Fordham Journal of Corporate & Financial Law

Volume 24, *Number* 2 2019 *Article* 3

Decoding Smart Contracts: Technology, Legitimacy, & Legislative Uniformity

Jared Arcari*

*J.D. Candidate, Fordham University School of Law, May 2019

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Abstract

Blockchain technology is increasingly permeating the everyday lives of countless people. Applications of the cutting-edge technology range from secured banking to tracking mortgage titles. A particular blockchain technology, dubbed "smart contracts," has the potential to revolutionize how individuals and companies securely contract with each other. Smart contracts, however, are not widely employed, mainly because potential users are uncertain of their enforceability as contracts under existing state contract laws. Similar skepticism slowed the acceptance of electronic signatures in the late 1990s, but was resolved ultimately through a model uniform act recognizing electronic signatures' effectiveness across interstate borders. This Note proposes a similar solution for smart contracts based on a review of current state legislative developments and existing laws regulating blockchain technology.

KEYWORDS: Contracts, blockchain, technology, smart contracts

DECODING SMART CONTRACTS: TECHNOLOGY, LEGITIMACY, & LEGISLATIVE UNIFORMITY

By Jared Arcari[*]

ABSTRACT

Blockchain technology is increasingly permeating the everyday lives of countless people. Applications of the cutting-edge technology range from secured banking to tracking mortgage titles. A particular blockchain technology, dubbed "smart contracts," has the potential to revolutionize how individuals and companies securely contract with each other. Smart contracts, however, are not widely employed, mainly because potential users are uncertain of their enforceability as contracts under existing state contract laws. Similar skepticism slowed the acceptance of electronic signatures in the late 1990s, but was resolved ultimately through a model uniform act recognizing electronic signatures' effectiveness across interstate borders. This Note proposes a similar solution for smart contracts based on a review of current state legislative developments and existing laws regulating blockchain technology.

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* J.D., Fordham University School of Law, 2019. Jared served as President of the Entrepreneur Law Society and the Fordham Business & Law Association. He also served as a research assistant to Prof. Bernice Grant, Sr. Director of the Entrepreneurial Law Clinic. While in law school, he devoted significant time to legal topics including securities regulation, entrepreneurial law, venture capital, and investment company regulation.

INTRODUCTION

The technology, business, financial, and legal industries have increasingly adopted blockchain technology and have developed innovations to blockchain in various contexts within their respective fields. Developers have built increasingly complex blockchain applications and the range of users has grown from a few early adopters to many major corporations and even global banking institutions. Major media and legal publications have broadcasted the precipitous rise of blockchain technology, showing the rapid growth and endless new applications of the technology.[1]

While the general discussion around blockchain technology and its implications has accelerated in recent years, one particular blockchain technology application garnered attention recently: smart contracts. Smart contracts are not new; the first documented reference to the instrument appeared in the 1990s and described it as a mechanism involving "many

1. Nathaniel Popper, *Tech Thinks It Has a Fix for the Problems It Created: Blockchain*, N.Y. TIMES (Apr. 1, 2018), https://www.nytimes.com/2018/04/01/technology/blockchain-uses.html [https://perma.cc/975N-NT67] (discussing how "[a] range of corporations and governments are trying to apply the blockchain model–for projects from the prosaic to the radical").

kinds of contractual clauses []such as liens, bonding, [and] delineation of property rights" that record and execute transactions between two parties on a blockchain.[2]

Smart contracts rely on automation and the interconnectivity aspects of blockchain technology to connect parties, exchange consideration, and record transactions.[3] Currently, smart contracts are used primarily for simple transactions that require an "if-then" function.[4] Financial institutions and banks have begun to invest in and leverage blockchain technologies, recognizing its increased efficiency in automated transactions and reduced operating costs.[5]

Recently, scholars, lawyers, regulatory agencies, and state legislators have begun pondering how to interpret and regulate smart contracts consistently.[6] These parties must address numerous concerns, including

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2. Nick Szabo, *Smart Contracts: Building Blocks for Digital Markets* (1996), http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.html [https://perma.cc/TQ5S-NUWL].

3. *See id.*

4. *See* CHAMBER OF DIGITAL COM., SMART CONTRACTS: IS THE LAW READY?, 10 (Sept. 2018), https://www.dlapiper.com/~/media/files/people/tank-margo/smart-contracts-is-the-law-ready-web.pdf?la=no&hash=2042E4EA0CD948BA7B1C0459BF8A3411D9D5EC78 [https://perma.cc/BZ2Y-PVED].

5. Peter Davey, *Is Blockchain Technology Right for Banking?*, CLEARING HOUSE, https://www.theclearinghouse.org/banking-perspectives/2017/2017-q4-banking-perspectives/articles/blockchain-for-banking [https://perma.cc/BZS6-DEEN] (last visited Apr. 9, 2019) ("When there are a lot of parties involved in a deal and each has to fulfill an obligation before the next party can perform its part, a blockchain can be leveraged to complete one part of the transaction and automatically trigger events for the next party. To take advantage of the automation, the terms of the deal and the various attributes would need to be agreed on in advance and then built into the application, making this more applicable for recurring or highly repeatable transactions.").

6. *See* Gary Tse, *Smart Contracts: A Boon or Bane for the Legal Profession?*, LEXOLOGY (Sept. 24, 2018), https://www.lexology.com/library/detail.aspx?g=f16551a7-e974-41d2-ba45-37e2dc7f6e41 [https://perma.cc/6UPT-S8PP] (finding that whether smart contracts will be a "boon or bane" for the legal profession in general is still up for debate); *see also* Transcript of Interview with Kevin Werbach and Nicolas Cornell, Wharton Profs. of Legal Studies and Business Ethics, The Promise—And Perils—of 'Smart' Contracts, Knowledge @ Wharton (May 18, 2017), http://knowledge.wharton.upenn.edu/article/what-are-smart-contracts/ [https://perma.cc/6MJG-8AXY] (discussing the "promise and perils" of smart contract applications).

unclear compliance requirements and the enforceability of smart contracts under traditional contract law.[7]

It is particularly difficult to develop compliance guidelines for the administration of transactions on a decentralized platform such as a blockchain.[8] From a statutory perspective, state legislatures are beginning to consider and implement blockchain technology laws and determine the enforceability of smart contracts within their jurisdictions.[9] As of April 2019, state legislatures have considered 133 blockchain technology-related laws.[10] Of those, only seven proposed, passed, or dead bills relate to smart contracts.[11]

Part I of this Note discusses blockchain technology and its current and future applications. Part II describes the growing field of smart contracts and discusses the enforceability of smart contracts according to contract law. Part III considers legislative movements currently in consideration in state capitols across the United States. Specifically, this Part discusses two different movements emerging in state legislatures: 1) proactive regulation, and 2) a hesitance to legally recognize smart contracts. Finally, Part IV contemplates a uniform code, based on the

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7. Confideal, *Are Smart Contracts Legal?*, MEDIUM (Oct. 17, 2017), https://medium.com/@confideal/are-smart-contracts-legal-1cc29c6f15c7 [https://perma.cc/86QD-KD5M] (discussing several factors determining the legality of smart contracts including the type of contract, jurisdiction, arbitration, and other factors).

