technically feasible.

contract would be programmed to distribute any excess value earned from its activities to the certificate tokenholders at certain intervals. If the certificate tokenholder agreed to a trust agreement at the time of exchanging assets for certificate tokens, the trust-instrument requirement would also be satisfied. As a result, a business trust would be formed and the smart contract and its investors would, as an entity, be entitled to limited liability, entity shielding, capital lock-in, and legal personhood. The smart contract would be a legally immortal being; the smart contract would be a person.

Returning to the above ICO example,[230] the ICO smart contract manages the assets on behalf of all the owners of the tokens sold through the ICO. The smart contract could be designed to act as the trustee in the business trust. The tokenholders would act as the certificate-holders—they have contributed funds in exchange for tokens. The tokens often give the holder the right to consume some service, but they are also freely transferable and some holders may opt to retain the token instead of redeeming it for services to reap a higher payout upon sale later. The company offering the ICO, especially if the company retains tokens, would also constitute a certificate-holder in the business trust. The smart contract manages the tokens for the benefit and profit of all the tokenholders, including the company and new purchasers. ICOs often sport legal documentation, such as a sales contract, documenting the terms of the token purchase and any rights to which the tokenholder will be entitled.[231] Properly designed, such sales contracts, or another contract signed at the time of sale, could fulfill the trust instrument requirement for creating a common-law business trust. ICOs could be organized, then, as decentralized business trusts.[232]

D.   *DAOs as Business Trusts*

The requirements for recognizing a business trust also map well to the possible design of a DAO. The complex smart contract, or group of interacting smart contracts, that comprise the DAO's code serve as the business trust, holding the trust property in the form of digital assets. The DAO would have at least two levels of

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230   *See supra* notes 129–41 and accompanying text.

231   *See, e.g.*, Storj, Storj Labs (BVI) Ltd. Terms of Token Sale (2017), https://storj.io/sale-terms.pdf [https://perma.cc/JZ6B-MBNT].

232   Recognizing that many of the ICOs undertaken to date may not fit this construct because they were not coded with this framework in mind, the details of how an ICO would be organized in order to qualify as a decentralized business trust and the legal ramifications of doing so are further explored in the third article in this three-part series.

tokenholders. The first level of tokenholders exchange cryptocurrency for tokens that (a) represent the holder's proportional ownership interest in the business trust, and (b) grant the holders the right only to vote on two issues: (1) who will act as trustees, and (2) whether to change the fundamental structure of the DAO's code. I will refer to these tokenholders as "certificate tokenholders" to reflect their equivalence to certificate holders in the business trust. The certificate tokenholders will grant elected trustees a second level of tokens—trustee tokens. Trustee tokens do not relate to any proportional ownership interest, but rather allow the trustees to direct the activity of the business trust: to select which products and services to bring to market, to contract with service providers and vendors, and to distribute profits back to the certificate tokenholders. Only a trustee token, and not a certificate token, would be endowed with the right to transfer or otherwise dispose of the DAO's property.

With this model, the DAO satisfies the requirement that the trustees hold and manage trust property on behalf of and for the benefit of the certificate holders. As to the trust instrument, arguably, the DAO computer code itself may constitute the trust agreement. Recognizing, however, that a debate exists as to whether a smart contract can stand on its own as a legal contract under the common law of contracts,[233] I submit that such an outcome is not required. Presently, creators of DAOs with sophisticated legal counsel sell tokens under the auspices of a sales contract—a regular, legal-prose, written-word contract.[234] Carefully constructed, such sales contracts—or another contract offered together with the sales contract—with each investor in the DAO could fulfill the role of a trust instrument. Under such circumstances, the DAO's code would represent real-time performance of that contract, rather than the contract itself.

Mapping a DAO to the Standard Oil Trust organization helps illuminate the idea of a DAO as a business trust. In the case of a DAO operating on Ethereum, the underlying protocol plays the role of the individual Standard Oil Company. The ether held by individual DAO investors acts like the stock held by owners of each Standard Oil Company. The owners of ether transfer the ether to the DAO, just as the owners of the Standard Oil Companies transferred their stock to the Standard Oil Trust. Thus, the ether-holders become beneficiaries

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233 For research regarding the enforceability of smart contracts under the common law of contracts, see Max Raskin, *The Law and Legality of Smart Contracts*, 1 Geo. L. Tech. Rev. 305, 321–40 (2017); Werbach & Cornell, *supra* note 34, at 338–82.

