Back to the Future:
Sorting Old Law from New Technology in Blockchain Smart Contract Applications & Assessing the Need for Regulation

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ABSTRACT

Permissioned blockchains, which allow automation of routine processes through smart contracts, have the potential to streamline authentication and trade significantly. While there may be a popular conception of the blockchain as an anonymous ledger, the parties in a permissioned blockchain are known to each other. Those parties create rules of governance to control access to the blockchain and define permissible actions. As this discrete blockchain application may be less familiar to many than the concept of an anonymous ledger, discussion of regulating blockchain may inappropriately sweep permissioned blockchains and anonymous, permissionless blockchains together. Further, referring to certain permissioned blockchain applications as "smart contracts" may lead to confusion regarding the intersection of law and technology.

This Essay first seeks to help attorneys and transacting parties have a clear-eyed view of the separation between new technology and the general principles of existing law that will apply to new technology. It clarifies that parties using smart contracts are still contracting within the same general framework of contract law that applies to other transacting parties; the use of a new technology does not typically overhaul the legal status of the underlying contractual provisions or the assets ultimately exchanged. Rather, courts and parties must apply the law to the facts—facts involving the use of permissioned blockchain technology. Smart contracts represent an exciting new technology, but they do not usher in a new common law.

The Essay next explains that permissioned blockchain applications require minimal regulation of the technology itself due to the ability of participants to protect themselves. Widespread use of a new technology, like blockchain, fairly sparks discussion about the need for regulation. In a consortium using a permissioned blockchain, however, parties are highly sophisticated, have worked together to develop norms and define parameters, and are not anonymous. In this context, structural legislation or regulation of blockchain technology is not necessary.

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INTRODUCTION

At a 1996 conference on cyberlaw, Judge Frank H. Easterbrook spoke to a group of people interested in, and perhaps even anxious about, how legal concepts might be affected by a sea change in society—the arrival of the internet age.[1] It may be surprising, then, that Judge Easterbrook used

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[1] Lawrence Lessig, *The Law of the Horse: What Cyberlaw Might Teach*, 113 HARV. L. REV. 501, 501 (1999).

this opportunity to discuss the "Law of the Horse."[2] These listeners had not been unwittingly attending an equestrian law conference. They were in the right place, and Judge Easterbrook was using the "Law of the Horse" to make a broader point about how to conceptualize the relationship between the law and the internet.[3]

While a cyberlaw conference seems to inherently imply a different and separate law for cyberspace, Judge Easterbrook did not see this as conceptually sound.[4] He argued that even in the cyber age, our legal system remains one of principles and rules.[5] Those principles and rules will be applied to situations involving the internet.[6] He analogized the study of a separate internet law to a law school course titled the "Law of the Horse."[7] For example, it would not make sense to teach a class that combined contract cases involving the sale of horses, tort cases involving injuries inflicted by horses, and criminal cases involving horse theft.[8] Instead, most law school classes are organized by general legal concepts, rather than by a common set of facts[9]—tort law and contract law, not horse law. The principles of tort and contract are not overhauled in the horse context, and neither will they be in the internet context.[10]

Almost 25 years later, the internet permeates almost every aspect of contemporary life, and a generation of people have never known a world without it.[11] This world is not static—new applications and new underlying methods for executing innovations are constantly being developed.[12] The next mystifying, fascinating technology whose potential lies before us is blockchain. [13] While blockchain may be synonymous with virtual

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[2] Frank H. Easterbrook, *Cyberspace and the Law of the Horse*, 1996 U. CHI. L.F. 207, 207–08, 214.

[3] *See id.* at 208, 215–16.

[4] *See id.* at 208.

[5] *Id.* at 207–08.

[6] *Id.* at 208.

[7] *Id.* at 207–08.

[8] *See id.*

[9] *See id.*

[10] *See id.*

[11] *See* Manuel Castells, *The Impact of the Internet on Society: A Global Perspective*, MIT TECH. REV. (Sept. 8, 2014), https://www.technologyreview.com/2014/09/08/171458/the-impact-of-the-internet-on-society-a-global-perspective/ [https://perma.cc/7FCF-E7AY]; Micha Kaufman, *The Internet Revolution Is the New Industrial Revolution*, FORBES (Oct. 5, 2012, 3:42 PM), https://www.forbes.com/sites/michakaufman/2012/10/05/the-internet-revolution-is-the-new-industrial-revolution/ [https://perma.cc/PK8J-GRT7].

[12] *See* Castells, *supra* note 11.

[13] *See* EMMANUELLE GANNE, CAN BLOCKCHAIN REVOLUTIONIZE INTERNATIONAL TRADE? 2 (2018).

currencies—and with Bitcoin specifically—in the popular conscience, the technology has found broader application in a wide range of contexts.[14] Virtual currencies utilize permissionless blockchain—a type of blockchain that allows anyone to join and where participants are anonymous.[15] Permissioned blockchain stands in contrast. In a permissioned blockchain, the participants control who can join and what type of access each user will have, and parties are not anonymous.[16] When parties know and trust each other, they may wish to execute their legal contracts using blockchain "smart contracts," sets of self-executing processes that are triggered when pre-existing conditions are realized.[17]

Public, permissionless blockchain applications like Bitcoin come with a unique set of regulatory considerations, including whether such applications should be regulated as securities or currencies.[18] However, permissioned blockchain applications often have significantly different attributes—most importantly, the ability to limit access to the blockchain and vet prospective users.[19] Nevertheless, economic participants looking to innovate in blockchain have not received clear signals from lawmakers or

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[14] *See infra* Section I.B; DEEPESH PATEL & EMMANUELLE GANNE, BLOCKCHAIN & DLT IN TRADE: A REALITY CHECK (Nov. 2019).

[15] Toshendra Kumar Sharma, *Permissioned and Permissionless Blockchains: A Comprehensive Guide*, BLOCKCHAIN COUNCIL, https://www.blockchain-council.org/blockchain/permissioned-and-permissionless-blockchains-a-comprehensive-guide/ [https://perma.cc/VL7N-SDTL].

[16] *Id.*

[17] *See* INT'L SWAPS & DERIVATIVES ASS'N ("ISDA") & LINKLATERS, WHITEPAPER: SMART CONTRACTS AND DISTRIBUTED LEDGER—A LEGAL PERSPECTIVE 5 (Aug. 2017), https://www.isda.org/a/6EKDE/smart-contracts-and-distributed-ledger-a-legal-perspective.pdf [https://perma.cc/5GA6-FFVU].

[18] For a good sampling of some financial regulators' concerns regarding cryptocurrency, see *Cryptocurrencies*, FINRA, https://www.finra.org/investors/learn-to-invest/types-investments/initial-coin-offerings-and-cryptocurrencies/cryptocurrencies [https://perma.cc/5VYP-F3WE]. *See also* [Former] Chairman Jay Clayton, *Statement on Cryptocurrencies and Initial Coin Offerings*, SEC (Dec. 11, 2017), https://www.sec.gov/news/public-statement/statement-clayton-2017-12-11 [https://perma.cc/8BYP-MHCZ]. Money laundering is also a concern. While, of course, money laundering not facilitated by blockchain also occurs, the anonymity of blockchain provides new opportunities for launderers. *See* Mike Orcutt, *Criminals Laundered $2.8 Billion in 2019 Using Crypto Exchanges, Finds a New Analysis*, MIT TECH. REV. (Jan. 16, 2021), https://www.technologyreview.com/2020/01/16/130843/cryptocurrency-money-laundering-exchanges/ [https://perma.cc/63QN-HD5H]; *see also* U.S. DEP'T OF JUST., CRYPTOCURRENCY ENFORCEMENT FRAMEWORK: REPORT OF THE ATTORNEY GENERAL'S CYBER DIGITAL TASK FORCE (2020), https://www.justice.gov/ag/page/file/1326061/download [https://perma.cc/4Z52-EKAX].

[19] *See infra* Section I.A.3.

regulators that the two realms will be approached separately.[20] Even where it seems likely that certain regulations will not apply to permissioned blockchains, certainty could help accelerate the blockchain revolution by removing regulatory haziness as an impediment to investment in blockchain innovation. Policymakers should seek a regulatory response that will both encourage innovation and protect parties and markets where necessary. For lawyers and transacting parties to effectively advocate for such a response, they must be able to conceptualize the difference between regulating law and regulating technology.

This Essay makes two separate but related points. To make those points, it will establish the premise that "smart contracts" are pieces of technology that can help implement underlying legal contracts, rather than contracts themselves. From that premise, it will first argue that those legal contracts should be governed by existing common or statutory law applicable to contracts, and accordingly do not require a new and separate legal framework. A new smart contract law would be analogous to the separate cyberlaw that Judge Easterbrook compared to the "Law of the Horse."[21] Second, the Essay argues that parties to transactions conducted on permissioned blockchains—parties who are contracting with trusted counterparties and defining their own parameters for the technology's use—can protect themselves without extensive new regulation of their permissioned blockchain applications.

Part I of this Essay provides background on the technologies related to the discussion of these points, as well as their uses and pertinent regulatory responses to them. Section I.A. of this Essay provides basic information about blockchain and smart contracts, as well as the key differences between permissioned and permissionless blockchains. Section I.B. outlines several examples of permissioned blockchain applications for trade and authentication in a range of industries in order to demonstrate blockchain's potential for improving efficiency in those industries' operations. Sections I.C.–I.E. describe proposed and existing regulatory responses to blockchain, as well as certain ways to think about regulation

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[20]   This is because most of the buzz regarding the regulation of blockchain focuses heavily on permissionless applications, like cryptocurrencies. *See generally* Sean Stein Smith, *Blockchain Regulation Is Making Headlines, and That Is Great for Cryptocurrency Development*, FORBES (Sept. 30, 2020, 8:51 AM), https://www.forbes.com/sites/seansteinsmith/2020/09/30/blockchain-regulation-is-making-headlines-and-that-is-great-for-cryptocurrency-development/ [https://perma.cc/53AW-RPNG]; Ephrat Livni, *What's Next for Crypto Regulation*, N.Y. TIMES DEALBOOK NEWSL. (Jan. 30, 2021), https://www.nytimes.com/2021/01/30/business/dealbook/crypto-regulation-blockchain.html [https://perma.cc/N4ZH-ENJ4].

[21]   *See* Easterbrook, *supra* note 2, at 207–08.

and self-regulation—through the "Law of the Horse," and also through the concept of a medieval law merchant and its modern analogues.

Part II analyzes the appropriate way to conceptualize the intersection of law and blockchain, as well as the proper regulatory response to the technology itself. Section II.A considers the value and applicability of existing law to these new technologies. Section II.B offers a way forward through self-regulation of permissioned blockchain.

I.   BACKGROUND

It is important to first have a clear-eyed view of the separation between new technology and the general principles of existing law that will apply to new technology. This Part introduces blockchain technology and its uses in various contexts. Crucially, it explains that a smart contract is merely a block of code that is used to execute an underlying legal contract.

A.   Blockchain Technology

Blockchain technology may be used in either a permissioned or permissionless context, with only the latter characterized by the protection of anonymity for users.[22] While anonymity is desirable for some, it comes with concerns regarding ease of illegal transactions, and also makes it difficult to verify counterparties' trustworthiness and security. [23] It is important to understand that anonymity breeds concerns about the security and integrity of the anonymous counterparty and its systems, but not of the blockchain itself, even in the permissionless context—the nature of blockchain mechanics discussed immediately below makes the blockchain transaction itself incorruptible. Permissioned blockchain is used when parties both seek to and can trust each other—for example, in authentication and high-value trading.[24]

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[22] *See infra* Section I.A.3.

[23] *See* Orcutt, *supra* note 18; *Consumer Advisory: Risks to Consumers Posed by Virtual Currencies*, CFPB (Aug. 2014), https://files.consumerfinance.gov/f/201408_cfpb_consumer-advisory_virtual-currencies.pdf [https://perma.cc/BRM2-4SLC] ("If something goes wrong with your purchase of virtual currencies, do you know how to contact the seller? Some virtual currency exchanges do not identify their owners, their phone numbers and addresses, or even the countries where they are located.").