8. *See id.*

9. *See* Scott H. Kimpel & Chris Adcock, *The State of Smart Contract Legislation*, HUNTON ANDREWS KURTH BLOCKCHAIN BLOG (Sept. 5, 2018), https://www.blockchainlegalresource.com/2018/09/state-smart-contract-legislation/ [https://perma.cc/3TP6-THQD]. Nebraska, New York, and Ohio are following several other states that have already passed legislation, but it is a slow process.

10. *See* Matthew E. Kohen & Justin S. Wales, *State Regulations on Virtual Currency and Blockchain Technologies*, CARLTON FIELDS P.A. (Apr. 19, 2019) (this figure includes all proposed, postponed, vetoed, and passed bills. This figure does count bills that are for certain state departments, specialized working group recommendations, or other unrelated bills). *See also* Jared Arcari, *Blockchain Technology and Smart Contract Legislation—Around the 50 States*, MEDIUM (Aug. 24, 2018), https://www.linkedin.com/pulse/blockchain-technology-smart-contract-legislation-around-arcari/ [https://perma.cc/EUQ2-QSQ5] (dividing proposed and passed state legislation, as of December 2018, into six distinct legislative categories including crowdfunding, money-transmission licenses, legal tender, taxable income, personal information, and creating task forces).

11. *Id.* (citing S.B. 2658 (CA. 2018), H.B. 7310 (Conn. 2019), S.B. 4142 (N.Y. 2019), H.B. 1045 (N.D. 2019), S.B. 300 (Ohio 2018), S.B. 700 (O.K. 2018), S.B. 1662, 110th Gen. Ass, 2nd Reg. Sess. (Tenn. 2017).

Uniform Electronic Transactions Act, which states can adopt to legitimize and legalize smart contracts.

I. SMART CONTRACT FOUNDATION: BLOCKCHAIN TECHNOLOGY

A. BLOCKCHAIN BACKGROUND & TERMINOLOGY

The history of blockchain technology is difficult to summarize. In testing digital code and various related theories, coders and developers discretely developed many early blockchain innovations with limited collaboration or guidance.[12] Most commentators point to the invention of Bitcoin in 2009 as the seminal moment for blockchain technology's explosive growth and mainstream recognition.[13] Nakamoto's white paper delineated Bitcoin and, more importantly, the necessary underlying blockchain technology used by the cryptocurrency.[14] Bitcoin could not exist without the foundation of a peer-to-peer network revealing a chronological record of transactions, the essential function of blockchain technology.[15] Thus, other applications soon developed using the same decentralized foundation to record and transfer data between transacting parties.[16]

The term "blockchain" has become the de facto definition for a growing array of distributed information systems.[17] The underlying mechanics of this technology resulted in its label: "[blockchain] got that name over time because all of the transactions coming onto the network were grouped into blocks of data and then chained together using

12. For a general discussion regarding the nebulous history of blockchain technology, see Vinay Gupta, *A Brief History of Blockchain*, HARV. BUS. R. (Feb. 28, 2017), https://hbr.org/2017/02/a-brief-history-of-blockchain [https://perma.cc/2CHK-K2B3].

13. *See* Popper, *supra* note 1.

14. *See generally* Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, BITCOIN, https://bitcoin.org/bitcoin.pdf [https://perma.cc/CAK2-8YDC] (last visited Feb. 9, 2019).

15. *See id.* at 1.

16. *See* Sean William, *Twenty Real-World Uses for Blockchain Technology*, MOTLEY FOOL (Apr. 11, 2018) (citing twenty various uses for blockchain technology across many different industries).

17. *See* Popper, *supra* note 1.

sophisticated math."[18] A uniform definition of "Blockchain," however, is unsettled and remains subject to revisions and clarifications by industry participants as new uses stretch the conceivable application of the distributed technology.[19]

Diving further into the mechanical definitions of a blockchain, a variety of terms compete to explain the same basic mechanical principles. These more precise terms include "distributed ledger technology" (DLT), "shared ledger technology" (SLT), or "mutual distributed ledger" technology.[20] Blockchains are differentiated further based on the level of access given to each user (such as read, write, or read and write access), or based on which users are allowed to access a particular blockchain.[21] There are "public blockchains," which anyone can access; "private blockchains" (or "closed blockchains"), which have a specified user population; and other blockchains that restrict access to certain parties based on their participation in the system.[22]

B. TECHNICAL ASPECTS OF BLOCKCHAIN TECHNOLOGY

Blockchain technology is primarily designed to prevent the age-old accounting problem of "double-spending."[23] Nakamoto first described in his original Bitcoin white paper a peer-to-peer network in which pieces of information would be "hashed"—the act of converting an input of

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18. Nathaniel Popper, *What is the Blockchain? Explaining the Tech Behind Cryptocurrencies*, N.Y. TIMES (Jun. 27, 2018), https://www.nytimes.com/2018/06/27/business/dealbook/blockchains-guide-information.html [https://perma.cc/37MS-ZXQG].

19. *See generally* Popper, *supra* note 1.

20. Angela Walch, *The Path of the Blockchain Lexicon (and the Law)*, 36 REV. BANKING & FIN. L. 713, 719-20 (2016-2017), https://www.bu.edu/rbfl/files/2017/09/p729.pdf [https://perma.cc/49BF-HY9C].

21. *See* Nicola Heath, *What's the difference between a private and public blockchain?*, INTHEBLACK (Sept. 5, 2018), https://www.intheblack.com/articles/2018/09/05/difference-between-private-public-blockchain [https://perma.cc/K92Z-BJJY].