234 *See, e.g.*, Storj, *supra* note 231.

of the DAO, the same way that Standard Oil Company stockholders became Standard Oil Trust beneficiaries. The beneficiaries receive one DAO token for a prespecified amount of ether, just as the Standard Oil Trust beneficiaries received one trust certificate for every $100 of stock contributed to the trust. The tokens give the beneficiaries the right to profits (or rewards) from the activities of the DAO and the right to elect the managers of the DAO, but beneficiaries have no right to direct the operation of the DAO. The elected managers are the trustees. This is the same split between ownership and management that occurred between the beneficiaries and the nine-member board of trustees in the Standard Oil Trust. This construction of a DAO to match the business-trust form pioneered by the Standard Oil Trust would not be difficult to achieve in context of current DAOs.[235]

Take, for example, the SuperDAO, which emerged after the failure of The DAO.[236] According to its creators, "SuperDAO is a decentralized autonomous organization that encapsulates the advantages of a traditional startup with the best attributes of crowd swarming dynamics and intelligence."[237] The SuperDAO is stateful and uses an "onion [layer] model" of governance, that is, one with multiple layers.[238] Owners of the "Superneum" token possess management capacity, intended to "steer[] the organization according to the goals and mission established at inception."[239] Meanwhile, an internal team undertakes "every day decisions" related to product development via "reputational voting."[240] The design of the SuperDAO "incentivizes

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235 I recognize that not all DAOs are structured this way today. Further, DAOs created in the future are not subject to any requirement of being structured this way. Any DAO not structured this way that is not incorporated or formed as an LLC will be ineligible to take advantage of an entity form that offers the advantages of limited liability and legal personhood. The point is that the business trust should be an option in a DAO's (and other DBEs') choice of entity analysis.

236 *About*, SUPERDAO, https://superdao.io/#About [https://perma.cc/T6VC-2VDS].

237 Ola, *On SuperDAO: Simple Overview of An Efficient DAO*, SUPERDAO BLOG (Jan. 27, 2017), https://blog.superdao.io/on-superdao-simple-overview-of-an-efficient-dao-73efc74362 a1 [https://perma.cc/9A2M-PMJV].

238 *Id.*

239 *Id.* The SuperDAO refers to this initial mission of the SuperDAO as the "constitutionalDNA." *Id.* The idea is that by coding the mission into the SuperDAO, it "can be referenced within the DAO during an organizational proceeding to enforce rules and deter harmful behavior not conducive to the set purpose of the DAO." *Id.* The Superneum tokenholders have "absolute power over any decision as long as its proposals are not anti-missionary to SuperDAO." *Id.*

240 *Id.* These "merit" holders make up "a committee (supercom) of ALL active working participant[s] earning 'Merits' for impact based contributions." *Id.* These are then "[s]ubdivided into 'minicoms' or sub committees that specialize in domain specific decision making. These could represent Dapp teams, financial analyst[s], human resources and so forth." *Id.* If the sub-committees have disputes, the full-committee consensus will settle the dispute. *Id.*

active participators with a higher skewed payout within a short value (profit) distribution event timeline and punishes apathetic participator[s] with lower payouts."[241] Nevertheless, this sounds very much like a director (Superneum) and officer/employee (merits) split. Or, in business-trust form, the Superneum tokenholders might be considered the trustees, and the merits-holders a third layer of workers hired by the trustees.

However, writings on the SuperDAO imply that, depending on participation levels, both Superneum and merits tokenholders can receive profits from the excess value earned by SuperDAO products and services.[242] To make the business-trust form map well to the SuperDAO, the creators would need a third layer of tokens—the certificate tokens. So, if the Superneum tokenholders only had the right to vote on who should hold an intermediate level of tokens or on whether to change the SuperDAO constitutionalDNA, Superneum tokenholders would be equivalent to certificate tokenholders. Those elected to hold the intermediate level of tokens—the trustee tokens—would retain the right to direct the management of the enterprise within the confines of the SuperDAO constitutionalDNA, and the merits tokenholders could remain Contractors approved by the trustee tokenholders.

Ultimately, the SuperDAO would retain its onion-layer checks and balances on operational decisionmaking and could still incentivize production with an award of value. The difference is that under the current structure, unless the creators of the SuperDAO elect to incorporate the SuperDAO under the law of a specific jurisdiction, the SuperDAO arguably represents a partnership, with many smaller partnerships formed as decentralized applications surface, because the Superneum tokenholders and merits tokenholders are both entitled to a share in the profits and to control the direction of the enterprise. The common law views this as a partnership rather than a business trust.[243] Under the modifications proposed here, the SuperDAO could be viewed as a business trust, the Superneum tokenholders would enjoy limited liability, and the SuperDAO would enjoy entity shielding and legal personhood.

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241 *Id.* Right to profits from the SuperDAO is tied to "[a] minimum criteria for participation." *Id.*

242 *See id.*

243 *See* Goldwater v. Oltman, 292 P. 624, 628 (Cal. 1930); Roberts v. Aberdeen-S. Pines Syndicate, 151 S.E. 865 (N.C. 1930).