[24] *See infra* Sections I.A.3., I.B.

1. *Blockchain Mechanics*

A blockchain is a specific type of database.[25] In a blockchain database,[26] transaction records are distributed through and maintained by multiple computers on a blockchain network, rather than held or controlled by a single entity.[27] In this way, blockchain enables a decentralized registry of records.[28] This is why blockchain may also be referred to as distributed ledger technology ("DLT").[29] Each block includes time-stamped batches of record entries.[30] Each block also includes the "hash"[31] of the previous block, linking the blocks together to create a chain.[32] Data are appended to the ledger only after validation.[33]

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[25] *How Blockchain Technology Works—Guide for Beginners*, COINTELEGRAPH, https://cointelegraph.com/bitcoin-for-beginners/how-blockchain-technology-works-guide-for-beginners [https://perma.cc/9GEV-9J6F] [hereinafter *How Blockchain Works*]. A blockchain database can serve as the foundation for any type of computing. Without a good database with strong security measures, however, the computing is not as trustworthy.

[26] A blockchain database may also be referred to as a blockchain ledger. *See id.*

[27] *See id.* The records could be conceptualized as being "duplicated," rather than "distributed."

[28] *Id.*

[29] Strictly speaking, blockchain is one type of DLT. *Blockchain & Distributed Ledger Technology (DLT)*, WORLD BANK (Apr. 12, 2018), https://www.worldbank.org/en/topic/financialsector/brief/blockchain-dlt [https://perma.cc/CZJ2-LMVH].

[30] Vimal Mani, *A View of Blockchain Technology from the Information Security Radar*, ISACA (Aug. 25, 2017), https://www.isaca.org/resources/isaca-journal/issues/2017/volume-4/a-view-of-blockchain-technology-from-the-information-security-radar [https://perma.cc/L9E9-8CDH]. A block (also called a "data block") is a file in which "data pertaining to [a blockchain] are permanently recorded. A block records some or all of the most recent . . . transactions that have not yet entered any prior blocks. Thus, a block is like a page of a ledger or record book. Each time a block is 'completed,' it gives way to the next block in the blockchain. A block is thus a permanent store of records which, once written, cannot be altered or removed." Jake Frankenfield, *Block (Bitcoin Block)*, INVESTOPEDIA (reviewed by Julius Mansa, Jun. 30, 2020), https://www.investopedia.com/terms/b/block-bitcoin-block.asp [https://perma.cc/9ZDR-UWWL].

[31] "A hash is . . . a unique cryptographic fingerprint of the data." Virginia Cram-Martos, *WTO Global Trade and Blockchain Forum: What Is Blockchain and DLT?*, WORLD TRADE ORG. (Dec. 2, 2019), https://www.wto.org/english/res_e/reser_e/01_a_virginia_cram-martos_final_wto_2019-1202.pdf [https://perma.cc/BM59-KNJW]; *see also How Blockchain Works*, *supra* note 25.

[32] *See* Fabien Gillioz, *From Smart Contract to Smart Legal Contract*, LINKEDIN (Feb. 27, 2017), https://www.linkedin.com/pulse/from-smart-contract-legal-fabien-gillioz/ [https://perma.cc/HSE2-UC4H]; Virginia Cram-Martos, *supra* note 31. The linking of blocks through hashing is critical to the establishment of trust for anonymous participants—in fact, this is true for any type of database. "Since all participants have a copy of the entire blockchain, they can detect any tampering. So when the hashes match up across the chain, all parties know that they can trust their records." *See Blockchain—The New Technology of*

Once a block is added to the chain, it cannot be changed or deleted without replacing all subsequent blocks. [34] This is the essence of blockchain's immutability. Each user on the network holds the record of data blocks, and each of those records is updated with new information at the same time.[35] In other words, the entire chain is held by each user, rather than specific blocks.[36] All of this combines to mean that data checking is performed "reliably and automatically on behalf of each user, creating a very fast and secure ledger system that is remarkably tamper-proof."[37]

2. *Bitcoin and Blockchain*

Blockchain may be immediately associated with Bitcoin in many people's minds. This is because Bitcoin is a blockchain application often covered in the mainstream media, which cannot be said of many other blockchain innovations.[38]

Trust, GOLDMAN SACHS, https://www.goldmansachs.com/insights/pages/blockchain/ [https://perma.cc/4HUX-W6CU].

[33] *See How Blockchain Works*, *supra* note 25.

[34] *See id.* A new block may be made up of multiple new transactions. PHILIP BOUCHER, HOW BLOCKCHAIN TECHNOLOGY COULD CHANGE OUR LIVES 5 (2017), https://www.europarl.europa.eu/RegData/etudes/IDAN/2017/581948/EPRS_IDA(2017)581 948_EN.pdf [https://perma.cc/N9YK-66QM].

[35] This means that the digital records are "shared instantaneously across a network of participants." ISDA & LINKLATERS, *supra* note 17, at 7.

[36] *See* BOUCHER, *supra* note 34, at 5; *How Blockchain Works*, *supra* note 25.

[37] BOUCHER, *supra* note 34, at 5. To visualize these mechanics in action, imagine a blockchain transaction between two parties. When the parties decide to participate in the transaction, the blockchain assigns an encrypted key to each of the two participants. The blockchain will verify the transaction and will create a time-stamped block that contains these two encrypted keys. That new block is then added to the end of the blockchain. This completes the transaction, at which point the ledger is updated. This example is adapted from *Blockchain Technology for Supply Chains—a Must or a Maybe?*, MCKINSEY & CO. (Sept. 12, 2017), https://www.mckinsey.com/business-functions/operations/our-insights/blockchain-technology-for-supply-chainsa-must-or-a-maybe [https://perma.cc/FU8W-FUJ5]. The article provides more information on the mechanics of blockchain, and also includes graphics that may be useful to some readers. *See id.*

[38] Investors and the business media have been captivated by news of increases and decreases in Bitcoin's value. News platforms dedicated to cryptocurrencies and Bitcoin, as well as dedicated corners of well-known business news outlets, constantly track Bitcoin. *See, e.g.*, *Markets: Bitcoin*, CNBC, https://www.cnbc.com/bitcoin/ [https://perma.cc/9V22-MWM6]; *Bitcoin*, COINDESK, https://www.coindesk.com/price/bitcoin [https://perma.cc/RJ9W-VT2K]; *Bitcoin News*, COINTELEGRAPH, https://cointelegraph.com/tags/bitcoin [https://perma.cc/S679-7USH]. One may be less likely to be aware of blockchain applications in logistics, art, and luxury products. *See infra* Section I.B.

Bitcoin was one of the earliest cryptocurrencies and an early example of blockchain's potential,[39] using blockchain technology to facilitate peer-to-peer payments. [40] Blockchain is the underpinning architecture that supports Bitcoin—it is not synonymous with Bitcoin, and one is not a sub-category of the other.[41] Blockchain technology is used for the transfer of digital tokens and the recording of those transactions, but it has many other uses as well.[42]

One of the most important attributes of Bitcoin and other virtual currencies is anonymity.[43] Users can transfer virtual currency without the need for a central authority, such as a financial institution or a government.[44] The existence of a currency that could potentially be widely accepted while remaining unregulated has caused governments, regulators, and others to explore the possibility of regulating Bitcoin and other virtual currencies or tokens—for example, as legal tender or securities.[45]

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[39] *See* Rosemary Bigmore, *A Decade of Cryptocurrency: From Bitcoin to Mining Chips*, TELEGRAPH (May 25, 2018, 3:30 PM), https://www.telegraph.co.uk/technology/digital-money/the-history-of-cryptocurrency/ [https://perma.cc/B82Z-9TMA].

[40] *Get Started with Bitcoin*, BITCOIN, https://bitcoin.org/en/ [https://perma.cc/UR9X-QU55]; *How Does Bitcoin Work?*, BITCOIN, https://bitcoin.org/en/how-it-works [https://perma.cc/6AWM-NR47] [hereinafter *How Does Bitcoin Work?*].

[41] *See* Matt Lucas, *The Difference Between Bitcoin and Blockchain for Business*, IBM (May 9, 2017), https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-bitcoin-and-blockchain-for-business/ [https://perma.cc/Z3FD-55CN].

[42] *Id.*

[43] Bitcoin transactions are not completely anonymous because certain details are or may become public. However, "the identity of the user behind an address remains unknown until information is [potentially] revealed during a purchase or in other circumstances." *Some Things You Need to Know*, BITCOIN, https://bitcoin.org/en/you-need-to-know [https://perma.cc/4Q8U-7JPT].

[44] *See How Does Bitcoin Work?*, *supra* note 40.

[45] *See* Terence Zimwara, *US Government Moves to Regulate Cryptocurrencies After Attorney General Publishes Enforcement Framework*, BITCOIN (Oct. 10, 2020), https://news.bitcoin.com/us-government-moves-to-regulate-cryptocurrencies-after-attorney-general-publishes-enforcement-framework/ [https://perma.cc/6EY9-QFJR]; Evelyn Cheng, *The U.S. Government Is Trying to Get Coordinated in Its Efforts to Regulate Bitcoin*, CNBC (Feb. 6, 2018), https://www.cnbc.com/2018/02/06/us-government-is-trying-to-get-coordinated-in-its-efforts-to-regulate-bitcoin.html [https://perma.cc/8ZSN-5G3L]; Francine McKenna, *Here's How the U.S. and the World Regulate Bitcoin and Other Cryptocurrencies*, MARKETWATCH (Dec. 28, 2017), https://www.marketwatch.com/story/heres-how-the-us-and-the-world-are-regulating-bitcoin-and-cryptocurrency-2017-12-18 [https://perma.cc/WH2A-JVWR]. There is also concern about the risks of fraud, money laundering, and even the potential demise of national currencies. *See, e.g.*, *Investor Alert: Watch Out for Fraudulent Digital Asset and "Crypto" Trading Websites*, SEC (Apr. 24, 2019), https://www.sec.gov/oiea/investor-alerts-and-bulletins/ia_fraudulentdigitalasset [https://perma.cc/W4FG-XM42]; Ruchir Sharma, *Will Bitcoin End the Dollar's Reign?*, FIN. TIMES (Dec. 9, 2020),

3. Permissioned and Permissionless Blockchains

Before discussing permissioned blockchains in detail, this Section explains the difference between permissionless and permissioned blockchains and why that difference matters. The fully decentralized, anonymous blockchain that many are familiar with through Bitcoin and other cryptocurrencies is a public, permissionless blockchain. [46] These blockchains are almost impossible to hack because there is no single central administrator, and therefore no central point of the network to identify and destroy.[47] However, a public blockchain is described as "public" because anybody can join without any condition[48]—meaning that users typically cannot be vetted. For this reason, anonymous and decentralized blockchains, like Bitcoin, are arguably not as well-suited for high-value transactions.[49]

Concerns have also arisen about the use of such permissionless blockchains in payments because bad actors can take advantage of anonymity to transact illegally—for example, by laundering money through payments using anonymous tokens or currencies.[50] However, this concern is only about the integrity of users, not about the integrity of the technology. The concerns are not, for instance, about a blockchain itself being hacked, as the consensus decision to approve the new block provides a substitute for a centralized authority judging the validity of a transaction.[51] Instead, the concern is about the potential for hacking of a user's systems—in contrast to hacking of a blockchain itself—by other unknown users. Thus, the real risk of a permissionless blockchain is the potential for security failure on the part of users and infrastructure companies, rather than for

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https://www.ft.com/content/ea33b688-12e0-459c-80c5-2efba58e6f1a [https://perma.cc/JEV2-4SGJ]; *see also infra* Section I.C. Of course, fraud and money laundering can, and do, also occur off-blockchain. *See, e.g.*, Investopedia Team, *What Methods Are Used to Launder Money?*, INVESTOPEDIA (fact-checked by Suzanne Kvilhaug, August 17, 2021), https://www.investopedia.com/ask/answers/022015/what-methods-are-used-launder-money.asp [https://perma.cc/9CDC-ASZS] (noting that, for example, one can launder money by structuring, or breaking up, a large transaction into smaller transactions; other methods include investing in gold or real estate).