22. Walch, *supra* note 20, at 720.

23. Nakamoto, *supra* note 14, at 1. Double-spending occurs when the same unique currency is used more than once, beyond the actual value of the currency. In a blockchain, double-spending is prevented by the recipient receiving multiple confirmations that the virtual currency they acquired is not duplicative. *See* Toshendra K. Sharma, *How Blockchain is Solving the Problem of Double-Spending in the Finance Sector*, BLOCKCHAIN COUNCIL (Nov. 3, 2018) https://www.blockchain-council.org/blockchain/how-blockchain-is-solving-the-problem-of-double-spending-in-the-finance-sector/.

information into an encrypted output—together in a chain of blocks containing such hashed information.[24] A blockchain, as described by Nakamoto, uses "timestamp transaction" blocks of data that are hashed (encoded), strung together in a chain, and then confirmed by the network of chains through a "proof-of-work."[25] To confirm the transactions, the "proof-of-work"[26] is maintained by "nodes" operated by external central processing units (CPUs) that work in tandem to corroborate blocks as they are added to the chain.[27] The blockchain, after each block is added, serves as a continuous record of all the transactions completed by all users, preventing duplications and maintaining the transaction history.[28]

Each time-stamped transaction is a "block" of information, which is then added to an existing chain of blocks and secured through cryptography.[29] A network of peers maintains this blockchain, whose processing power maintains the integrity and record of the overall blockchain.[30] Each time-stamped block transaction contains a unique hash—or transaction history for that block—which includes identifying numbers of any currency trading hands and the entire preceding history of the blockchain.[31] In essence, a blockchain's purpose is simple: to create a shared, trusted, and secured continuous ledger of transactions that is available to the public to inspect and confirm.[32]

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24. *Id.*

25. *Id.*

26. For a useful definition and explanation of a "proof-of-work," see Andrew Gazdecki, *Proof-Of-Work and Proof-Of-Stake: How Blockchain Reaches Consensus*, FORBES TECH. COUNCIL (Jan. 28, 2019), https://www.forbes.com/sites/forbestechcouncil/2019/01/28/proof-of-work-and-proof-of-stake-how-blockchain-reaches-consensus/#61d167ae68c8.

27. *Id.*

28. *See* Sloane Brakeville & Bhargav Perepa, *Blockchain basics: Introduction to distributed ledgers*, IBM DEVELOPER (Mar. 18, 2018), https://developer.ibm.com/tutorials/cl-blockchain-basics-intro-bluemix-trs/ [https://perma.cc/S9PM-4VC5].

29. *See id.*

30. Scott A. McKinney, Rachel Landy & Rachel Wilka, *Smart Contracts, Blockchain, and the Next Frontier of Transactional Law*, 13 WASH. J. L. TECH. & ARTS 313, 318 (2018), http://digital.law.washington.edu/dspace-law/handle/1773.1/1818 [https://perma.cc/2GW3-8T8J].

31. *See id.*

32. *What is Blockchain?*, BLOCKCHAINHUB, https://blockchainhub.net/blockchain-intro/ [https://perma.cc/R4QR-DKP8] (last visited Apr. 9, 2019).

The technical aspects of blockchain technology, and the operation of its underlying components, become even more complex. "Hashing" refers to the process of taking an input of data of any length and producing an output of a fixed length, transforming various input data into fixed-length markers that are easily identifiable and trackable.[33] There are different hashing standards such as SHA-256 ("Secure Hashing Algorithm"-256), which takes any sized input and outputs a fixed 256-bit length result that is standardized and consistent with the other hashed information on the blockchain.[34] The mechanics of the peer-to-peer network of computer processor units ("CPUs") complicate matters even further in that each CPU maintains a complete copy of the entire blockchain and confirms new additions to the blockchain by checking the records of the other CPUs in the network.[35] This transaction history retention ensures that the unaltered copy of the blockchain is maintained by countless users who can authenticate the true record against any malicious false records.[36]

II. WHAT ARE SMART CONTRACTS?

A. SMART CONTRACT TECHNOLOGY BACKGROUND

Smart contracts are programs represented by electronic code, recorded and transacted on a blockchain that allows the "exchange [of] money, property, shares" or any other type of consideration between parties.[37] From a legal perspective, a smart contract is an automated arrangement between parties that causes performance based on "the satisfaction or non-satisfaction, determined objectively through code," of required conditions set forth in the contract.[38] Fundamentally, smart

33. *What Is Hashing? Under the Hood of Blockchain*, BLOCKGEEKS, https://blockgeeks.com/guides/what-is-hashing/ [https://perma.cc/8NDE-7CH3] (last visited Apr. 9, 2019).

34. *See id.*

35. *See What is Blockchain?*, *supra* note 32.

36. *See* Brakeville & Perepa, *supra* note 28.

37. *Smart Contracts: The Blockchain Technology That Will Replace Lawyers*, BLOCKGEEKS, https://blockgeeks.com/guides/smart-contracts [https://perma.cc/UEV9-743V] (last visited Apr. 9, 2019).

38. David M. Adlerstein, *Are Smart Contracts Smart? A Critical Look at Basic Blockchain Questions*, COINDESK (Jun. 26, 2017), https://www.coindesk.com/when-is-a-smart-contract-actually-a-contract [https://perma.cc/2ZDM-PKJA].

contracts are instruments written in code that control and record the exchange of consideration between two or more parties.[39]

A common analogy used to describe the mechanics of how a smart contract operates is the humble vending machine: a person exchanges something, such as a coin, and the programming within the vending machines dispenses the product once it confirms that the payment clears.[40] This simplified explanation of a smart contract conceptualizes a smart contract's exchange of consideration and the automatic response after the exchange has been confirmed and recorded.[41]

Some commentators argue, however, that the term "smart contract" can be misleading.[42] The term "smart" insinuates a complex transaction, whereas the actual definition of smart contracts typically refers to any "contract" hosted on a blockchain, regardless of complexity.[43] The current use of smart contracts is mostly limited to simplified triggered transactions, such as the payment of funds triggered by an agreed upon event or imposing financial penalties for non-performance of a specific task.[44] These simple smart contracts consist of an "all-or-nothing" type of

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39. *Id.*

40. *See id.*

41. *See id.*

42. *See* Andrew Glidden, *Should Smart Contracts Be Legally Enforceable?*, BLOCKCHAIN AT BERKELEY (Feb. 27, 2018), https://blockchainatberkeley.blog/should-smart-contracts-be-legally-enforceable-599b69f73aea [https://perma.cc/2CPT-Y2MY]. The author compares smart contracts to the "pipes" of the internet, the wires and conduits that carry data between machines and users but do not analyze or make use of that data. The author discusses the issue of calling smart contracts "smart," arguing that they are a technology conduit for enforcing agreements through "programmatically-executed transactions" or "PETs." *See also* David B. Black, *Blockchain Smart Contracts Aren't Smart and Aren't Contracts*, FORBES (Feb. 27, 2019), https://www.forbes.com/sites/davidblack/2019/02/04/blockchain-smart-contracts-arent-smart-and-arent-contracts/#227d64b21e6a [https://perma.cc/YK4Z-RLJG].