Similarly, returning to our case study of the Plantoid,[244] the Plantoid DAO represents a commercial venture designed to build wealth for the Plantoid and for those contributing to the Plantoid over time.[245] For the Plantoid's DAO to operate as a business trust, the Plantoid smart contracts serve as trustees, holding title and managing the property of the Plantoid for the benefit and profit of the Plantoid.[246] As a result, the certificate-holders in the Plantoid DAO are the artists commissioned to create Plantoid reproductions. Importantly, the artists do not themselves direct the DAO in its choice between reproduction proposals. Rather, the individuals that sent appreciation funds to the Plantoid receive the right to vote on which artist to commission for the next reproduction.[247] In other words, when individuals purchase services from the Plantoid by sending the Plantoid cryptocurrency, the services being purchased are (1) a gesture of appreciation from the Plantoid and (2) the right to vote on the reproduction proposal at some future date when sufficient funds exist for reproduction. Meanwhile, the certificate-holders in each Plantoid business trust received their share in exchange for a contribution of labor—the artistic reproduction of the Plantoid. As a result, a Plantoid with a trust agreement could fulfill the requirements of a common-law business trust. The result would be that the artists would enjoy limited liability, the Plantoid and its DAO would enjoy legal personality, and the contracts that the Plantoid enters into with humans would enjoy the benefit of a legally recognized entity on either side of the contract. The Plantoid really would be a "blockchain-based life form,"[248] a legally immortal being.

IV.   Lessons From History for Decentralized Business Trusts and the Law

Technology innovation frequently spurs innovation in business forms. History foreshadows the use of the business trust in the context of DBEs, but the antitrust concerns that arose in connection with

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244 *See supra* notes 146–55 and accompanying text.

245 The purpose of the DAO is to accumulate sufficient funds that the Plantoid can reproduce. Each time the Plantoid reproduces, it sends a 1% royalty to the Plantoid from which it originates. *See Pyramid Scheme*, Окнаоs, http://okhaos.com/plantoids/ [http://okhaos.com/plantoids] (explaining that under the smart-contract terms comprising each Plantoid DAO, "the artists commissioned with the (re)production of a plantoid will not only receive the bitcoins collected by the plantoid that commissioned them (as an ex-ante lump-sum payment), but also a small proportion of the funds collected by all the plantoids they created").

246 *See id.*; *see also* Caffyn, *supra* note 151.

247 *See Pyramid Scheme*, Окнаоs, *supra* note 245.

248 *A Bionic Creature*, *supra* note 146.

nineteenth-century business trusts do not carry the same significance in the DBE context. The preeminent concern in this context is the effect that DBEs may have on corporate culture, calling for both the law and software developers to anticipate that effect and account for it as they build DBEs.

A.   *History Foreshadows DBE Use of the Business-Trust Form*

In the early days of colonial exploration and mercantilism, entrepreneurs sought royal charters for each voyage.[249] As seafaring technology improved and the likelihood of returning from an expedition alive increased, royal charters began granting monopolies over large swaths of territory to enable multiple voyages.[250] Such charters gave rise to important historical entities like the East India Trading Company and the world's oldest multinational corporation, the Hudson's Bay Company.[251] Facing the notorious difficulty of obtaining such charters, many businesses turned to unincorporated business organization forms that offered at least some of the same advantages of the corporation, including limited liability for partners not directly involved in day-to-day management of the business.[252] Business ventures in the newly created United States of America experienced similar development of business organization forms—state governments issued corporate charters,[253] but the difficulty in obtaining them and the tendencies of fickle legislatures to revoke them drove business ventures to less restrictive business forms.[254]

The new technology that emerged in the nineteenth century, including railroads, telegraph lines, and increasingly efficient oil production, brought the need for an alternative method of securing incorporation into sharp relief as invention and entrepreneurship outpaced the law's ability to enable economic stability.[255] Business ventures, powered by the new technology of the time, created integrated industrial firms with economies of scale that struggled against the

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249   *See* MICKLETHWAIT & WOOLDRIDGE, *supra* note 14, at 20–21.

250   *See id.* at 17.

251   *Id.*

252   *See id.* at 40.

253   D. GORDON SMITH & CYNTHIA A. WILLIAMS, BUSINESS ORGANIZATIONS 176 (3d ed. 2012) ("Prior to the widespread adoption of general incorporation statutes in the mid-1800s, corporations in the United States were formed only by legislative action, usually by a state legislature.").

254   *See* MICKLETHWAIT & WOOLDRIDGE, *supra* note 14, at 43–44.

255   *Cf. id.* at 49.

overly restrictive general corporation laws of the day.[256] As Rockefeller showed the way, businesses increasingly turned to the business trust over the corporation because it offered the benefits of incorporation without imposing most of its undue restrictions.[257] Over time, however, business trusts amassed too much power for regulatory comfort,[258] and the law lag that drove businesses to the trust form became increasingly apparent. As a result, states adopted general incorporation statutes, enabling the more simple and direct procedures for incorporating a business organization still enjoyed today.[259] Technology, however, continues to push the boundaries of business organization law.