[46] Sharma, *supra* note 15.

[47] *Id.*

[48] *Id.*

[49] SCOTT A. WOLLA, BITCOIN: MONEY OR FINANCIAL INVESTMENT? 3–4 (Mar. 2018), https://files.stlouisfed.org/files/htdocs/publications/page1-econ/2018/03/01/bitcoin-money-or-financial-investment_SE.pdf [https://perma.cc/TA37-FY3M]. While Bitcoin is sometimes used as a form of payment, it is also often used as an investment vehicle. *Id.*

[50] Orcutt, *supra* note 18; *see also* U.S. DEP'T OF JUST., *supra* note 18.

[51] *See supra* Section I.A.1.

failure of the technology and a subsequent integrity loss in the blockchain itself.[52]

In contrast, in a permissioned blockchain environment, there is control over who can access and interact with a blockchain.[53] The use of a permissioned blockchain is limited to a group of members—a blockchain is a defined network.[54] The network might constitute a consortium, made up of members who have joined an association and agreed to its rules.[55] The parties are known to each other, and participants can ensure that their counterparties meet high standards of security.[56] There are typically specific rules of governance,[57] which may determine roles of certain members; restrict admission; dictate who can modify, delete, or contribute; limit the ability to engage in transactions; designate specific levels of transparency between the parties to a specific trade; identify specific triggers for smart contracts; and verify the integrity of participants.[58] In this context, the security described in this Section and in Section I.A.1—describing blockchain mechanics—does not serve the purpose of maintaining anonymity, but rather of maintaining certainty and immutability of the underlying transaction data. In fact, the ability to limit and vet a blockchain's users is a principal advantage of choosing a permissioned blockchain.

4. *Smart Contracts*

Smart contracts are self-executing blocks of code, where the execution of a task is triggered upon the realization of conditions predefined by the contracting parties.[59] For example, smart contracts are able to verify that the conditions the transacting parties have agreed upon are properly

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[52] It is worth noting that this security risk exists off-blockchain as well, whenever parties' security cannot be verified—the risks of transacting with those users exist regardless of the technology.

[53] *See* Sharma, *supra* note 15.

[54] *Id.*

[55] See *infra* Section I.B.4, for a discussion of ISDA as one such example.

[56] Shermin Voshmgir, *Blockchains & Distributed Ledger Technologies*, BLOCKCHAINHUB BERLIN, https://blockchainhub.net/blockchains-and-distributed-ledger-technologies-in-general/ [https://perma.cc/A7TJ-YXZK]. For example, a sophisticated trader would likely impose the same security requirements in using the permissioned blockchain as it would in an off-blockchain transaction. Just as in an off-blockchain transaction, this greatly limits the risks posed by fraudulent or incompetent market participants.

[57] *See* Sharma, *supra* note 15.

[58] Thus, you can see that the permissioned blockchain can be designed to function in a very specific way. This is in contrast to a permissionless blockchain.

[59] ISDA & LINKLATERS, *supra* note 17, at 3.

fulfilled before approving the payment or delivery of goods. Imagine a contract where Corporation X will deliver a shipment of office chairs to Partnership Y upon partial payment. Once payment is received in Corporation X's account, the smart contract could then authorize release of Corporation X's inventory and release a pick ticket, allowing warehouse personnel to begin gathering and packing the items to send to Partnership Y.

Despite the name, smart contracts are not actually legal contracts in themselves. Rather, they are blocks of code, implemented using computer programs.[60] In contrast, a contract consists of an offer, acceptance, and consideration.[61] A smart contract can implement an actual legal contract, using code that will automatically execute designated tasks upon the fulfillment of conditions specified by the parties.[62] Just as Bitcoin's renown and frequent presence in the news may create a common misconception that blockchain exists only to serve Bitcoin or that Bitcoin and blockchain are synonymous, the use of the term "smart contracts" could mislead laypersons and specialists alike to understand smart contracts—a term that actually describes codes and programs—as contracts in the legal sense.[63]

Smart contracts can provide contracting parties with efficiency and security in their transactions. With the self-execution that smart contracts offer, the occurrence of a condition or event will be confirmed by the code, rather than by one of the parties or a third party.[64] This self-execution aspect of blockchain architecture can improve the speed and efficiency of transactions by reducing the number of intermediaries,[65] which then may lead to a reduction in costs. Where pre-shipment conditions are verified and

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[60] "A smart contract is—at least in most cases—merely a piece of software or programme code that controls, monitors, or documents the execution of a contract that has been concluded elsewhere." Giesela Rühl, *The Law Applicable to Smart Contracts, or Much Ado About Nothing?*, OXFORD BUS. L. BLOG (Jan. 23, 2019), https://www.law.ox.ac.uk/business-law-blog/blog/2019/01/law-applicable-smart-contracts-or-much-ado-about-nothing [https://perma.cc/6BRL-LQ5G].

[61] RESTATEMENT (SECOND) OF CONTRACTS, §§ 17, 22 (AM. L. INST. 1981).

[62] *See* ISDA & LINKLATERS, *supra* note 17, at 5.

[63] *Id.*

[64] David Schatsky, *Getting Smart About Smart Contracts*, DELOITTE, https://www2.deloitte.com/us/en/pages/finance/articles/cfo-insights-getting-smart-contracts.html [https://perma.cc/3SNR-E3CU]. However, it may be wise to have a third party review the source code that creates the self-executing tasks. Stuart D. Levi & Alex B. Lipton, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*, HARV. L. SCH. F. ON CORP. GOVERNANCE (May 26, 2018), https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/ [https://perma.cc/NB68-VEC3].

[65] *See* ISDA & LINKLATERS, *supra* note 17, at 3.

executed automatically through smart contracts, manual entry and initiation tasks are eliminated.[66]

B.   *Blockchain Applications in Permissioned and Consortium Context*

As noted in Section I.A, a blockchain represents a database. In each of the below examples, it is the integrity of the blockchain as a database that makes blockchain implementation an improvement over the existing or previous database technologies used in these areas.

1.   *Logistics and Supply Chain*[67]

Shipping companies can significantly benefit from incorporating blockchain into their processes, as its use can maximize efficiency in an industry that places a weighty premium on fast delivery.[68] In the logistics context, permissioned blockchain can facilitate shipment tracking,[69] verify the fulfillment of contract conditions,[70] and automatize and facilitate payment processing.[71] Blockchain implementation in these areas could decrease the number of intermediaries required to manually perform these tasks. In turn, such streamlining would allow for incorruptible tracking and reduction of human error.[72]

There are many stakeholders involved in shipping processes whose actions must be coordinated, including "exporters, terminal operators, port authorities, freight forwarders, [and] customs [officials]."[73] Much of the shipping and logistics industry is still reliant on transferring paperwork

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[66] Chi Fung Fan, Almund Weitz & Yin Lam, *Blockchain Is Already Transforming Trade and Logistics—and That's Just the Beginning!*, WORLD BANK BLOGS (June 6, 2019), https://blogs.worldbank.org/transport/blockchain-already-transforming-trade-and-logistics-and-thats-just-beginning [https://perma.cc/4R9U-8H3M].

[67] For more on applications of DLT and blockchain in supply chain finance and supply chain digitization, see PATEL & GANNE, *supra* note 14, at Sections 4.1, 4.4.

[68] *See* MH&L Staff, *Delivery Time Top Priority for Online Shoppers*, MATERIAL HANDLING & LOGISTICS (Sept. 21, 2016), https://www.mhlnews.com/transportation-distribution/article/22051729/delivery-time-top-priority-for-online-shoppers [https://perma.cc/SZ52-ZQ2R].

[69] Fan et al., *supra* note 66.

[70] *A Beginner's Guide to Blockchain for the Supply Chain*, BLUME GLOBAL, https://www.blumeglobal.com/learning/blockchain/ [https://perma.cc/BF2T-ZHJL].

[71] Vishal Gaur & Abhinav Gaiha, *Building a Transparent Supply Chain*, HARV. BUS. REV. (May–June 2020), https://hbr.org/2020/05/building-a-transparent-supply-chain [https://perma.cc/2VBR-7TLV].

[72] *See supra* Section I.A.1. Nevertheless, while the data in a blockchain is virtually incorruptible, the use of a blockchain does not turn bad data into good data. In other words, the integrity of accurate and inaccurate data alike will be preserved.

[73] Fan et al., *supra* note 66.

between parties physically and in-person,[74] creating "situations where goods may have arrived at the port, but the relevant paper trail has not caught up."[75] Using blockchain, logistics companies can become more efficient by "[m]inimizing or eliminating the need to repeat similar information across multiple documents; [r]ecording the digital signature of each party to increase security; [t]racing and correcting errors at each stage of the process[; and] [a]llowing all parties in the supply chain to access information on one common platform."[76] As a function of the increased efficiency created by these process improvements, costs may also be reduced.[77]

Another benefit of blockchain in the supply chain is that it can "reduce[] the monopoly enjoyed by certain intermediaries over critical information," because anyone who is part of the supply chain can access the information stored in the blockchain.[78] These interested parties can more easily check where an item is, learn who the other parties to the transaction are, and catch mistakes.[79] Without blockchain, parties may often be unable to ascertain when goods will be ultimately delivered and where they are physically located at a given time.[80]

FedEx is a founding member of the Blockchain in Transport Alliance ("BiTA"),[81] the world's largest commercial blockchain alliance.[82] The alliance works to set industry standards for using blockchain technology in transportation, freight, logistics, and adjacent areas.[83] FedEx's affiliation with the alliance is part of its exploration into using blockchain for its operations.[84] FedEx chairman and CEO Fred Smith praised the chain of custody that blockchain can bring to the entire logistics industry. "For cross-border shipments, 'trust' is [a] legal requirement for every transaction.

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[74] *Id.*

[75] *Id.*

[76] *Id.*

[77] *Id.*

[78] *Id.*

[79] *Id.*

[80] *See id.*

[81] Nikhilesh De, *FedEx Moves Forward with Blockchain Logistics Plans*, COINDESK (Jan. 31, 2018, 10:18 PM), https://www.coindesk.com/fedex-moves-forward-blockchain-logistics-plans [https://perma.cc/7A7L-44CL].

[82] *About BiTA*, BiTA, https://www.bita.studio/ [https://perma.cc/U35S-N26Z] [hereinafter *About BiTA*]. BiTA has an impressive roster of members, including UPS, Home Depot, Penske, Google, Salesforce, BP, Whirlpool, P&G, and many other familiar brand names. *BiTA Members*, BiTA, https://www.bita.studio/members [https://perma.cc/UE98-HDTQ].

[83] *About BiTA*, *supra* note 82.

[84] De, *supra* note 81.

What blockchain has is a potential for the first time ever to make the information available for everybody." [85] FedEx also believes that a blockchain-supported logistics platform should be opened to all logistics stakeholders in order to create industry standards.[86]

Standard letters of credit, foundational to the transaction of business and the functioning of supply chains, are good candidates for the use of blockchain technology.[87] When implemented with a blockchain process, standard letters of credit may not require either control from a central point or the extensive manual intervention—and accompanying fees—inherent in a traditional letter of credit.[88] Networks and platforms like Finacle Trade Connect, Letter of Credit Network, and Komgo offer letters of credit supported by blockchain.[89] These examples demonstrate that blockchain can give a new, digital life to the old institution of letters of credit.[90]

Recently, blockchain has received attention for how it can play a role in the ongoing, massive-scale supply chain effort to distribute COVID-19 vaccines.[91] If a blockchain were to be created to maximize efficiency in this supply chain, stakeholders at all different phases of the vaccine distribution effort could, for example, use blockchain to access information about the

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[85] Caroline Preece, *Adopt Blockchain or Be Disrupted, Warns FedEx CEO*, CRYPTONEWSREVIEW (May 15, 2018, 7:21 AM), https://cryptonewsreview.com/adopt-blockchain-or-be-disrupted-warns-fedex-ceo/ [https://perma.cc/5H52-YRAG].

[86] *See* Ana Alexandre, *FedEx Executive Advocates for Industry Blockchain Standards*, COINTELEGRAPH (Apr. 30, 2019), https://cointelegraph.com/news/fedex-executive-advocates-for-industry-blockchain-standards [https://perma.cc/S7GV-ZLZD].