43. *See* Glidden, *supra* note 42; *see also* Black, *supra* note 42.

44. *See* Stuart D. Levi & Alex B. Lipton, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*, HARV. L. SCH. ON CORP. GOVERNANCE AND FIN. REG. (May 26, 2018), https://www.skadden.com/insights/publications/2018/05/an-introduction-to-smart-contracts [https://perma.cc/26VL-ETK8].

contract that the coding can execute.[45] Although some advocates believe that "smart contracts will revolutionize the way firms transact and may fundamentally transform our social and legal institutions," the future of smart contracts remains undefined with each new development.[46]

There is strong support for smart contracts' varied uses and enforceability from professional groups such as the American Bar Association (ABA) and from large corporations including IBM and NASDAQ.[47] For example, the ABA recently described smart contracting as a "disruptive advancement that will have far-reaching impact for many industries, including financial services, government, real estate, manufacturing, and healthcare."[48] Similarly, IBM went so far as to create a blog dedicated solely to blockchain technology, titled "Blockchain Unleashed: IBM Blockchain Blog," to discuss the company's support of smart contracts hosted on its cloud services.[49]

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45. *See* Smart Contracts Alliance, *Smart Contracts: Is the Law Ready?*, CHAMBER DIGITAL COM. (Sept. 2018), https://digitalchamber.org/smart-contracts-whitepaper/ [https://perma.cc/SAX8-ZLH8]. The Chamber of Digital Commerce writes in their report on smart contracts that "critical to [the definition of a smart contract] is the recognition that a smart contract is not necessarily a legal contract. Instead, a smart contract is essentially an advanced form of a conditional 'if-then' statement written in computer code." *Id.* at 10.

46. Jeremy M. Sklaroff, *Smart Contracts and the Cost of Inflexibility*, 166 U. PA. L. REV. 267 (2017), https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=9605&context=penn_law_review [https://perma.cc/3WFD-HZ5E].

47. *See* IBM Blockchain Unleashed, *Smart legal contracts: How the law benefits with blockchain*, IBM BLOCKCHAIN BLOG (Jun. 27, 2018), https://www.ibm.com/blogs/blockchain/2018/06/smart-legal-contracts-how-the-law-benefits-with-blockchain-2/ [https://perma.cc/T4RX-7TKC]. *See generally* Ian Foley, *How Smart Contracts Can Help Businesses Provide Better Customer Service*, NASDAQ (Oct. 1, 2018, 10:53 AM), https://www.nasdaq.com/article/how-smart-contracts-can-help-businesses-provide-better-customer-service-cm1030345 [https://perma.cc/DS2B-LNPJ] (discussing how various companies that have already developed innovative products to provide legal documents and templates to companies wishing to streamline their legal agreements, including Smart Contract and ConsenSys).

48. Tsui S. Ng, *Blockchain and Beyond: Smart Contracts*, A.B.A. (Sept. 19, 2018) https://www.americanbar.org/groups/business_law/publications/blt/2017/09/09_ng [https://perma.cc/A7T9-GU83] (providing attorneys with a bit of advice, advising transactional attorneys to stay "abreast of changes that may affect their clients" and to learn more about the "technical aspects" of how smart contracts operate in the legal field).

49. *See* Tiffany Winman, *Blockchain Unleashed: Hello World!*, IBM BLOCKCHAIN BLOG (Oct. 20, 2016), https://www.ibm.com/blogs/blockchain/2016/10/blockchain-unleashed-hello-world/ [https://perma.cc/42K9-NYYB].

B. FOUR LEGAL FOUNDATIONS OF SMART CONTRACTS

The operability of smart contracts can be divided and analyzed in four distinct categories: observability, verifiability, privity, and enforceability.[50] Nick Szabo, a computer scientist and cryptographer, discussed these four contractual elements as the basic foundations controlling contractual obligations between parties in smart contract transactions.[51] This Note will briefly summarize each category in turn.

Observability relates to the "ability of the principals to observe each others' performance of the contract, or to prove their performance to other principals."[52] Parties entering into deals want to ensure that performance occurs according to the terms of the agreement. Observability of each party's performance requires verification, meaning that either the other party or a third-party intermediary must objectively confirm the performance.[53]

To facilitate observability, smart contracts utilize intermediaries called "oracles," which are tertiary computer programs that operate separately from the smart contract's code; the oracles find information from outside the blockchain, such as bank statements or account information, and provide contracting parties with the relevant data to confirm each party's performance.[54] The parties are able to observe the performance of each other to the satisfaction of the contract's requirements, building trust and accountability through the smart contract's arms-length transaction.[55]

The second foundational element of smart contracts is "verifiability," meaning the "ability of a principal to prove to an arbitrator that a contract has been performed or breached."[56] That is, once the parties have agreed to particular terms, they must be able to verify that each party

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50. *See* Szabo, *supra* note 2.

51. *See id.*

52. *See id.*

53. *See id.*

54. *See What's a Blockchain Oracle? Information Oracles & External Data Feeds*, BLOCKCHAINHUB, https://blockchainhub.net/blockchain-oracles/ [https://perma.cc/NNQ3-M822] (last visited Apr. 9, 2019). In short, oracles are input-gathering programs that allow contracting parties to "pull" information from the outside world into their contract to confirm performance).