At the dawn of the twentieth century, the biggest corporations suffered from a strictly hierarchical structure, with most ownership and managerial power resting in the hands of a few.[260] As those few began to fall away, visionaries like Alfred Sloan at General Motors sought to decentralize corporate structures.[261] Sloan split the various elements of General Motors into separate, autonomous divisions defined by the market that they served.[262] These divisions, of course, still found themselves guided by a "powerful general office," leading to a "controlled decentralization" structure, rather than a fully decentralized one.[263]

This revolutionary system led to the rise of professional managers.[264] The resulting

> potential conflict of interest between the "principals" who own companies and their "agents," who run them, which was

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[256] *See id.* at 65–66; *see also* Collins, *supra* note 5, at 2312–15 (describing restrictive nature of the first general corporation laws).

[257] *See* MICKLETHWAIT & WOOLDRIDGE, *supra* note 14, at 67; Collins, *supra* note 5, at 2315–16 ("But since a trust was not technically a corporation, it did not require a state grant to exist, was not subject to the state regulation of corporations, and was not prohibited from holding stock in multiple corporations in multiple states."); Rutledge & Schaefer, *supra* note 193, at 87.

[258] *See* Collins, *supra* note 5, at 2321–28; *cf.* Rutledge & Schaefer, *supra* note 193, at 89 n.25.

[259] SMITH & WILLIAMS, *supra* note 253, at 177 ("The old system was displaced through the passage of general incorporation statutes—'general' because any eligible person could form a corporation without a special act of the legislature. Over time the requirements for incorporation have become exceedingly simple."); Collins, *supra* note 5, at 2329–30.

[260] *Cf.* MICKLETHWAIT & WOOLDRIDGE, *supra* note 14, at 103–04 (referring to the robber barons as those with overwhelming economic and managerial power until the twentieth century).

[261] *Id.* at 105.

[262] *Id.* at 105–06.

[263] *Id.* at 105.

[264] *Id.* at 108.

later dubbed the agency problem, has dogged the history of the company, . . . with shareholders repeatedly trying to find ways to make managers' interests the same as their own (most recently with share options) and managers usually wriggling out of them.[265]

As the twentieth century came to a close, the emergence of the internet led to further unbundling of the corporation.[266] "By the end of the twentieth century, you could see the gradual Siliconization of commerce. The hierarchies of big firms everywhere became looser."[267]

Technology giants of the twenty-first century continued to flatten corporate-governance models in certain spheres of the economy. Amazon's internet sales disrupted retail-business structures;[268] "fintech" companies pushed competition into the financial industry,[269] and video-streaming services ended the days of big-box DVD-rental stores.[270] Just as the first DLT protocol (the Bitcoin blockchain) emerged in 2009, the Sharing Economy hit mainstream, with companies like Uber, Lyft, and Airbnb striving to "democratiz[e] how we produce, consume, govern, and solve social problems."[271] Sharing Economy businesses experiment with organizational models that "reduce the need for capital-intensive infrastructure (such as hotels) and durable goods (such as cars)" because spaces and goods can be shared locally.[272] The Sharing Economy represents another technological innovation challenging the present understanding of the nature and purpose of the firm.[273]

The Sharing Economy's roots lie in peer-to-peer systems. Peer-to-peer systems are "based on distributed power and distributed ac-

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265   Id. at xviii.

266   *Id.* at 142–43.

267   *Id.* at 145.

268   Panos Mourdoukoutas, *Who Killed Sears' Business Model?*, Forbes (Jan. 5, 2017, 3:56 PM), https://www.forbes.com/sites/panosmourdoukoutas/2017/01/05/who-killed-sears-business-model/ [https://perma.cc/Z7QP-R9UA] ("[Amazon's] remote location warehouses, expedient delivery and razor-thin margins have given Amazon a price advantage over Sears, further compressing its operating margins.").

269   *The Fintech Revolution*, Economist (May 9, 2015), http://www.economist.com/news/leaders/21650546-wave-startups-changing-financefor-better-fintech-revolution [https://perma.cc/Y39P-DZSN].

270   Brian Stelter, *Internet Kills the Video Store*, N.Y. Times (Nov. 6, 2013), http://www.nytimes.com/2013/11/07/business/media/internet-kills-the-video-store.html [https://perma.cc/88XF-8QQ5].

271   *About*, *supra* note 167.