[87] A letter of credit is "a letter addressed by a banker to a correspondent certifying that a person named therein is entitled to draw on the writer's credit up to a certain sum." *Letter of Credit*, MERRIAM-WEBSTER, https://www.merriam-webster.com/dictionary/letter%20of%20credit [https://perma.cc/Z628-J8YK].

[88] For traditional requirements for letters of credit, see HM Revenue & Customs, *Guidance: Letters of Credit for Importers and Exporters*, GOV.UK (Aug. 1, 2012), https://www.gov.uk/guidance/letters-of-credit-for-importers-and-exporters [https://perma.cc/B98S-9CAR].

[89] For more details on these platforms and how they function, see PATEL & GANNE, *supra* note 14, at 12, 14, 15, 35.

[90] Letters of credit have been used since ancient times. *Letters of Credit (LCs): Recognizing the Value of Simple Trade Instruments*, ICC (July 12, 2016), https://iccwbo.org/media-wall/news-speeches/letters-of-credit-lcs-recognizing-the-value-of-simple-trade-instruments/ [https://perma.cc/5Z79-BLRF].

[91] *See, e.g.*, Hannah Schofield and Lavan Thasarathakumar, *Blockchain, COVID-19 and the Pharmaceutical Supply Chain*, PHARMEXEC.COM (May 12, 2021), https://www.pharmexec.com/view/blockchain-covid-19-and-the-pharmaceutical-supply-chain [https://perma.cc/5UH5-9GTE]. Additionally, for discussion of how blockchain can help run clinical trials for the COVID-19 vaccine, see INFOSYS, USING BLOCKCHAIN TO ACCELERATE EFFICIENT CLINICAL TRIALS DURING A PANDEMIC (2020), https://www.infosys.com/blockchain/documents/accelerate-efficient-clinical-trials-pandemic.pdf [https://perma.cc/58F8-URSA].

location along the supply chain of a particular batch of vaccine doses.[92] Blockchain could also be used to authenticate and verify "healthcare workers' identit[ies], maintenance of patient records, and tracking of the treatment aftereffects."[93]

2. Luxury Goods Authentication

The luxury goods industry is plagued by fraudulent versions of coveted products, from imitations to exact replicas. [94] Blockchain can provide traceability and tracking for sales of luxury goods, from first purchase to vintage resale. LVMH Moët Hennessy Louis Vuitton, the luxury goods conglomerate that owns well-known brands like Louis Vuitton and Christian Dior, has begun to use a permissioned blockchain called AURA,[95] through which minute details of a product can be retrieved, such as the name of a mine from which a stone in a particular piece of fine jewelry was extracted.[96]

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[92] IBM Blockchain, *Trusted Vaccine Distribution Enabled with Blockchain*, IBM, https://www.ibm.com/blockchain/solutions/vaccine-distribution [https://perma.cc/6NG3-952N]; *see also* Julien de Salaberry, *The Impact of Technology on the COVID Vaccine Supply Chain*, FEDEX (Dec. 8, 2020), https://fedexbusinessinsights.com/the-impact-of-technology-on-the-covid-vaccine-supply-chain/ [https://perma.cc/G5QP-RFK7].

[93] Arushi Chawla, *Blockchain, IoT to Streamline Global COVID-19 Vaccine Distribution*, COUNTERPOINT (Dec. 11, 2020), https://www.counterpointresearch.com/blockchain-iot-to-streamline-global-covid-19-vaccine-distribution/ [https://perma.cc/5D7K-W6EK].

[94] Roberto Fontana, Stéphane J.G. Girod & Martin Králik, *How Luxury Brands Can Beat Counterfeiters*, HARV. BUS. REV., (May 24, 2019), https://hbr.org/2019/05/how-luxury-brands-can-beat-counterfeiters [https://perma.cc/YUW7-LQCL].

[95] "[AURA] will provide proof of the authenticity of luxury items both to the customer and for internal use at LVMH. It will also trace the origins of the raw materials used to create each piece, depicting a digestible story and timeline of each individual product. Furthermore, AURA will keep track of exactly who is purchasing each piece at the point of sale, and will even go into the used goods market."

Two Luxury Brands Employ Blockchain to Prove Authenticity, DIGITAL ASSET LIVE (June 22, 2019), https://digitalasset.live/2019/06/22/two-luxury-brands-employ-blockchain-to-prove-authenticity/ [https://perma.cc/5NTD-HZDT].

[96] *See LVMH Unveils Luxury Industry Blockchain with Microsoft, ConsenSys*, LEDGER INSIGHTS (May 16, 2019), https://www.ledgerinsights.com/lvmh-luxury-blockchain-microsoft-consensys/ [https://perma.cc/A443-WLP5]. For additional information on gemstone tracing through blockchain, see Laurent E. Cartier, *Traceability and Blockchain for Gemstones – An Overview*, 25 FACETTE MAGAZINE 22 (2019), reprinted at Laurent E. Cartier, *Traceability and Blockchain for Gemstones – An Overview*, Swiss Gemmological Inst. SSEF (Mar. 12, 2021), https://www.ssef.ch/traceability-and-blockchain-for-gemstones-an-overview/ [https://perma.cc/6N2T-738X].

AURA, as a database updated with time-stamped blocks of data,[97] is built to foster trust in such information—essential to the value of these luxury items. This provides a particularly trustworthy certificate of authenticity, in which full information (including information on ethics and sustainability) can be included.[98] That certificate is provided through the brand application.[99] LVMH created[100] this authentication system to serve its own product lines and customers, but also plans to offer the system to competitors.[101] In this way, this innovation stands as one example of the use of blockchain in a consortium—here, of luxury brands that choose to become members and agree to share information on specified terms.

3. Art Authentication and Provenance

It is not surprising that parties involved in fine art sales, in which provenance and authenticity are among the parties' primary concerns,[102] are attracted by the possibilities that blockchain can bring to their business. Provenance refers to the documentation of a work of art's history—including the work's creator and previous ownership.[103] Authentication, which can be thought of as one part of provenance,[104] allows a user to know that the work has actually been made by its alleged creator and is not a copy or a forgery.[105] Blockchain, as a decentralized database consisting of

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97 *See supra* Section I.A.1.

98 Alice Newbold, *Louis Vuitton to Launch First Blockchain to Help Authenticate Luxury Goods*, VOGUE (May 17, 2019), https://www.vogue.co.uk/article/lvmh-blockchain [https://perma.cc/M83P-BZ49].

99 Thomas Simms, *Louis Vuitton and Christian Dior Owner Unveils Blockchain Platform to Verify Luxury Goods*, COINTELEGRAPH (May 16, 2019), https://cointelegraph.com/news/louis-vuitton-and-christian-dior-owner-unveils-blockchain-platform-to-verify-luxury-goods [https://perma.cc/5FW4-6DKG].

100 LVMH created the system in partnership with Microsoft and ConsenSys. Ian Allison, *Louis Vuitton Owner LVMH Is Launching a Blockchain to Track Luxury Goods*, COINDESK (Mar. 27, 2019, 1:59 PM), https://www.coindesk.com/louis-vuitton-owner-lvmh-is-launching-a-blockchain-to-track-luxury-goods [https://perma.cc/5KEY-4BGE].

101 *Id.*

102 *What Every Art Collector Needs to Know About Provenance*, ARTWORK ARCHIVE, https://www.artworkarchive.com/blog/what-every-art-collector-needs-to-know-about-provenance [https://perma.cc/PPR9-7SQT].

103 *Id.*; *see also Glossary: Provenance*, NAT'L GALLERY, https://www.nationalgallery.org.uk/paintings/glossary/provenance [https://perma.cc/TKJ2-H96Q].

104 *See* Grace Ignacia See, *How to Authenticate and Appraise an Artwork*, ARTLING (Apr. 12, 2019), https://theartling.com/en/artzine/art-authenticate-appraise/ [https://perma.cc/J8AR-3DFA].

105 *See id.*

time-stamped blocks of data,[106] can improve efficiency and accuracy in both of these areas.

Indeed, art registries have begun to complete provenance and authentication using blockchain.[107] While this blockchain application "combines provenance and authentication, providing a chained record of ownership,"[108] that chain is "dependent on the validity of the starting point of the blockchain record."[109] This is because a registry, whether on blockchain or not, is only as good as the information that is entered by users.[110] In recognition of this, Artory, a company that aims to become a prominent art registry, only accepts registration of artworks that have been independently vetted by a third-party specialist, known as a "record issuer."[111] Artory then records the details related to the provenance and history of the work in its blockchain.[112] Finally, it issues digital and physical certificates to the record issuer.[113]

The process that Artory's technology implements functions much like the land registers for real estate that exist in most civil law countries. These systems record—and make available to the public—information on history of ownership, as well as details of registration, transfer, sale, and any encumbrances on the property.[114] Here, blockchain technology replaces the trusted person who controls most or all aspects of these real estate transactions: the notary.[115] In the civil law context, this trusted notary is an

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[106] *See supra* Section I.A.1.

[107] Amy Whitaker, *Art and Blockchain: A Primer, History, and Taxonomy of Blockchain Use Cases in the Arts*, ARTIVATE (Summer 2019), at 21.

[108] *Id.* at 33.

[109] *Id.*

[110] "Like the information contained in the catalogue raisonnés, blockchain technology can enable the transfer of title of property, track possession, history and the whereabouts of art and record encumbrances on works, but the information contained in the ledger is only as accurate as the information recorded to the blockchain. Failing to verify legal title or to conduct due diligence related to the authenticity or provenance of a work prior to the sale of a work can lead to economic and reputational costs."

Alexandra L. Bear, *The Hammer Falls on the First Major Blockchain-Based Art Auction*, NAT'L L. REV. (Nov. 14, 2018), https://www.lawoftheledger.com/2018/11/articles/blockchain/blockchain-based-art-auction/ [https://perma.cc/DCY9-PURQ].

[111] *Id.*

[112] *Id.*

[113] *Id.*

[114] EUR. U. INST. FLORENCE/EUR. PRIV. L.F. & DEUTSCHES NOTARINSTITUT WÜRZBURG, REAL PROPERTY LAW AND PROCEDURE IN THE EUROPEAN UNION 27–46 (2005).

[115] MAURICE BARBIERI & DOMINIK GASSEN, BLOCKCHAIN—CAN THIS NEW TECHNOLOGY REALLY REVOLUTIONIZE THE LAND REGISTRY SYSTEM? 12 (2017),

attorney specializing in, and by law having a monopoly on, such transactions.[116] New platforms such as Artory[117] are analogues to the civil law land registries, but modernized and tailored to works of art. While the idea behind this legal process is old, the technology is new.

4. ISDA: Smart Contracts and Documentation in Over-the-Counter Derivatives Transactions

The International Swaps and Derivatives Association ("ISDA") has begun to explore applications of smart contracts and permissioned blockchains to the activities of its members.[118] A brief overview of ISDA and its members' activities will shed light on a permissionless blockchain's potential role in this context. ISDA is a trade association for entities who engage in derivatives transactions, [119] which include over-the-counter ("OTC") derivatives transactions.[120] ISDA members include banks, private equity firms, and law firms involved in their clients' OTC derivatives trades.[121] To join ISDA, an applicant must be elected by the ISDA Board of Directors.[122]

OTC derivatives transactions are executed through bilateral contracts, almost always between two highly sophisticated parties.[123] The contracts

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http://www.notaries-of-europe.eu//index.php?pageID=15101   [https://perma.cc/6YUV-9C8M].

[116] Pedro A. Malavet, *The Foreign Notarial Legal Services Monopoly: Why Should We Care*, 31 J. Marshall L. Rev. 945, 952 (1998).

[117] Verisart, Fresco, and Blockchain Art Collective are other examples. *See* Sam Mire, *12 Startups Using Blockchain to Transform the Art Industry [Market Map]*, Disruptor (Dec. 25, 2018), https://www.disruptordaily.com/blockchain-market-map-art/ [https://perma.cc/BY2B-PLQ9].