55. *See id.*

56. *See* Szabo, *supra* note 2.

will perform their obligations consistent with the agreed-upon terms.[57] The theory of verification is unique to smart contracts because a third party must verify performance, whereas in traditional contracts, this is often the burden of the transacting parties.[58]

Smart contract verification is fundamentally more complex because of the decentralized and anonymous attributes of blockchain technology.[59] For example, an individual accesses a traditional bank account by using an account number and routing number or by inserting a PIN number that is known only by the owner of the account.[60] The PIN number serves as the centrally-stored key, verifying to a centralized repository of PIN numbers and their respective bank accounts that the party accessing the account is the authorized user.[61] In contrast, smart contracts utilize a different process of verification "with minimal reliance on centrally provided systems or services,"[62] thus removing single opportunities for failure and preventing vulnerable centrally-located systems from controlling access to countless different accounts.

The third foundational element of smart contracts is "privity"—the concept of restricting knowledge and control of the contents of a smart contract strictly to the contracting parties.[63] The term "privity" is not unique to smart contracts; privity of contract is the general legal concept that a contract should "not give rights or obligations to entities other than those who are parties to the contract."[64] Privity is similar when applied to either a smart contract or a traditional legal contract in that the parties are

57. *See id.*

58. *See id.*

59. *See* Jared Arcari, *Smart Contracts—A Legal Contracts Perspective Part II: Verifiability*, MEDIUM (Jul. 13, 2018), https://www.linkedin.com/pulse/smart-contracts-legal-contract-perspective-part-ii-jared-arcari/ [https://perma.cc/WZ69-QF2K].

60. *See id.*

61. *See id.*

62. *What is Smart Identity?*, GITHUB, https://github.com/SmartIdentity/smartId-contracts#what-is-smart-identity [https://perma.cc/VM9C-6T8P] (last visited Apr. 9, 2019).

63. *See* Szabo, *supra* note 2.

64. *Privity of Contract: Everything You Need to Know*, UPCOUNSEL, https://www.upcounsel.com/privity-of-contract [https://perma.cc/Q52Y-HR6Q] (last visited Apr. 7, 2019).

seeking insulation from the outside world.[65] Privity in smart contracts, however, also involves the privacy of the parties' identity and transaction details, as opposed to the traditional contract setting, in which parties seek to avoid liability rather than disclosure of identifying information.[66]

Enforceability is the fourth foundational element of smart contracts.[67] Enforceability hinges on whether "the agreement is legally binding and enforceable in a court of law."[68] Because there is no federal contract law in the United States, enforceability is handled at the state level.[69] State courts typically apply the common law requirements of contracts when determining the legal recognition of a contract: offer, acceptance, and consideration.[70] Consequently, much of the controversy over smart contracts centers around the enforceability of an agreement that is structured in digital code and hosted on a blockchain. This concept stands in stark contrast to the traditional pen-and-paper contract on which most legislatures and courts based their contract laws and common law contract principles.[71]

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65. *See* Michael Smolenski, *Smart Contracts: Privacy vs. Confidentiality*, HACKERNOON (Oct. 14, 2017), https://hackernoon.com/smart-contracts-privacy-vs-confidentiality-645b6e9c6e5a [https://perma.cc/94DL-CFNJ]. Smolenski discusses the difference between privacy and confidentiality, noting that confidentiality is nearly impossible on a public ledger, given its public nature, but that smart contracts can operate to mask the identity of end-users and deny access to untrusted intermediaries.

66. *See id. See also* Ahmed Kosba et al., *Hawk: The Blockchain Model of Cryptography and Privacy-Preserving Smart Contracts*, IEEE SYMP. SEC. & PRIVACY 839, 839 (2016), https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7546538 [https://perma.cc/6BAK-434N] (smart contracts operating on a blockchain operate on trust, however, the authors note that smart contracts currently can be "trusted for correctness and availability but not for privacy").

67. *See generally* CARDOZO BLOCKCHAIN PROJECT, "SMART CONTRACTS" & LEGAL ENFORCEABILITY 9 (Oct. 16, 2018), available at https://cardozo.yu.edu/sites/default/files/Smart%20Contracts%20Report%20%232_0.pdf [https://perma.cc/LY49-8ERD].

68. *See* Levi & Lipton, *supra* note 44.

69. *See id.*

70. *Id.*

71. *See* CARDOZO BLOCKCHAIN PROJECT, *supra* note 67, at 9. Several authors previously have discussed the enforceability of smart contracts through existing doctrines in contract law including the statute of frauds and contract theory. *See id.*; Max Raskin, *The Law and Legality of Smart Contracts*, 1 GEO. L. TECH. REV. 304 (2017), https://georgetownlawtechreview.org/the-law-and-legality-of-smart-contracts/GLTR-04-2017/ [https://perma.cc/HY2A-GSYD]. This Note, however, focuses on the four "legal" foundations of smart contracts without expanding into traditional contract law.

There are, however, some issues that smart contracts face regarding traditional contract laws and enforceability. The underlying technical computer code of a smart contract makes comparisons to traditional contracts difficult.[72] For example, because a smart contract's coding is irreversible once executed, the outcome of the contract is permanent even if the performance of one of the parties is fraudulent or the terms of the agreement are later deemed to be void.[73] In essence, parties may not appreciate the sudden and irreversible execution of a smart contract's code without the ability to pause or reconsider the agreement before final execution as they are able to do in a traditional contract setting.[74]

Additionally, deciphering the meaning and intent of digital code is an issue that courts will face when attempting to enforce or void smart contracts.[75] Courts are already reluctant to enforce contracts with ambiguous language, or where there is inadequate notice or disclosure of the terms;[76] thus, future challenges brought by parties to smart contracts who are not familiar with electronic code are likely.[77]

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72. Dr. Gernot Fritz & Lukas Treichl, *What's in a Smart Contract?*, FRESHFIELDS, BRUCKHAUS, DERINGER, https://www.freshfields.com/en-us/our-thinking/campaigns/digital/fintech/whats-in/whats-in-a-smart-contract/ [https://perma.cc/SG8L-9V47] (last visited Apr. 9, 2019).

73. *See id.*

74. *See* Levi & Lipton, *supra* note 44.

75. *See id.*

76. *See* Neal H. Klausner et al., *How Courts Interpret Ambiguous Contracts*, CORP. COUNSEL BUS. J. (Jan. 1, 2004), https://ccbjournal.com/articles/how-courts-interpret-ambiguous-contracts [https://perma.cc/A6DQ-5HPU]. The authors discuss broadly how contracts are interpreted when there is ambiguous language or terms, nothing that in most instances the court "will construe ambiguous contract terms against the drafter of the agreement."