272   Stemler, *supra* note 166, at 202.

273   *See, e.g.*, *supra* note 169.

cess to resources."[274] Further, peer-to-peer systems generally allow anyone to participate in their networks, rather than limit access to a select few.[275] Finally, peer-to-peer systems distribute knowledge among all users, rather than centralize knowledge in the hands of a managerial group.[276] Blockchain-based systems take the peer-to-peer inroads made by the Sharing Economy to their logical conclusion.[277] DBEs, residing on a DLT protocol, therefore represent the next wave of corporate decentralization technology. Business trusts are the flexible form historically turned to when entrepreneurs using the new technology of their time want greater flexibility without losing the benefits of the corporate form. The emergence of decentralized business trusts should not, therefore, come entirely as a surprise. If Rockefeller were a coder and his Standard Oil enterprise were a DBE, he would have created a decentralized business trust. As a result, the idea that the emergence of decentralized business trusts will also give rise to new concerns should also not come as a surprise. Rockefeller's Standard Oil Trust did, after all, become the monopoly that inspired modern antitrust law. Rather, we (and Rockefeller) might be surprised by the type of concerns resulting from the emergence of DBEs.

B.   *Decentralized Business Trusts Are Unlikely Candidates for Next-Generation Monopolies*

The rise of the business trust in the nineteenth century enabled business ventures to amass startling amounts of wealth and economic power.[278] The unexpected economic prowess of the business trust and concerns regarding the effects on a market economy led to the enactment of the Sherman Antitrust Act.[279] Several factors at play in the DBE context, however, suggest that the recognition of decentralized business trusts in the DBE context will not raise similar antitrust con-

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274   Arun Sundararajan, The Sharing Economy 32–33 (2016) (quoting Michel Bauwens).

275   *See id.* at 33.

276   *Id.*

277   *See id.* (noting that today's Sharing Economy represents a hybrid system of pure peer-to-peer networks combined with more traditional economic spaces and that Blockchain more purely fulfills Bauwens' three elements of peer-to-peer systems).

278   *See* Rutledge & Schaefer, *supra* note 193, at 88–89 ("While a corporation could not hold shares in another corporation, no such limitation restricted the trust—a capacity that allowed certain trusts to amass control over significant portions of commercial activity." (footnote omitted)).

279   *Id.* at 89 & n.25 ("The title of the first federal legislation passed to protect competition, namely the Sherman Antitrust Act, reflects widespread use of the form, exemplified by Rockefeller's Standard Oil Trust." (citing 15 §§ U.S.C. 1–38 (2012))).

cerns. Specifically, the choice-of-entity motivation is different for DBE entrepreneurs than it was for Rockefeller. Current uses of the business trust demonstrate that when the right choice of entity motivation is at play, business trusts can be, and are, used without giving rise to antitrust concerns.

When Rockefeller conducted his choice-of-entity analysis, industry integration served as his primary motivation.[280] In other words, Rockefeller set out to create a monopoly.[281] In the DBE context, entrepreneurs will use the decentralized-business-trust form developed in this Article to achieve limited-liability status and separate legal personhood without the practical constraints and misaligned policy of other available business forms.[282] That the business-trust form offers an item in the menu of entity forms is neither new nor unique to DBEs. Business trusts are often the entity form of choice for mutual funds, real estate investment ventures, and asset securitization.[283] These industries do not use the business-trust form to build monopolies. Trusts are used in asset securitization, for example, as a special-purpose corporation that insulates assets from the risks associated with their owner.[284] More generally, Professor Steven Schwarcz concludes that the deciding factor in the choice to use a business trust, as opposed to a corporation, lies in the extent to which investors need to place the assets of the business venture at risk.[285] Under his analysis, the business trust offers the better choice of entity where the goals of both the business venture's creditors and owners center on preserving the value of the assets rather than generating a risk-weighted return.[286] This rationale holds true for DBEs at some levels of the technology (particularly the smart contract and DAO levels), where the aim of the venture rests in preserving the assets contributed to the venture.[287]

Further separating the motivation for using of the business trust in the DBE context from Rockefeller's motivation of integrating an industry is the possibility that, as an entity form available in some

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[280] *See* TARBELL, *supra* note 1, at 55.

[281] *See* Collins, *supra* note 5, at 2315.

[282] *See supra* Part III.

[283] Rutledge & Schaefer, *supra* note 193, at 90; Schwarcz, *Commercial Trusts as Business Organizations*, *supra* note 195, at 559 ("In a seeming incongruity, trusts have come to dominate certain types of modern business and financial transactions.").

[284] *See* Schwarcz, *The Alchemy of Asset Securitization*, *supra* note 195, at 135.

[285] Schwarcz, *Commercial Trusts as Business Organizations*, *supra* note 195, at 561.