[118] *See* ISDA & King & Wood Mallesons, Whitepaper: Smart Derivatives Contracts: From Concept to Construction 9 (Oct. 2018), https://www.isda.org/a/cHvEE/Smart-Derivatives-Contracts-From-Concept-to-Construction-Oct-2018.pdf [https://perma.cc/F6L3-6K47].

[119] *About ISDA*, ISDA, https://www.isda.org/about-isda/ [https://perma.cc/98AG-HG3K].

[120] OTC derivatives are in contrast to exchange-traded derivatives, which are traded on a derivatives exchange such as the Chicago Board Options Exchange ("CBOE"). Jens Nystedt, *Derivative Market Competition: OTC Markets Versus Organized Derivative Exchanges* 4–5 (IMF, Working Paper No. 61, 2004); *About Us*, CBOE, https://www.cboe.com/about/ [https://perma.cc/E6Z4-D83D].

[121] *ISDA Members*, ISDA, https://www.isda.org/membership/isda-members/ [https://perma.cc/JG58-B38D].

[122] *Membership*, ISDA, https://www.isda.org/membership/application/ [https://perma.cc/L8VG-Q7L3].

[123] *See What Is Over-the-Counter*, Corp. Fin. Inst., https://corporatefinanceinstitute.com/resources/knowledge/trading-investing/over-the-counter-otc/ [https://perma.cc/8HMJ-QEZH].

are intended to effect transactions in complicated financial instruments, such as swaps.[124] The parties are usually repeat players in these types of transactions, and a retail consumer cannot typically enter into an OTC derivatives contract.[125]

ISDA, with the help of attorneys experienced in derivatives transactions,[126] has drafted a series of form contracts[127] that have become the baseline for many OTC derivatives trades.[128] These contracts allow users to choose amongst certain options within the contract[129] —for example, between various predefined options for how to settle the financial transaction at its conclusion and decide how much money is owed.[130] Beyond choosing between these options, the parties can also make any changes to the form contract that they wish.[131] In fact, these contracts are typically heavily negotiated, even though the starting point is the standard form contract.[132] ISDA also creates glossaries of definitions, and those definitional terms can be incorporated by reference into the form

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[124] *See* Richard Heckinger, Ivana Ruffini & Kirstin Wells, *Over-the-Counter (OTC) Derivatives*, FED. RES. BANK CHI. (2014), at 29.

[125] *See id.* Viewers of the film *The Big Short* may remember young investors Charlie and Jamie of the Brownfield Fund and their long-shot search to find a bank to enter into an ISDA Master Agreement with them. THE BIG SHORT (Regency Enterprises & Plan B. Entertainment 2015).

[126] In fact, one of this Essay's authors, Françoise Birnholz, has contributed to the development of ISDA standards.

[127] These include the ISDA Master Agreement and the Credit Support Annex. DELOITTE RISK ADVISORY, CREDIT SUPPORT ANNEXURE: LEVERAGING CSA FOR COLLATERALISED MARGINING 2 (Aug. 2018).

[128] GuyLaine Charles, *The ISDA Master Agreement—Part I: Architecture, Risks and Compliance*, PRAC. COMPLIANCE & RISK MGMT. FOR SEC. INDUS. (Jan.–Feb. 2012), at 26.

[129] "The New York law CSA consists of 13 Paragraphs (sections). Paragraph 13 is where the parties make certain elections and modifications to the standard, pre-printed terms under Paragraphs 1–12 to specify how their margin collateral relationship under their ISDA transactions is to be governed." *Glossary: ISDA Credit Support Annex (CSA)*, THOMPSON REUTERS PRAC. L., https://uk.practicallaw.thomsonreuters.com/3-386-8586 [https://perma.cc/58K9-CMZY].

[130] *Exhibit 99.6: Credit Support Annex to the Schedule to the ISDA Master Agreement*, SEC, https://www.sec.gov/Archives/edgar/data/1083199/000119312507210724/dex996.htm [https://perma.cc/S4BM-R5EZ] [hereinafter *Exhibit 99.6*].

[131] Charles, *supra* note 128, at 26.

[132] *See OTC Derivatives: Benefits to U.S. Companies*, ISDA 9 (May 2009), https://www.sifma.org/wp-content/uploads/2018/02/ISDA-OTC-Derivatives-Benefits-to-US-Companies.pdf [https://perma.cc/7GRY-GKH7]; Alton B. Harris, *Negotiating Over-the-Counter Derivative Contracts*, NIXON PEABODY (July 20, 2010), https://www.nixonpeabody.com/en/ideas/articles/2010/07/20/negotiating-over-the-counter-derivative-contracts [https://perma.cc/UFJ8-XTLQ]; Charles, *supra* note 128, at 26.

contracts.[133] In the ISDA documents, certain "events" are identified within the contract, and these events can trigger specified outcomes. [134] For example, an event like a bankruptcy or a default on a certain transaction specified in the agreement could trigger termination of the contract.[135]

ISDA crafted the ISDA Common Domain Model ("ISDA CDM") to help its members use smart contracts in carrying out their businesses.[136] ISDA characterizes this as "a standard digital representation of events and actions that occur during the life of a derivatives trade."[137] At bottom, it is a computer program that can keep track of the events described above and properly account for their consequences.[138] ISDA points out that the ISDA CDM exists alongside the transaction or contract itself—it is not the transaction in itself. [139] There is still a legal contract governing a given transaction, and the ISDA CDM exists to implement that.

ISDA views the ISDA CDM as an important piece of the development of standards in smart derivatives contracting.[140] ISDA acknowledges that standards are important and divides legal/regulatory standards, commercial practices, and technological standards into separate buckets in thinking about compliance in the age of smart contracting.[141] To mitigate concerns about the application and adaptation of appropriate legal standards to smart contracts, ISDA has a strong documentation framework[142] to build on and reference, including form contracts and definitions.[143] Through the ISDA CDM, ISDA has already worked to ensure that (1) the technology is strong and operable, while (2) legal standards are properly applied. [144] As necessary changes are made in digital implementation of derivatives

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[133] *See, e.g.*, *2006 ISDA Definitions*, ISDA, https://www.isda.org/book/2006-isda-definitions/ [https://perma.cc/H4EQ-VCXV] [hereinafter *2006 ISDA Definitions*]; *Exhibit 99.6*, *supra* note 130; *Exhibit 10.32: ISDA Master Agreement and Schedule*, SEC, https://www.sec.gov/Archives/edgar/data/1107694/000119312508091225/dex1032.htm [https://perma.cc/DG3K-RJMX] [hereinafter *Exhibit 10.32*].

[134] *Exhibit 99.6*, *supra* note 130; *Exhibit 10.32*, *supra* note 133.

[135] *Exhibit 10.32*, *supra* note 133 (Section 5, Events of Default and Termination Events).

[136] ISDA & KING & WOOD MALLESONS, *supra* note 118, at 9.

[137] *Id.*

[138] *Id.*

[139] *Id.* at 10 (Figure 3).

[140] *Id.* at 8.

[141] *Id.* at 6–8; *see also* PATEL & GANNE, *supra* note 14, at 45–50 (discussing interoperability, standardization, governance, legal, and privacy challenges).

[142] ISDA & KING & WOOD MALLESONS, *supra* note 118, at 8.

[143] *See* DELOITTE RISK ADVISORY, *supra* note 127; *2006 ISDA Definitions*, *supra* note 133.

[144] *Id.*

trading, the ISDA CDM will be the baseline from which to make those changes.[145]

While a smart contract is akin to a medium through which to execute a legal contract,[146] ISDA has also contemplated DLT technology playing a recordkeeping role in derivatives contracting. [147] Specifically, ISDA envisions DLT assisting with the documentation of trades—the ledger would create a place where transaction data would be recorded, and that regulators could access. [148] Because of the incorruptible nature of a distributed ledger, neither party to the trade could tamper with that data.[149]

5. *Blockchain for Transparency and Reduction of Counterparty Risk in Equity Markets*[150]

Finally, the recent volatility related to the short selling of GameStop stock demonstrates that there is potential for more transparency and for reduction in counterparty risk in modern capital markets, and that blockchain can facilitate these improvements. Amidst GameStop stock's dramatic price movements in late January and early February of 2021,[151] some observers of the trading noted the possibility that illegal "naked"

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  145 *Id.*

  146 *See supra* Section I.A.4.

  147 *See* ISDA & LINKLATERS, *supra* note 17, at 19.

  148 *Id.* at 19–20.

  149 *See supra* Section I.A.1.

  150 For more on how blockchain can be used for clearing and settlement functions in the markets, see *Will Blockchain Revolutionize Clearance and Settlement?*, DTCC, https://perspectives.dtcc.com/gallery/will-blockchain-revolutionize-clearance-and-settlement [https://perma.cc/394Y-YVNH] (interactive gallery documenting clearance and settlement functions in markets over time); KEN MONAHAN, STEAMPUNK SETTLEMENT: DEPLOYING FUTURISTIC TECHNOLOGY TO ACHIEVE AN ANACHRONISTIC RESULT (2019), https://perspectives.dtcc.com/assets/steampunk-settlement.19-2018.pdf [https://perma.cc/E9MC-XRKA]. Also, for a related development in blockchain and the markets, see *SGX and Temasek Partner to Advance Digital Asset Infrastructure in Capital Markets*, SGX (Jan. 22, 2021), https://www.sgx.com/media-centre/20210122-sgx-and-temasek-partner-advance-digital-asset-infrastructure-capital-markets [https://perma.cc/5Q9A-73Q9] (Singapore Exchange and Temasek together plan to create "Asia Pacific's first exchange-led digital asset venture focused on capital markets workflows through smart contracts, ledger and tokenisation technologies . . . . The [joint venture] will look to partner with fixed income issuance platforms to connect to its post-trade and asset servicing infrastructure, providing issuers, arranger banks, lawyers, investors and paying agents with a comprehensive, issuance-to-settlement network for Asia bonds." The joint venture has also set its sights on "funds and sustainable finance.").

  151 Matt Phillips, Taylor Lorenz, Tara Siegel Bernard & Gillian Friedman, *The Hopes that Rose and Fell with GameStop*, N.Y. TIMES (Feb. 7, 2021), https://www.nytimes.com/2021/02/07/business/gamestop-stock-losses.html [https://perma.cc/7MET-ZWKL].

short sales of GameStop were occurring [152] —although this was not necessarily the case.[153] A short sale is carried out when a trader borrows a stock, sells it, buys it back at a lower price, and then returns the borrowed stock to its owner.[154] During the period in which GameStop was being heavily short sold, market metrics indicated that there were more shorts than outstanding shares of GameStop, necessarily meaning that not every short-seller had actually borrowed her own real share. [155] This could indicate an illegal naked short, which creates risk because the shares sold by the short-seller might not actually be available for delivery to the buyer as promised.[156]

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[152] Avi Salzman, *GameStop Trading Should Be Halted for 30 Days, Says State Securities Regulator*, BARRON'S (Jan. 27, 2021, 12:29 PM), https://www.barrons.com/articles/gamestop-trading-should-stop-for-30-days-says-state-securities-regulator-51611768563 [https://perma.cc/ZN4Y-C7PB] ("More than 100% of the available shares in GameStop were borrowed for short bets as of the end of last year. That could mean that some traders are using 'naked shorts,' an illegal practice involving taking out negative bets on shares that do not exist, but experts say it can also happen through legal trading strategies."). *See also* Bob Pisani, *What Pro Traders, the Reddit Crowd and Regulators May Do Next in the GameStop Short Squeeze Saga*, CNBC (Jan. 29, 2021, 8:12 AM), https://www.cnbc.com/2021/01/29/gamestop-short-squeeze-what-pro-traders-the-reddit-crowd-and-regulators-may-do-next.html [https://perma.cc/MM6G-FU9S] ("One obvious source of review is whether to tighten the stock-borrowing rules. 'Does it make sense to anyone you can short a stock with more shares than are listed?' said Global Markets Advisory Group's Lou Pastina. The SEC could also clamp down on naked short selling, the illegal practice of selling short stocks without first borrowing the security.").

[153] Salzman, *supra* note 152.