77. *See, e.g.*, Nicosia v. Amazon.com, Inc., 834 F.3d 220, 238 (2d. Cir. 2016) (holding that "reasonable minds could disagree" as to whether Amazon provided reasonable notice of important provisions); Schnabel v. Trilegiant Corp., 697 F.3d 110 (2d Cir. 2012) (holding that, on whether the plaintiff fully manifested their assent to the terms of a contract cited the Second Restatement of Contracts, § 19(2), "the conduct of a party is not effective as a manifestation of his assent unless he intends to engage in the conduct and knows or has reason to know that the other party may infer from his conduct that he assents").

III. LEGISLATIVE MOVEMENTS: TOWARD REGULATION OR REBUTTAL?

In state legislatures across the country, lawmakers have been slow to regulate blockchain technology. According to the National Conference of State Legislators (NCSL), as of March 3, 2019, state legislatures contemplated fifty-four bills relating to the use of blockchain technology.[78] By another count, state legislators considered 133 bills related to blockchain technology for various purposes as of April 2019.[79] By either count, state legislators are slowly considering laws and regulations for blockchain technology's many applications. Efforts to pass smart contract legislation have lagged behind blockchain technology acceptance considerably, despite some legislators' recognition of the growing public demand for smart contracts with five proposed or active smart contract laws.[80]

Several laws regulating blockchain technology in record-keeping, transmission of currency, and other applications have been enacted already.[81] More recently, Congress expressed interest in regulating blockchain technology through the proposed Blockchain Promotion Act

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78. Heather Morton, *Blockchain State Legislation*, NAT'L CONF. ST. LEGISLATURES, (Mar. 29, 2019), http://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/83E5-NUDT]. The states that have passed legislation are: Arizona (H.B. 2602, H.B. 2603, H.B. 2216, H.B. 2417), California (A.B. 2658, S.B. 838), Colorado (S.B. 29, S.B. 86, S.B. 279), Connecticut (S.B. 443, S.B. 513), Delaware (S.B. 182, S.B. 183, S.B. 194, S.B. 69), Florida (H.B. 1357), Hawaii (H.B. 1481), Illinois (H.B. 5553, H.R. 120 H.J.R. 25), Maine (L.D. 950), Maryland (H.B. 1100, S.B. 893), Michigan (H.B. 6257, H.B. 6258), Missouri (H.B. 1256), Nebraska (L.B. 691, L.B. 694, L.B. 695), Nevada (S.B. 398), New Jersey (A.B. 3613, S.B. 2297, A.B. 3768, S.B. 2462), New York (A.B. 8780, A.B. 8793, A.B. 10854, A.B. 11309, S.B. 8858, S.B. 9156), Ohio (S.B. 220, S.B. 300), Tennessee (H.B. 1507, S.B. 1662), Vermont (H.B. 765, H.B. 737, H.B. 868, S.B. 269, S.B. 138), Virginia (H.J.R. 153), Wyoming (H.B. 1, H.B. 101)

79. *See* Kohen & Wales, *supra* note 10.

80. *See, e.g.*, Elizabeth Zima, *Four Blockchain Bills Introduced in New York State Assembly*, GOVTECH (Dec. 15, 2017), http://www.govtech.com/policy/Four-Blockchain-Bills-Introduced-in-New-York-State-Assembly.html [https://perma.cc/8LWV-3L27] (discussing New York Assemblyman Clyde Vanel's push to introduce four bills to the New York legislature, asserting that "New York must be in the forefront of this").

81. *See id.*

of 2018.[82] The Blockchain Promotion Act is the first federal acknowledgment of blockchain technology, establishing a working group to recommend definitions and future blockchain technology discussions in Congress.[83]

While legislative progress for blockchain technology is promising, the overall response has been limited.[84] Legislative solutions are narrow, ranging from laws that set out preliminary definitions of blockchain technology to bills recognizing and authorizing electronic signatures contained in smart contracts. Some states, such as New York, have introduced bills defining smart contracts and recognizing their digital signatures akin to electronic signatures.[85] Other states, like Arizona, have passed laws specifically authorizing and enforcing smart contracts as legal contracts.[86]

This Note divides state "legislative movements" into two broad categories: (1) legislative actions designed to legally recognize smart contracts, and (2) legislative inaction or proactive efforts to prevent smart contract recognition.[87] This general discussion addresses current policies and laws of several states, as well as endeavors to illustrate the current fracture between state legislatures.

A. STATES LEGITIMIZING SMART CONTRACTS

Smart contracts, and the underlying blockchain technology, are relatively unfamiliar to many state legislatures. In June 2015, Vermont became the first state to pass a blockchain-related law.[88] This law directed

82. Blockchain Promotion Act of 2018, H.R. 6913, 115th Cong. (2018).

83. *Id.*

84. *See generally* Morton, *supra* note 78.

85. A.B. 8780 (N.Y. 2018).

86. H.B. 2417, 53rd Leg. (Ariz. 2017).

87. For the purposes of this Note, the term "legislative materials" encompasses materials related to legislating smart contracts, including the legislative intent derived from official comments, committee remarks and reports, public comments in support or against legislation, and proposed, vetoed, and passed legislation.

88. Vt. Act No. 51, § A.3 (June 2015). *See also* Aaron Nicodemus, *Bitcoin Transactions Taxable Under First-of-Kind Vermont Bill*, BLOOMBERG BNA (Jan. 16, 2018), https://news.bloomberglaw.com/tech-and-telecom-law/bitcoin-transactions-taxable-under-first-of-kind-vermont-bill [https://perma.cc/5WJC-SN3E] (citing Vermont as an "innovation state" since becoming the first state to pass a blockchain-related law in 2015 and continuing to pass laws thereafter).