[286] *Id.*

[287] If the goal were a risk-weighted return, the participants would be better served by retaining the cryptocurrency for speculative trading, instead of trading it in for certificate tokens. *See id.*

states at common law, some DBEs may qualify as a business trust and bear the hallmarks of a corporation as a result of purely private ordering through contract. This quality of decentralized business trusts may contradict the sensibilities of many in the open-source DLT community (especially at the protocol level) that presently strive to claim immunity from state-backed laws.[288] In other words, at some levels of the technology, DBEs will elect the business-trust form for the same perfectly acceptable reasons that asset securitization, mutual funds, and real estate investment trusts do. At other levels of the technology (particularly, the protocol level), DBEs may stumble into legal-entity status through a contract that is given additional attributes by state common law to their chagrin. In either case, neither the DBE nor its creators intend to integrate the DLT industry the way Rockefeller intended to integrate the oil-refinery industry. Nevertheless, the long cycle of innovation in technology and business entities demonstrates that both society and the law would benefit from anticipating new challenges to arise from the emergence of decentralized business trusts.

C. *DBEs May Negatively Impact Corporate Culture*

Monopolistic economic power may not be the negative externality that follows decentralized business trusts, but history makes clear that when technology fundamentally changes the nature of business organization, both positive and negative effects on society are likely to follow. For example, the improvements in sailing technology that enabled royal charters to shift from approving one voyage to granting a monopoly over unlimited voyages in a given geographic territory also inexorably tied corporate pursuits to the imperialism of the day.[289] Much later, using Alfred Sloan's GM as the prototype, the multidivisional firm spread during the twentieth century,[290] bringing with it a "new culture of management" emphasizing professional standards and

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288   This sentiment stems from a long line of cyber-separatists, beginning with John Perry Barlow. *See* John Perry Barlow, *A Declaration of the Independence of Cyberspace*, ELECTRONIC FRONTIER FOUND. (Feb. 8, 1996), https://www.eff.org/cyberspace-independence [https://perma.cc/TLY6-8FSW] ("Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather.").

289   *See* MICKLETHWAIT & WOOLDRIDGE, *supra* note 14, at 17–25 ("The sixteenth and seventeenth centuries saw the emergence of some of the most remarkable business organizations the world has seen: 'chartered companies' . . . . By the late seventeenth century the Company was a well-organized monopoly, providing some £20,000 in customs duties to the crown. But it was still a state monopoly—and one mired in politics.").

290   *See id.* at 104–06.

company loyalty.[291] Law and society responded to each of these developments. Royal monopolies like that granted to the East India Company became increasingly embroiled in politics—for example, the tea monopoly granted to the East India Company sparked the Boston Tea Party.[292] The rise of a professional management class led to a slew of corporate-governance regulations designed to address the perceived agency costs created by the separation of ownership and management.[293] So what negative externality should we expect to follow decentralized business trusts? Because decentralized business trusts extend the peer-to-peer efforts of the Sharing Economy to an extreme degree, they may contribute to a gradual shift in corporate culture—one that is arguably already underway.

Despite the powerful narrative of the Sharing Economy's benefits for unlocking dead capital and enabling microentrepreneurship, evidence of a less desirable cultural shift driven by the Sharing Economy is mounting.[294] One commentator, for example, describes a darker side of the Sharing Economy as a world characterized by

> a new form of surveillance where service workers must live in fear of being snitched on, . . . marketplaces are generating new and ever-more-entitled forms of consumption[,] . . . [and] many Sharing Economy companies are making big money for their investors and executives, and making good jobs for their software engineers and marketers, by removing the protections and assurances won by decades of struggle, by creating riskier and more precarious forms of low-paid work for those who actually work in the Sharing Economy.[295]

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291 *Id.* at 109–10.

292 *Id.* at 27. The East India Company was also embroiled in the debate surrounding slavery, which significantly impacted its sugar imports. *Id.*

293 *See* SMITH & WILLIAMS, *supra* note 253, at 173–75, 175 (defining corporate-governance law and linking it to "a separation of ownership (the shareholders) and control (the management) in public corporations").

294 *See, e.g.*, Benjamin Edelman, Michael Luca & Dan Svirsky, *Racial Discrimination in the Sharing Economy: Evidence from a Field Experiment*, 9 AM. ECON. J. APPLIED ECON. 1, 1 (2017) ("[G]uests with distinctively African American names are 16 percent less likely to be accepted relative to identical guests with distinctively white names."); Sofia Ranchordás, *Does Sharing Mean Caring? Regulating Innovation in the Sharing Economy*, 16 MINN. J.L. SCI. & TECH. 413, 455–65 (2015) (describing negative aspects of the Sharing Economy and regulatory responses); Brishen Rogers, *The Social Costs of Uber*, 82 U. CHI. L. REV. DIALOGUE 85, 86 (2015) ("Uber's longer-term impact on labor standards is quite unclear, however, and it may have dark implications for the future of low-wage work more generally."); Stemler, *supra* note 166, at 222–28 (describing market failures in the Sharing Economy and outlining possible related societal harms).