[154] Reuters Staff, *Factbox: How "Naked" Short Selling Happens*, REUTERS (July 16, 2008, 5:33 PM), https://www.reuters.com/article/us-sec-shortselling/factbox-how-naked-short-selling-happens-idUSN167830620080716 [https://perma.cc/74KC-RWWQ]. The short-seller makes money on the difference between the price the stock is sold at and the price it is bought at. *Id.*

[155] Salzman, *supra* note 152. This may be hard to understand if one is trying to conceptualize the mechanics by imagining an exchange of physical certificates—clearinghouse technicalities beyond the scope of this Essay allow a situation like this to occur. Philipp Sandner, *Will Blockchain Replace Clearinghouses? A Case of DVP Post-Trade Settlement*, FORBES (Dec. 2, 2020, 12:34 PM), https://www.forbes.com/sites/philippsandner/2020/12/02/will-blockchain-replace-clearinghouses-a-case-of-dvp-post-trade-settlement/ [https://perma.cc/8B8F-2T29].

[156] Salzman, *supra* note 152. The reason why this might not necessarily indicate an illegal naked short is beyond the scope of this Essay, but for an explanation of how this could occur and still be considered acceptable, see footnote 3 in Matt Levine, *The GameStop Game Never Stops*, BLOOMBERG MONEY STUFF NEWSL. (Jan. 25, 2021, 12:34 PM), https://www.bloomberg.com/opinion/articles/2021-01-25/the-game-never-stops [https://perma.cc/U52R-G4VK]. *See also* Michael Hiltzik, *Column: GameStop Has Spawned 1,001 Theories, Most of Them Wrong. Here's What's Right*, L.A. TIMES (Feb. 1, 2021, 12:34 PM), https://www.latimes.com/business/story/2021-02-01/gamestop-takes-wrong [https://perma.cc/8FMW-VNV5].

Blockchain authentication and verification could ensure that short-sellers cannot sell a given stock until a share has actually been borrowed.[157] For example, each share and trade could be recorded in the blockchain, and the self-executing code would not allow trades unless the prerequisites, such as ability to secure possession of shares to be sold, are met. The data on the blockchain would be transparent to the parties and immutable.[158] U.S. Senator Cynthia Lummis has advocated for this type of blockchain application as a solution to deficient documentation and monitoring in the markets.[159]

C.   Existing and Pending Regulatory Responses

The rapid advancement of digital technology over the past three decades has prompted responsive legislative efforts at the state and federal level in the United States, as well as in other countries. [160] Some policymakers have taken the opportunity to modernize existing laws related to contracting in the internet age generally, such as the laws on electronic signatures and custodian formalities. [161] The E-Sign Act is particularly

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[157] Bradley Keoun & Sebastian Sinclair, *First Mover: Crypto Gawks at GameStop, Sees Shades of Self*, COINDESK (Jan. 28, 9:24 AM), https://www.coindesk.com/first-mover-crypto-gamestop-bitcoin-dogecoin [https://perma.cc/GC25-TWZX] ("GameStop's ratio shows some big investors might have sold shares that they hadn't already borrowed, a practice known as 'naked short-selling' that is generally prohibited but loosely enforced. It happens because of Wall Street's impossibility of instantaneously coordinating multiple ledgers of who owns what and when. With blockchain networks, the information is always being synchronized. 'Bitcoin really does fix this, because Bitcoin is an honest ledger,' [crypto-banker Caitlin] Long said . . . . 'The . . . crypto market is so riled up about GameStop . . . because [it] has known about the inaccuracies in Wall Street's bookkeeping for years. This is just another in a long list of examples.'").

[158] *See supra* Section I.A.1.

[159] Shaurya Malwa, *American Senator on GameStop Drama: Blockchain Can Fix Stock Manipulation*, CRYPTOSLATE (Jan. 29, 2021, 3:32 PM), https://cryptoslate.com/american-senator-on-gamestop-drama-blockchain-can-fix-stock-manipulation/ [https://perma.cc/Y6Z2-8NVD].

[160] *See Regulation of Cryptocurrency Around the World*, LIBR. CONG., https://www.loc.gov/law/help/cryptocurrency/world-survey.php [https://perma.cc/9A9G-S2H4]; *Blockchain State Legislation*, NCSL (Mar. 28, 2019), https://www.ncsl.org/research/financial-services-and-commerce/the-fundamentals-of-risk-management-and-insurance-viewed-through-the-lens-of-emerging-technology-webinar.aspx [https://perma.cc/VB3L-4PFQ]; *Blockchain 2019 Legislation*, NCSL (July 23, 2019), https://www.ncsl.org/research/financial-services-and-commerce/blockchain-2019-legislation.aspx [https://perma.cc/W5GH-C5YQ].

[161] *See, e.g.*, Electronic Signatures in Global and National Commerce Act (E-Sign Act), 15 U.S.C. ch. 96 (2000); *Rules & Guidance: 4570. Custodian of Books and Records*, FINRA, https://www.finra.org/rules-guidance/rulebooks/finra-rules/4570 [https://perma.cc/GB7N-EQPD]; Paul G. Cellupica, Deputy Director and Chief Counsel, Division of Investment Management, *Engaging on Non-DVP Custodial Practices and*

significant due to its role in promoting more efficient contract execution by confirming the validity of electronically signed contracts. [162] Regarding blockchain, perhaps because blockchain is likely primarily associated with Bitcoin in the public imagination,[163] governments seem to have focused on virtual currencies and accordingly legislated in the areas of banking, securities, and finance.[164] So far, one country, the Marshall Islands, has embraced tokenization so much that it has designated the Sovereign ("SOV"), a blockchain-based currency, as its official legal tender.[165]

Anti-money laundering, fraud, and privacy have all been identified as issues relating to certain blockchain applications,[166] with regulators already conducting enforcement actions in these areas.[167] However, recall that these issues relate to the integrity of anonymous users, not to the integrity of a

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Digital Assets, SEC, https://www.sec.gov/investment/non-dvp-and-custody-digital-assets-031219-206 [https://perma.cc/Y9CH-UZ26].

[162] *See* 15 U.S.C. ch. 96.

[163] The authors are not aware of empirical evidence on this, but note that Bitcoin's price is followed daily, including in mainstream media, *see, e.g.*, sources cited *supra* note 38. The authors suspect, however, that many of the other DLT applications discussed in this Essay are less widely known and covered.

[164] *See* Patrick J. Boot, *New Legislation Proposes to Merge Crypto and Banking*, Nat'l Rev. (Dec. 8, 2020), https://www.natlawreview.com/article/new-legislation-proposes-to-merge-crypto-and-banking [https://perma.cc/77ZV-SJ6E]; Paddy Baker, *US State Bank Regulators Agree to Single Set of Rules for Fintech, Crypto Firm Licensing*, Coindesk (Sept. 15, 2020, 2:01 PM), https://www.coindesk.com/48-state-regulators-combined-crypto-regulation [https://perma.cc/U58Q-3RVP]; Tanzeel Akhtar, *Germany Legalizes Electronic Securities on the Blockchain*, Coindesk (Dec. 16, 2020, 9:38 AM), https://www.coindesk.com/germany-legalizes-electronic-securities-on-the-blockchain [https://perma.cc/KC8L-WULC]; Grant Gulovsen, *The Securities Clarity Act Is Simple and Logical (and Bad News for Lawyers Like Me)*, Coindesk (Oct. 13, 2020, 6:12 AM), https://www.coindesk.com/securities-clarity-act-bad-news-for-lawyers [https://perma.cc/2FM5-NQT3]; *Securities Law*, Blockchain L. Guide, https://blockchainlawguide.com/securities/ [https://perma.cc/HRP6-QRRU] [hereinafter Blockchain Guide]. *But see* Joe Dewey, *Blockchain & Cryptocurrency Regulation 2021: USA*, Glob. Legal Insights, https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/usa [https://perma.cc/W6VY-SS2V] (reviewing areas of blockchain regulation outside of the FinTech-centric core, while still demonstrating that much of the regulation concentrates in banking, securities, finance, and related areas).

[165] *SOV*, SOV Found., https://sov.foundation [https://perma.cc/N82H-PQVU].

[166] U.S. Dep't of Just., *supra* note 18; Pritesh Shah et al., *Blockchain Technology: Data Privacy Issues and Potential Mitigation Strategies*, Thompson Reuters Prac. L., https://www.davispolk.com/sites/default/files/blockchain_technology_data_privacy_issues_and_potential_mitigation_strategies_w-021-8235.pdf [https://perma.cc/YMZ4-6K3J]; Baker McKenzie & R3, Blockchains and Laws: Are They Compatible? 13–19 (2017).

[167] Blockchain Guide, *supra* note 164 (listing SEC disapprovals and enforcement actions); Jeffrey Neuburger & Wai Choy, *Blockchain and the Law—Category Archives: SEC*, Proskauer, https://www.blockchainandthelaw.com/category/sec/ [https://perma.cc/GW6T-FMQ7] (reviewing enforcement actions).

blockchain itself.[168] Meanwhile, an array of blockchain applications—mostly those utilizing permissioned blockchains[169]—seems to have escaped serious regulatory contemplation from governments.[170] It is not clear whether this is because sovereign governments have not thought intensively about the potential of this technology, or whether they have done so and deemed regulation unnecessary or low-priority.

The Essay has now surveyed a sampling of permissioned blockchain applications in order to demonstrate the efficiency gains that incorporation of this technology can produce. It has also discussed regulatory responses and areas of shallow regulatory attention. Part I will conclude with a discussion of the law merchant and the "Law of the Horse," tools that will be useful in Part II's discussion of (1) the proper regulatory response to permissioned blockchain technology and (2) how contracting executed via blockchain fits into existing contract law.

Going forward, the Essay will sometimes refer to agreements between private parties, ultimately enforceable by courts as contracts, as "private law." It will refer to statutes and regulations, the violation of which could be the subject of a criminal or civil regulatory enforcement action by the government, as "public law."

D.   *The Law Merchant and Modern Analogues*

The idea of a medieval "law merchant" has long captivated lawyers and scholars as a model of self-regulation.[171] The law merchant, sometimes referred to as the *lex mercatoria*,[172] simply refers to the practice of medieval merchants agreeing on their own rules and customs to use in conducting trade, separate from feudal rules.[173] These customs developed over time, just as the judge-made common law of the United States.[174]

Some scholars have argued that the law merchant is more myth than reality and has become overblown by those who use it as support for ideas

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[168]   *See supra* Section I.A.3.

[169]   The potential application of blockchain technology is extremely wide-ranging, and therefore impossible to fully review in this piece. Select applications are reviewed in Section I.B., *supra*.

[170]   *See supra* notes 160, 164, and 166.

[171]   Emily Kadens, *The Medieval Law Merchant: The Tyranny of a Construct*, 7 J. LEGAL ANALYSIS 251, 251 (2015).

[172]   *Id.* at 255, 253.

[173]   Leon E. Trakman, *The Evolution of the Law Merchant: Our Common Heritage*, 12 J. MAR. L. & COM. 1, 3–4 (1980).

[174]   *Id.* at 3–5. However, one can imagine that medieval merchants did not have the type of relatively easy access to sophisticated courts that Americans have today.

of "private ordering."[175] It is certainly plausible that today's accounts of informal customs in the 1300s are not entirely accurate. However, the idea of a law merchant really represents nothing more than the use of contractual provisions or the establishment of a course of dealing in a particular trade, creating effectively binding private law to govern transactions. As just one example, the use of customs to self-regulate, which is the idea that the law merchant represents, certainly exists today in consortiums like ISDA—where market participants have chosen their own norms and customs for conducting business.[176] Of course, federal and state courts are available to resolve contract disputes and will apply the common law of contract that has evolved over centuries. But it was the members of the ISDA consortium who considered and developed the terms, provisions, and options that would best suit their needs and would likely be enforceable by courts.[177] Of course, in both private and public law, an adjudicatory authority is essential.

Another modern analogue to the law merchant can be found in the commercial rules of policy-setting organizations, such as the International Chamber of Commerce ("ICC").[178] The Incoterms rules issued by the ICC "provide internationally accepted definitions and rules of interpretation for most common commercial terms used in contracts for the sale of goods."[179] Such organizations exist outside of any one government or court system.[180]

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[175] Kadens, *supra* note 171, at 252.