Vermont's Commissioner of Financial Regulation to further investigate opportunities for storing personal information utilizing blockchain technology.[89] In March 2017, Arizona passed the first smart contract legislation recognizing as legally enforceable signatures obtained through smart contracts under current electronic signature laws.[90]

States are beginning to recognize smart contracts and debate whether they fit within existing state laws or if they require unique regulations.[91] By engaging in active discussion and legislative efforts to statutorily recognize smart contracts, lawmakers are demonstrating their willingness to embrace new technologies. For example, in 2016, Delaware launched the Delaware Blockchain Initiative to explore blockchain technology and smart contracts—specifically, to determine if contracts hosted on a blockchain could fit within Delaware's existing corporate laws.[92] The Delaware Blockchain Initiative identified the potential value of smart contracts as effective new instruments, stating "smart contracts offer a powerful and innovative way to streamline cumbersome back-office procedures, lower transactional costs for consumers and businesses, and manage and reduce risk."[93]

Other states are emerging as smart contract supporters by passing legislation that recognizes smart contracts as valid legal instruments and ensuring their enforcement. Specifically, these laws recognize smart contract digital signatures as legally enforceable signatures or recognize agreements made through smart contracts as contractually enforceable in court.[94] For example, Arizona and Tennessee each passed legislation explicitly authorizing smart contracts by recognizing them and the

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89. *Id.*

90. H.B. 2417, 53rd Leg. (Ariz. 2017). *See also* Jeffrey Neuburger, *Arizona Passes Groundbreaking Blockchain and Smart Contract Law – State Blockchain Laws on the Rise*, PROSKAUER NEW MEDIA & TECH. L. BLOG (Apr. 20, 2017), https://newmedialaw.proskauer.com/2017/04/20/arizona-passes-groundbreaking-blockchain-and-smart-contract-law-state-blockchain-laws-on-the-rise/ [https://perma.cc/8VXL-2SYQ].

91. *See* Melanie Kramer, *Smart Contracts Are Seeping into U.S. Law—Tennessee Passes Bill*, BITCOINIST (Apr. 2, 2018), https://bitcoinist.com/smart-contracts-are-seeping-into-u-s-law-tennessee-passes-bill/ [https://perma.cc/JSB7-Q3JS].

92. Press Release, Delaware Office of the Governor, Governor Markell Launches Delaware Blockchain Initiative (May 2, 2016), https://www.prnewswire.com/news-releases/governor-markell-launches-delaware-blockchain-initiative-300260672.html [https://perma.cc/A9KV-98XY].

93. *Id.*

94. *See* Kramer, *supra* note 91.

"cryptographic signatures" which identify the transacting parties as legally enforceable and binding.[95] Arizona's new smart contract law explicitly "recognizes the validity of smart contracts under state law."[96] In comparison, Tennessee's newly-minted law "acknowledges smart contracts 'may exist in commerce' and that smart contracts are valid and enforceable under state law."[97] Both laws aim to enforce smart contracts through existing laws and procedures, such as through current electronic signature statutes and contract law.

Some states are beginning to take exploratory steps to evaluate the implications of allowing their citizens and corporations to utilize smart contracts.[98] For example, two state initiatives, the Delaware Blockchain Initiative[99] and Illinois Blockchain Initiative (the Illinois Blockchain and Distributed Ledger Task Force)[100] exemplify states taking extensive active measures to recognize blockchain technology and smart contracts. Delaware's initiative is wide-ranging, allowing "for the application of distributed ledger technology to many of the . . . most basic and critical legal documents."[101] Delaware is uniquely positioned to effect change across the United States; sixty-six percent of Fortune 500 firms are

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95. H.B. 2417, 53rd Leg. (Ariz. 2017); Pub. Ch. 591 (Tenn. 2018).

96. Mohammed Tashakor, *The New Kid On The Blockchain: Legislative Acceptance of Smart Contracts*, GEO. L. TECH. R. (Apr. 2018), https://georgetownlawtechreview.org/the-new-kid-on-the-blockchain-legislative-acceptance-of-smart-contracts/GLTR-04-2018/ [https://perma.cc/M5HH-8D9V].

97. *Id.* (citing Pub. Ch. 591 (Tenn. 2018)).

98. *See* Michael Baumert, *Contracting for Smart Contracts*, L. TECH. TODAY (Feb. 7, 2019), https://www.lawtechnologytoday.org/2019/02/contracting-for-smart-contracts/ [https://perma.cc/GP8C-5FFN]. *See, e.g.*, H.B. 2417, 53rd Leg. (Ariz. 2017); S. 269, 2018 Leg. (Ver. 2018).

99. Press Release, Delaware Office of the Governor, Governor Markell Launches Delaware Blockchain Initiative (May 2, 2016), https://www.prnewswire.com/news-releases/governor-markell-launches-delaware-blockchain-initiative-300260672.html [https://perma.cc/X98J-SQF7].

100. *See* Colin Wood, *Illinois Blockchain Initiative Launches Alongside Blockchain Business Liaison Role*, STATESCOOP (Nov. 30, 2016), https://statescoop.com/illinois-blockchain-initiative-launches-alongside-blockchain-business-liaison-role/ [https://perma.cc/BG7N-QJJS].

101. *See* Andrea Tinianow & Caitlin Long, *Delaware Blockchain Initiative: Transforming the Foundational Infrastructure of Corporate Finance*, HARV. L. SCH. F. ON CORP. GOVERNANCE AND FIN. REG. (Mar. 16, 2017), https://corpgov.law.harvard.edu/2017/03/16/delaware-blockchain-initiative-transforming-the-foundational-infrastructure-of-corporate-finance/ [https://perma.cc/7T66-HJRH].

incorporated in Delaware, filing countless documents, forms, and administrative items with Delaware's Secretary of State each year.[102]

Legislative actions and initiatives to legitimize smart contracts have not come without opposition. Critics point to several factors limiting the effectiveness of smart contract regulations by states, including a confusing "patchwork" of state regulations and ever-changing technology.[103] Some opponents have diminished state lawmakers' actions to "little more than pro-crypto posturing meant to attract investment and entrepreneurs."[104] This, the detractors note, occurs when states "go out of [their] way to legally recognize smart contracts," and are unnecessarily trying to amend situations already governed by "existing federal and state laws . . . [which] provide an 'unquestionable legal basis' [on which to enforce smart contracts]."[105]

Other critics have argued that existing federal regulations, such as the Electronic Signatures in Global and National Commerce Act ("ESIGN Act") or the more comprehensive Uniform Electronic Transactions Act ("UETA"), which regulates and authorizes the use of electronic signatures, already sufficiently encompass the digital "signatures" captured in smart contract transactions and therefore negate any further state action to recognize smart contracts.[106] Additionally, some states have taken separate proactive steps to ensure smart contract enforceability, including Tennessee's Amended Public Chapter No. 591—passed as H.B. 1507 in 2018—which explicitly authorizes digital

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102. *See* Delaware Division of Corporations, *About*, https://corp.delaware.gov/about agency/ [https://perma.cc/D7V3-N5GD] (last visited May 12, 2019).