295 TOM SLEE, WHAT'S YOURS IS MINE: AGAINST THE SHARING ECONOMY 10–11 (2015).

This commentary on the Sharing Economy raises important questions for decentralized business trusts because they arguably represent an extension of the heightened decentralization of business embodied by the Sharing Economy. As detailed above, the Sharing Economy's roots lie in peer-to-peer systems. Blockchain-based systems take the peer-to-peer inroads made by the Sharing Economy to their logical conclusion.[296] As such, will the externalities produced by DBEs represent the extreme version of the externalities now documented in the Sharing Economy?

Many describe the potential of DBEs with the same altruistic rhetoric as that surrounding the Sharing Economy. The founders of the SuperDAO proclaim that the SuperDAO "encapsulates the advantages of a traditional startup with the best attributes of crowd swarming dynamics and intelligence."[297] A DLT-based system called Backfeed even offers a solution to the negative aspects of the Sharing Economy, declaring that "[w]ith Backfeed, every community member is simultaneously a contributor and an actual shareholder in the service provided by the community. Hence, everyone has an incentive to maximise the value of that service, as the mo[re] successful it is, the greater the potential benefits will be."[298] Others, however, predict dangerous consequences for DBEs and other "algorithmic entities."[299] Indeed, to the extent that the promise of DBEs for rectifying the negative aspects of the Sharing Economy depend on the fact that they offer a new method for organically and efficiently tapping into the wisdom of the crowd, evidence suggests that such wisdom is only as robust as the crowd is diverse, independent, and decentralized.[300] DBEs may further decentralize business ventures, whether in the Sharing Economy or otherwise, but without correcting for deficiencies in diversity and independence, DBEs will raise new challenges.

By way of illustration, consider the possible effects of a lack of software-developer diversity on the one hand, and a lack of participant independence on the other. Computer code is a language that manifests the culture, viewpoints, and biases of those who write it.[301]

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296   *See supra* note 277 and accompanying text.

297   Ola, *supra* note 237.

298   Alex Pazaitis, Primavera De Filippi & Vasilis Kostakis, *Blockchain and Value Systems in the Sharing Economy: The Illustrative Case of Backfeed*, 125 Tech. Forecasting & Soc. Change 105, 110 (2017).

299   LoPucki, *supra* note 94, at 903–04 ("Entities without human collaborators could be more ruthless, more difficult to deter, and easier to replicate.").

300   James Surowiecki, The Wisdom of Crowds 22 (2004).

301   Danielle Keats Citron & Frank Pasquale, *The Scored Society: Due Process for Auto-*

Compounding this reality, extensive literature discusses the effects of the lack of corporate-board diversity.[302] If the trustees of DBEs are self-selected, without any way to ensure diversity, DBEs may be less able to attend to the needs of their broad participant base than intended,[303] may not optimize financial performance,[304] and may experience diminished decision-making capacity.[305] DBEs that do not consider mechanisms for ensuring diversity and independence of participants may thus represent legally recognized business entities with biases engrained into their organizational framework and managed by trustees concerned with only a small number of stakeholder groups. Such DBEs may be more susceptible to problems of groupthink while also operating on a decentralized system and scale previously considered impossible. Such circumstances hold clear potential for embedding biases, discrimination, and other less desirable qualities into decentralized business trusts, and calls for the creators of such systems to consider building corporate-governance mechanisms patterned after existing laws into the "constitutionalDNA" of DBEs.[306]

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mated Predictions, 89 WASH. L. REV. 1, 4 (2014) (describing the process by which human biases are embedded into the source code of predictive algorithms); *see also* FRANK PASQUALE, THE BLACK BOX SOCIETY 110–13 (2015).

302 *See* Deborah L. Rhode & Amanda K. Packel, *Diversity on Corporate Boards: How Much Difference Does Difference Make?*, 39 DEL. J. CORP. L. 377, 382–401 (2014) (surveying the literature).

303 Maretno Harjoto, Indrarini Laksmana & Robert Lee, *Board Diversity and Corporate Social Responsibility*, 132 J. BUS. ETHICS 641, 641 (2015) (finding an association between stronger corporate social responsibility performance and board diversity).

304 *See, e.g.*, David A. Carter, Betty J. Simkins & W. Gary Simpson, *Corporate Governance, Board Diversity, and Firm Value*, 38 FIN. REV. 33, 33 (2003) ("[W]e find significant positive relationships between the fraction of women or minorities on the board and firm value."). Other studies do not find a positive relationship, and still others find no statistical significance. *See* Rhode & Packel, *supra* note 302, at 383–90.

305 Rhode & Packel, *supra* note 302, at 393 ("A common argument by scholars, as well as board members of both sexes, is that diversity enhances board decision-making and monitoring functions."); *see also* SUROWIECKI, *supra* note 300, at 36 ("The positive case for diversity, as we've seen, is that it expands a group's set of possible solutions and allows the group to conceptualize problems in novel ways. The negative case for diversity is that diversity makes it easier for a group to make decisions based on facts, rather than on influence, authority, or group allegiance. Homogeneous groups, particularly small ones, are often victims of what the psychologist Irving Janis called 'groupthink.'").