[176] *See* Section I.B.4., *supra*. For example, every clearinghouse or exchange creates private law in many areas that are not strictly regulated by the Securities and Exchange Commission ("SEC") or Commodity Futures Trading Commission ("CFTC"). CBOE's own rules demonstrate this, although those rules are not completely independent of regulators' purview. *Regulation*, CBOE, https://www.cboe.com/us/options/regulation/ [https://perma.cc/MNW8-UJ9V]. That private law generally developed in certain directions before the SEC or CFTC existed.

[177] *See supra* Section I.B.4. The same is true of permissioned blockchain systems, for which transaction requirements are set out by either a course of dealing or, preferably, a contract that governs trades, and for which the requirements and the trades themselves will be enforceable by courts.

[178] *See* *2021 Arbitration Rules*, ICC, https://iccwbo.org/dispute-resolution-services/arbitration/rules-of-arbitration/ [https://perma.cc/4CR2-JBZ5]; *Incoterms 2020*, ICC, https://iccwbo.org/resources-for-business/incoterms-rules/incoterms-2020/ [https://perma.cc/SG82-PYX2].

[179] *Incoterms Rules*, ICC, https://iccwbo.org/resources-for-business/incoterms-rules/ [https://perma.cc/9ES3-YEYZ].

[180] The "ICC is governed by its Executive Board, World Council, Chairmanship and Secretary General." *About Us*, ICC, https://iccwbo.org/about-us/ [https://perma.cc/M4V5-235A].

E.   A Debate on the "Law of the Horse": A New Internet Law?

Through the example of the "Law of the Horse" discussed in Part I, *supra*, Judge Easterbrook introduced the idea that it would not be prudent to attempt to develop a separate law of a burgeoning internet, disconnected from factual applications and controversies.[181] Within a few years, Professor Lessig responded with a commentary called "The Law of the Horse: What Cyberlaw Might Teach," with the assertion that laws would indeed need to evolve as the internet evolved.[182] Similarly, Professor Lastowka has proclaimed that Easterbrook was "dead wrong," because the internet "has not only shaped the law, but . . . has shaped society generally."[183] While this debate was originally laid out in the context of the broader internet, the Chamber of Digital Commerce has weighed in regarding smart contracting specifically.[184] At least in the context of state legislative efforts, the Chamber has stated that "existent laws already provide a sufficient legal foundation for the enforcement of [smart contracts]" and that such legislation will "create inconsistent and redundant state laws, hindering innovation."[185]

II.   ANALYSIS & SOLUTION

After appreciating that a smart contract is not itself a contract, but rather a piece of technology that assists with the implementation of a legal contract,[186] the next step is to consider both (1) how to regulate the technology, and (2) what law applies. In the permissioned blockchain context, comprehensive regulation is not necessary because the parties can

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[181]   Easterbrook, *supra* note 2, at 208, 215.

[182]   Lessig, *supra* note 1.

[183]   Greg Lastowka, *Foreword: Paving the Path of Cyberlaw*, 38 MITCHELL HAMLINE L. REV. 1, 1 (2011).

[184]   Patricia Fry, Chamber Digital Com. & Elec. Signature & Recs. Ass'n, *Joint Statement in Response to State "Smart Contracts" Legislation*, CHAMBER DIGITAL COM., https://digitalchamber.org/wp-content/uploads/2018/04/Joint-Ltr-State-Smart-Contracts-Legislation.pdf [https://perma.cc/5MM7-FKRG] [hereinafter *Joint Statement*]; *see also* SMART CONTRACTS ALLIANCE, SMART CONTRACTS: IS THE LAW READY? (2018), https://digitalchamber.s3.amazonaws.com/Smart-Contracts-Whitepaper-WEB.pdf [https://perma.cc/Q7BT-EL44]; *Chamber Supports Coordinated Approach Among Industry and Regulators Globally*, CHAMBER DIGIT. COM., https://digitalchamber.org/supporting-a-coordinated-approach-among-industry-and-regulators-globally/ [https://perma.cc/RC36-6Y3R]; Marco Dell'Erba, *Do Smart Contracts Require a New Legal Framework? Regulatory Fragmentation, Self-Regulation, Public Regulation*, U. PA. J.L. PUB. AFF. 1, 47 (forthcoming) (stating that the Chamber of Digital Commerce is correct that a new contract law is not needed).

[185]   *Joint Statement*, *supra* note 184.

[186]   *See* ISDA & LINKLATERS, *supra* note 17, at 5.

protect themselves by defining the parameters of the technology's use within a defined and trusted group. ISDA exemplifies such a consortium through its use of permissioned blockchain for smart derivatives contracting, for which it has developed a standardized digital form that incorporates regulatory and legal concerns.[187] Regarding the law, existing contract law is equipped to deal with contracts executed with blockchain. The common law has adapted and expanded to deal with new facts throughout American and English history. Further, law is best organized by principles, rather than by facts—the law of contract, rather than the law of blockchain.[188]

A. Separating Law from Technology and Confirming Applicability of Existing Common Law

The Chamber of Digital Commerce is correct that creating a wholly new common law for smart contracting is not necessary or wise.[189] A smart contract is a piece of technology used to implement a legal contract, rather than a new legal instrument.[190] The underlying legal contract exists alongside the smart contract.[191] Those legal contracts are almost always governed by state contract law.[192] Given this, it seems at best unnecessary and at worst dangerous to require a different legal framework depending on the medium of contract implementation. Doing so could lead to redundancy and confusion[193]—the judge-made common law of contract could conflict or confusingly overlap with a new common law of smart contracting. It would be unmanageable and unnecessary to apply an entirely different legal framework depending on if a contract term, such as delivery of goods, was executed using a train instead of a truck. Digital self-execution should not change the legal landscape either.

Consider ISDA Master Agreements and the ISDA CDM as an example of a legal contract and smart contract existing alongside one another. The ISDA form contracts are simply memorialized in smart contracts,[194] rather than on paper or in a digitized format, such as a PDF. The smart contract is new technology working to execute the terms of the contract, but it is not a

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187   *See supra* Section I.B.4.

188   *See* Easterbrook, *supra* note 2, at 207–08.

189   *Joint Statement*, *supra* note 184.

190   *See supra* Section I.A.4.

191   *See id.*

192   Legal contracts may also be governed by specific statutes or regulations governing the subject matter of the contract.

193   *Joint Statement*, *supra* note 184.

194   *See* ISDA & King & Wood Mallesons, *supra* note 118, at 5.

substantive term of the contract.[195] It is a vehicle for the contract, rather than the contract itself.[196] With this being the case, the governing contract law should not change.

In ISDA form contracts, parties choose the applicable law via a choice-of-law provision[197]—for example, New York state law or United Kingdom law. That choice determines the law that will apply in most cases. Contracting parties do not need, nor do they have a place for, a new landscape of contract law applicable to smart contracts. ISDA might include an option in future form contracts (such as the ISDA Master Agreement) where the parties may elect to use smart contracting. But that election would only be another term of the legal contract—a different breed of contract law for those legal contracts is not needed.

As smart contracting becomes more commonplace, fact patterns relating to smart contracts will be litigated in the courts. Courts will apply those fact patterns to existing common law. They will create new tests as necessary or clarify how existing tests will apply to these new facts. The internet itself did not create a new common law—the common law expanded to deal with new circumstances, as it always has. For example, contract cases have applied the principles of offer and acceptance to the relatively new concepts of click-wrap, shrink-wrap, and browse-wrap, which deal with the acceptance of terms and conditions on websites.[198] In those cases, jurists decided how old principles worked in new contexts—they did not start from scratch.[199]

Perhaps Professor Lessig and Judge Easterbrook did not disagree as much about the "Law of the Horse" as appearances might suggest. It does feel superficial to separately consider the law of the internet, precisely for the reason that scholars who appear to be in Professor Lessig's camp think Judge Easterbrook was "dead wrong"—because, in Professor Lastowka's words, the internet "has not only shaped the law, but it has shaped society generally."[200] While this is certainly true, the argument tends to support the

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[195] *See id.* at 10 (Figure 3).

[196] But note that the agreement to use smart contracts in implementation may properly be part of the contract.

[197] *Exhibit 99.6*, *supra* note 130.

[198] *See, e.g.*, Hines v. Overstock.com, Inc., 668 F. Supp. 2d 362 (E.D.N.Y. 2009) (discussing browse-wrap agreements); DeFontes v. Dell, Inc., 984 A.2d 1061 (R.I. 2009) (discussing shrink-wrap agreements).

[199] "Smart contracts are said to change the way we trade goods and services. And they are said to pose numerous challenges for the law. As this post has demonstrated, determination of the applicable contract law is not one of them." Rühl, *supra* note 60.

[200] Lastowka, *supra* note 183, at 1.

impossibility and impracticality of creating a new law of the internet—to do so would be to create a whole new law of almost everything.

Instead, jurists, attorneys, and policymakers have done and must do what has always been done—apply the law to facts and create legislation to address discrete problems as they arise. In this way, Professor Lessig is certainly correct that we have much to learn from the law of the internet.[201] But Judge Easterbrook correctly makes the point that it will not be effective to attempt a framework of regulation when so much is still unknown about how the technology will develop.[202] Because technology will likely evolve at a brisk clip for the foreseeable future, anything but our existing system of addressing problems as they come up is impractical. This discussion even brings to mind the justiciability concept of standing—for federal courts to preside a matter, there must be a case or controversy.[203] Otherwise, courts risk providing opinions that are merely advisory[204]—untethered to real-world facts, and therefore perhaps less valuable in practice.

B.   *Proper Regulatory Response to Permissioned Blockchain Technology*

To say that it is not necessary or appropriate to create an entirely new legal framework for the smart contracting context is not to say that regulation of a new technology is never proper—that proves far too much. As discussed, technologies have been regulated as problems have arisen.[205] E-signatures have been regulated with the E-Sign Act.[206] More broadly, imagine products that surely were seen as cutting-edge technology when first created—for example, the first guns or cars. Firearms and automobiles are now heavily regulated.[207]

It may be appropriate for blockchain applications such as Bitcoin to be regulated as currencies or securities, if this is where they fit within the public law after evaluating the nature of that application. However, this

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[201] Lessig, *supra* note 1.

[202] Easterbrook, *supra* note 2, at 208, 215. Here, just as the "Law of the Horse" may be ill-advised, so too is the Law of the Database—a different law for blockchain databases versus other types of databases. Blockchain is simply a different database, being used to, for example, create and record transfers. The same general principles of law should apply, regardless of the type of database.

[203] Muskrat v. United States, 219 U.S. 346, 356 (1911).

[204] *Id.*

[205] *See supra* Section I.C.

[206] E-Sign Act, *supra* note 161. This Act did not create a new common law of contracting. It did, however, affect contracting by identifying a discrete but important area that required clarification—e-signatures—and granting approval of that mechanism.

[207] *See Gun Control Act*, ATF, https://www.atf.gov/rules-and-regulations/gun-control-act [https://perma.cc/S74B-58AH]; *Laws & Regulations*, NHTSA, https://www.nhtsa.gov/laws-regulations [https://perma.cc/AEX8-BQFT].

Essay's focus is on permissioned blockchains, and the same treatment is likely not appropriate for many permissioned blockchain applications, which can be designed and tailored for a wide range of different uses.[208] The differences between permissioned and permissionless blockchains should be recognized as regulation is considered.

For example, a great advantage of permissioned blockchain is the ability to limit participants to only those who are trusted and vetted— importantly, those vetted to have high standards of security in their systems. [209] This is a crucial difference between the two types of blockchains. The existence of this advantage means that regulatory clarity should be pursued vigorously, so that parties do not hesitate to implement the technology. This Essay hopes to assist in creating, for future discussions of blockchain regulation, a clear separation between permissioned and permissionless blockchain applications. It aims to prevent permissioned blockchains from being swept into regulatory efforts more suited for permissionless blockchains. In a permissioned blockchain, especially when used in a consortium, the ability to transact exclusively with known and vetted parties provides an environment in which parties can effectively both create private law and work to fit blockchain into existing public law frameworks.