306 This is an area clearly ripe for applying the principles of cryptolaw for DLT to the design of DBEs. Transplanting business trusts to DLT protocols requires considering the role of corporate law and ways to build similar functions into the code governing DBEs to increase the likely success of the transplant and minimize its likelihood of generating unexpected and undesirable effects.

Conclusion

This Article contributes to a new and developing legal discourse regarding DLT by exploring the impact of transplanting business organization law to DLT-based business ventures. Like many businesses that relied on prior technological innovations, DLT-based business ventures struggle to find an optimal business organization form among the current menu of entities. This Article reveals that careful attention to both law and code may enable DAOs, smart contracts, and DLT protocols to resolve that tension and enjoy the same limited liability, capital lock-in, and legal personhood enjoyed by their corporate counterparts without being forced to take on a form that ill fits for both practical and doctrinal reasons.

The argument that certain DBEs can be structured as business trusts raises significant legal issues to be explored in future work. For example, recognizing certain smart contracts as legal business entities raises a host of new legal questions to be explored in the realm of ICOs. Rather than settle the law in this area, DBEs may further complicate the legal treatment of ICOs. Federal securities laws may view business trust certificates as securities under the Securities Act of 1933[307] and the Securities Exchange Act of 1934.[308] State laws vary, but at least some states subject business trust certificates to regulation under their blue sky laws because they apply the full panoply of corporate rights and responsibilities to business trusts.[309] Rather than ending the legal inquiry, this treatment of business trust certificates raises a new set of substantive legal issues to investigate. If a smart contract generates the certificates sold, acts as the sole trustee of the assets exchanged for the tokens, and the smart contract runs on an open-source protocol that can no longer be dominated by a single entity, who would federal securities laws or state blue-sky laws look to as the issuer of the token? Will the laws really require a smart contract to register with the SEC or the state government to sell securities? Can

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[307] *See* 15 U.S.C. § 77b(a)(1) (2012).

[308] 15 U.S.C. § 78c(a)(10) (2012). At least one commentator is more certain that "[a] business trust certificate would qualify as a 'security' under" these laws and certain others, including "the Public Utility Holding Company Act of 1935, 15 U.S.C. § 79(a)(16) (1988); the Trust Indenture Act of 1939, 15 U.S.C. § 77ccc(16) (1988); and the Investment Company Act of 1940, 15 U.S.C. § 80a-2(a)(36) (1988)." Takemi Ueno, *Defining a "Business Trust": Proposed Amendment of Section 101(9) of the Bankruptcy Code*, 30 Harv. J. on Legis. 499, 513 n.96 (1993). Such certainty would be a step closer to a bright-line rule than that presented in the SEC's ruling on The DAO, while remaining true to that ruling's characterization of The DAO as an "unincorporated organization." *See* The DAO Report, *supra* note 140, at *43.

[309] *See, e.g.*, Rubens v. Costello, 251 P.2d 306, 310 (Ariz. 1952); Pac. Am. Realty Tr. v. Lonctot, 381 P.2d 123, 125 (Wash. 1963).

compliance with such regimes be built into the code before the smart contract initiates the ICO? What policy reasons would the SEC have to enforce securities laws against the smart contract? These issues call for deeper exploration and hint at the broader ramifications of DBEs for DLT governance.

Further, the tendency of DBEs to complicate substantive legal issues may, perhaps counterintuitively, allow for greater clarity in the continued quest to understand the nature and purpose of the firm. The firm, in its many forms, is a complex entity. DBEs illuminate that complexity, and mapping DBEs to business trusts using a methodology rooted in systems analysis offers the analytical space to embrace and explore that complexity. DBEs should also be expected to impact corporate culture by producing new negative externalities. While it is possible that changes to a DBE's code may correct for such negative cultural changes, business-organization and corporate-governance laws have been developing for just that purpose for quite some time. Rather than reinvent the wheel, DBEs should be encouraged to look to existing state-backed law that might be transplanted into DBE structures.

Ultimately, identifying decentralized business trusts as an alternative business-entity form for DBEs offers the potential to reorient models of the firm toward organizations offering greater transparency, stronger endogenous feedback loops, and increased cultural and societal responsiveness. Realizing that potential requires anticipating the ripple effects that recognizing computer code as a legal entity will have on adjacent areas of law. This Article offers a starting point in that regard and calls for further interdisciplinary research at the intersection of business organization law and DLT. In so doing, the Article both contributes to a growing literature considering the impact of algorithmic entities and stands as a reminder that the relationship between law and code is a fluid, multidirectional relationship. The emergence of new computer-code structures may influence the trajectory of the law, but the law also influences the trajectory of the code.