In a permissioned blockchain, the transacting parties are likely experienced, repeat players in the activity that the blockchain application is being used to execute.[210] Further, the parties likely know and trust each other to a reasonable degree.[211] In this context, the parties are able to flesh out the proper guardrails of their transactions for themselves, with an awareness of legal constraints—as with ISDA.[212] They are motivated to do this in order to protect their own interests and their industry. This should greatly minimize the risk of a disastrous implementation that endangers legal rights and participants' assets.

More generally, current public law provides a workable framework for blockchain transactions, [213] especially when supplemented by private

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[208]   *See supra* Section I.B.

[209]   *See supra* Section I.A.3.

[210]   *See supra* Section I.B.

[211]   *See id.* As previously described, the parties can verify that their counterparties have strong security systems in place. While hacking of a blockchain is generally never a concern, users themselves can be hacked. Due to the ability to vet counterparties, regulators do not need to consider this as much in the permissioned blockchain context.

[212]   *See supra* Section I.B.4.

[213]   This relates to the argument in Section II.A., *supra*.

contractual agreements.[214] Market participants should use contracts to help fit blockchain into existing laws and regulations[215]—particularly the UCC, state contract law, anti-money laundering requirements, and state money transmitter law. This contracting activity is useful because, although existing law can accommodate blockchain, it was not written with blockchain in mind. Therefore, parties should use their contracts and accompanying negotiations with counterparties to envision and articulate how their blockchain applications fit within existing law.[216] Further, broad market acceptance is enhanced if the applicable law and infrastructure conform to well-trod principles that govern other major transaction processes.[217]

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[214] Private law will also help create a course of dealing, or "a sequence of conduct concerning previous transactions between the parties to a particular transaction that is fairly to be regarded as establishing a common basis of understanding for interpreting their expressions and other conduct." U.C.C. § 1-303 (AM. L. INST. & UNIF. L. COMM'N 2021).

[215] For example, the Financial Crimes Enforcement Network ("FinCEN"), a bureau of the Treasury Department, creates anti-money laundering regulations. *See What We Do*, FinCEN, https://www.fincen.gov/what-we-do [https://perma.cc/5UYT-A344] ("FinCEN's mission is to safeguard the financial system from illicit use and combat money laundering and promote national security through the collection, analysis, and dissemination of financial intelligence and strategic use of financial authorities.").

[216] Further, the market cannot wait for structural legislative or regulatory action—it is evident from this Essay that blockchain innovation is already in motion. However, as we argue in Section II.A., *supra*, such legislative or regulatory action would not be necessary or wise in many contexts anyway—certainly not in regard to creating a new contract law for blockchain. In some areas, interpretation and guidance from regulators on how blockchain will apply will be quite useful. For example, it may be helpful for the CFTC to issue guidance on whether certain transactions involving digital assets are derivatives. The same can be said of the SEC and the application of the securities laws to transactions involving digital assets on blockchain. Also, money transmitter law varies state-by-state, and state regulators may wish to guide parties on when money transmitter licensing is required in certain blockchain transactions involving digital assets. *See Money Transmitter Licensing Law*, BLOCKCHAIN L. GUIDE, https://blockchainlawguide.com/mtl/ [https://perma.cc/8C5V-MJUN]. This does not change the fact that blockchain can fit into existing law. Regulators providing guidance will be doing the same thing as private parties and courts—explaining and deciding how blockchain fits into existing law. Additionally, the regulatory considerations discussed in the examples here may not apply to many of the permissioned blockchain applications that are the main focus of this Essay. The permissioned blockchain applications discussed in the Essay are not used to transfer digital assets, for example, as is the case with many permissionless blockchain applications. *See supra* Part I. In contrast, contract law is likely to apply in some capacity in the vast majority of blockchain applications—whenever an agreement exists between parties.

[217] Of course, this includes the principles making up the common law of contracts. Less generally, though not applicable to many of the permissioned blockchain applications discussed in this Essay, one could also think about the various processes used by securities and commodities clearinghouses, such as DTCC. For more on DTCC, see note 150, *supra*. If the same principles can govern securities and commodities transactions on- and off-blockchain, acceptance of blockchain applications may be enhanced.

This Essay has outlined different applications of permissioned blockchain in trade and authentication because the authors believe that permissioned blockchain has great potential to improve efficiency and transparency in those and other areas. Permissioned blockchain architecture will ensure both integrity of data and simplification of documentation.[218] This will effectuate swifter and eventually cheaper transactions. The authors believe that an expectation of minimal regulation in the permissioned blockchain space, especially coupled with reassurance from regulators, will allow innovative practices to grow in trade and authentication. Although this Essay does not argue that regulation stifles innovation, its authors do believe that uncertainty about pending regulatory efforts can have that effect.[219]

1. ISDA: Consortium Equipped for Self-Regulation in Permissioned Blockchain Implementation

ISDA's standard-setting activities concerning over-the-counter derivatives, as well as its efforts to integrate blockchain into this work, allow it to stand as an example of a consortium requiring minimal regulatory oversight as it begins to use permissioned blockchain technology. ISDA is a modern example of the concept of the law merchant—essentially a course of dealing in a specific area of trade.[220] ISDA has been able to regulate the affairs of its members well over the past few decades, just as medieval and other merchants effectively regulated themselves by creating their own customs and standards.[221] In this way, ISDA's example supports those who see the law merchant as a model of effective "private ordering."[222] ISDA will be well-equipped to regulate its own innovation in the context of permissioned blockchains going forward.

Users of ISDA form contracts are equipped to innovate intelligently and carefully in smart contracting.[223] Their agreements are based on trust and mutual understanding amongst each other[224]—they have decided to contract with each other, know each other's identities, and have agreed to

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[218] *See supra* Section I.A–B.

[219] One scholar has found empirical support for this idea in the context of medical technology. *See* Ariel Dora Stern, *Innovation Under Regulatory Uncertainty: Evidence from Medical Technology*, J. PUB. ECON. 181 (2017).

[220] *See supra* Section I.D.

[221] Kadens, *supra* note 171, at 251–52.

[222] *Id.* at 252.

[223] *See supra* Section I.B.4.

[224] As we have repeatedly emphasized, there should be trust in both the permissioned and permissionless blockchain technology itself, but in a permissioned blockchain, the members themselves and the security of any particular user's systems can also be vetted.

begin negotiations with a form contract that the parties have likely used many times before.[225] Because of ISDA glossaries, terms in ISDA contracts typically have the same meaning for all parties [226]—and if not, any deviation would be specified in the contract. This comes together to mean that the parties are equipped to articulate the proper guardrails of their transactions for themselves—armed with legal teams that can structure transactions within the confines of existing regulatory parameters.[227] The parties are motivated to do good work in this regard, in order to protect their high-value deals.[228] Because of these inherent protections, ISDA and its members represent an existing, ideal consortium for the use of permissioned blockchain smart contracts without strong regulatory interference.

2. *Other Consortiums as Candidates for Self-Regulation in Blockchain*

ISDA is a strong example of a consortium that is equipped to protect itself as it experiments and innovates with blockchain technology, both in documentation and implementation of contract terms. FedEx and its fellow members of BiTA,[229] as well as the innovators behind Artory and AURA in art and luxury, respectively,[230] are similarly well-equipped to go forward and innovate in permissioned blockchain applications without regulation for their protection. The parties are known to each other in all of those applications.[231] In the case of BiTA, the alliance leads the efforts to develop industry standards develop industry standards,[232] just as with ISDA. BiTA could even attempt to draft form contracts and corresponding digital representations of these contracts, like ISDA with the Master Agreement, Credit Support Annex, and CDM.[233] Whether through such form contracts or a different mechanism, the BiTA alliance of large companies and household names can be expected to act together, with their considerable resources and in their own self-interest, to create guardrails protecting their

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[225]   Charles, *supra* note 128, at 26 ("[T]he ISDA Master Agreement is a standardized industry-accepted agreement . . . ."); Heckinger, Ruffini & Wells, *supra* note 124, at 29.

[226]   *See, e.g.*, *2006 ISDA Definitions*, *supra* note 133.

[227]   Heckinger, Ruffini & Wells, *supra* note 124, at 29. In the ISDA context, the parties are almost exclusively entities, rather than individuals.

[228]   *Id.*

[229]   *See supra* Section I.B.1.

[230]   *See supra* Section I.B.1–2.

[231]   *See supra* Section I.B.1–3.

[232]   *See supra* Section I.B.1.

[233]   *See supra* Section I.B.4. Indeed, the consortiums discussed in this Essay should put in place some sort of "Master Agreement" as a plain-text legal contract, in order to provide governing terms for members' activities. The framework provided in that document can aid both consortium members and courts.

contracts and ensuring consistency with existing law. The same can be said of the participants in the worlds of fine art and high fashion—corporations or individuals who likely have considerable resources.[234]

3. *How Governments Can Help Achieve Clarity*

The strong focus on Bitcoin and other cryptocurrency blockchain applications [235] creates confusion and uncertainty about the proper regulatory response to blockchain technology because what is appropriate in the context of Bitcoin is not necessarily appropriate for other blockchain applications. There also may be confusion about the line between law and technology in smart contracting, especially given the term "smart contracts." While it is not very controversial that a smart contract is distinct from a legal contract, there is more robust discussion of whether a distinct common law or legal framework should be applied to contracts that use blockchain in some capacity.[236]

This Essay concludes that the common law of contracts should apply to any legal contract implemented with smart contracting. With this clarification of the law aside, the authors hope policymakers will address regulation of the technology—where regulation is appropriate—with clear eyes. [237] Additionally, a clearer regulatory picture may encourage innovation, which in turn may further the development of the law's application to blockchain technology. This is because as parties innovate in blockchain, they will likely attempt to structure their private contracts so that blockchain applications fit into existing law.[238]

It would be promising to see statements of intended policy from state and federal regulators and legislators, expressing (1) an intention to impose minimal additional regulation in the permissioned blockchain context due to the protections inherent in the ability to vet users of permissioned blockchains, and (2) an understanding that existing legal frameworks, and especially the common law of contracting, are equipped to deal with contracts implemented with blockchain smart contracts. In order to

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[234] *See,   e.g.,   Financial   Indicators*,   LVMH, https://www.lvmh.com/investors/profile/financial-indicators/   [https://perma.cc/RJP9-KNUD].

[235] *See supra* Section I.C.

[236] *See supra* Section I.E.

[237] *See supra* Section II.A.

[238] Existing legal frameworks would include those of the specific subject matter touched upon in those contracts—for example, banking law, energy law, or IP. While this Essay focuses largely on the common law of contracts and argues that contracts executed using blockchain can fit into existing contract law, we also believe and argue that fitting blockchain into existing laws is the best approach in most contexts. *See supra* Section II.B.

productively discuss and conceptualize the proper regulatory response to new applications of blockchain technology—whatever one's taste or distaste for regulation generally—participants must have a lucid view on these two points. With such clarity, individuals and businesses can further realize the myriad potential uses of blockchain, and can more clearly imagine a true business revolution, as important as the one kickstarted by the creation of the internet itself.

Conclusion

Permissioned blockchain applications can offer increased efficiency to transacting parties in a wide range of industries. Those looking to innovate in permissioned blockchain solutions, however, may be unsure whether permissioned blockchain will be swept up by the drive to regulate permissionless blockchains. Because the parties to permissioned blockchain transactions are known to each other and exercise a high degree of control and collaboration with regard to the technology, policymakers should decide and subsequently clarify that permissioned blockchain technology will not receive strong regulatory attention.

Policymakers also must operate under the premise that the proper regulatory response to the technology and the applicable legal framework are separate considerations. As new blockchain applications are proposed and implemented, the first step in thinking about regulatory and legal treatment will be to understand the divide between law and technology in that application. In most instances, as with permissioned blockchain smart contracts, legal thinkers can find an anchor in the fine-tuned body of existing common and statutory law, which has evolved over centuries to address new facts and realities. A new and separate body of contract law for smart contracting is not necessary.