103. *See* Mike Orcutt, *States That Are Passing Laws to Govern "Smart Contracts" Have No Idea What They're Doing*, MIT TECH. R. (Mar. 29, 2018), https://www.technologyreview.com/s/610718/states-that-are-passing-laws-to-govern-smart-contracts-have-no-idea-what-theyre-doing/ [https://perma.cc/Y2JB-TJX2]. In fact, the article's title best sums up the author's attitude toward states attempting to regulate smart contracts.

104. *Id.*

105. *Id.*

106. Electronic Signatures in Global and National Commerce Act, 15 U.S.C. §§ 7001-06 (2000); Uniform Electronic Transactions Act, National Conference of Commissioners on Uniform State Laws (1999), http://euro.ecom.cmu.edu/program/law/08-732/Transactions/ueta.pdf [https://perma.cc/2VLM-PCFL]; Amy D. Kim & Perianne Boring, *State-by-State Smart Contract Laws? If it Ain't Broke, Don't Fix It*, COINDESK (Feb. 26, 2018), https://www.coindesk.com/state-state-smart-contract-laws-aint-broke-dont-fix [https://perma.cc/N8WW-RU3E].

signatures, including those authorizing smart contracts, as electronic signatures recognized as legally enforceable under state law.[107]

B. STATES ON THE SIDE LINES

Other states, such as Florida, remain side-lined, unsure if they should proactively regulate smart contracts or wait for federal or uniform code guidance.[108] As of December 2018, forty-three states did not have any laws regulating smart contracts, the electronic signatures assenting to such contracts, or protections for parties utilizing this new technology.[109]

However, even states that stalled in passing smart contract legislation are still working to pass general blockchain technology and virtual currency legislation. For example, while Florida did not pass H.B. 1357 to regulate smart contracts, the state legislature did pass H.B. 1379 (now Florida Chapter 2017-155) in June 2017, defining "virtual currency broadly to include a currency that is not of a country."[110] The Florida legislature amended its public laws to include virtual currencies under the

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107. Tenn. Pub. Ch. 591 (2018) (the statute makes clear how cryptographic signatures received through smart contract transactions should be treated: "a cryptographic signature that is generated and stored through distributed ledger technology is considered to be in an electronic form and to be an electronic signature.").

108. *See* Nikhilesh De, *Florida Bill Would Legally Recognize Blockchain Signatures, Smart Contracts*, COINDESK (Jan 11. 2018), https://www.coindesk.com/florida-bill-legally-recognize-blockchain-signatures-smart-contracts [https://perma.cc/3PLN-P7UK]. Florida House Bill 1357 ultimately died on the calendar on March 10, 2018, without any votes or further actions.

109. *Smart Contract Legislation Updates by State*, SAGEWISE, https://www.sagewise.io/smart-contracts-state-legislation/ [https://perma.cc/WA2A-XVE9] (last visited May 12, 2019). The current list of states without smart contract legislation according to SageWise includes: Alabama, Alaska, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

110. *Florida Smart Contract Legislation*, SAGEWISE, https://www.sagewise.io/smart-contracts-state-legislation/smart-contract-legislation-florida/ [https://perma.cc/Y5QZ-7QAA] (last visited Apr. 9, 2019). *See also* H.B. 1379 (Fla. 2018) (defining "virtual currency" as a "medium of exchange in electronic or digital format that is not a coin or currency of the United States or any other country").

Florida Money Laundering Act.[111] Florida weighed regulation against non-regulation as cryptocurrencies and other blockchain technologies flourished in an unregulated market.[112]

Despite advancing legislation for virtual currencies, Florida has not passed regulations for other blockchain technologies, including smart contracts. For example, Florida's House of Representatives introduced H.B. 1357 in January 2018 and the bill quickly advanced to several committees for review and comment.[113] The Bill passed all committee votes unanimously, demonstrating strong support by the subject-specific committees.[114] After passing the Government Accountability Committee and being put to a full House vote in March 2018, the bill was postponed indefinitely, withdrawn from consideration the following day, and has not been resubmitted.[115]

As state legislatures continue to propose new bills in support of smart contracts or continuously postpone their enactment, a pattern has emerged. As discussed in the next section, bipartisan support has emerged in several states to recognize smart contracts as enforceable legal instruments. These states have acted as "canaries in the mine" while other state legislatures have watched closely.[116] The next Section specifically

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111. Fla. Cha. 2017-155 (2017), https://www.flsenate.gov/Session/Bill/2017/1379/BillText/Filed/PDF [https://perma.cc/4WSQ-6CXN].

112. *See* Brett Schwab, *State-Level Legislation Anticipates Wide-Spread Business Use of Blockchain*, BLOCKCHAIN AND THE LAW (Feb. 9, 2018), https://www.blockchainandthelaw.com/2018/02/state-level-legislation-anticipates-wide-spread-business-use-of-blockchain/ [https://perma.cc/H3WN-VJ4S]. Note that other state legislatures use the term "cryptocurrency" interchangeably with the term "virtual currency." *See, e.g.*, H.B. 215, 2017 Leg., Reg. Sess. (Ala. 2017) § 8-7A-2(10).

113. H.B. 1357 (Fla. 2018).

114. *See id.* The bill passed the Oversight, Transparency, and Administration Subcommittee with a 12-0 vote, the Government Operations and Technology Appropriations Subcommittee with a 21-0 vote, the Appropriations Committee with a 25-0 vote, and, finally, the Government Accountability Committee with a 21-0 vote. *Id.*

115. *See id.* The legislative history of H.B. 1357 is sparse, showing a mere 25% progression of the bill through the legislative process before the matter died on the calendar. Florida has yet to propose an alternative bill, perhaps waiting for other states to enact model statutes or predicting a future federal law regulating smart contracts.

116. In the context of this Note, the term "canaries in the mine" serves as an allusion to the now-retired use of caged canaries (small birds) which miners would carry down into mine tunnels to detect dangerous gases. In the presence of a dangerous gas, such as carbon monoxide, the old adage indicated that the canaries would perish, a clear sign to miners that the mine tunnel was unsafe.

examines three "canaries" in greater detail: Arizona, Tennessee, and New York.

C. RECENT FEDERAL ENFORCEMENT ACTIONS

State legislatures currently face an uncertain regulatory landscape as more of their constituents increasingly use blockchain technologies. Legislators face a daunting task of implementing protective regulations without stifling new technologies. In a regulatory environment where federal regulations or uniform codes regulating blockchain technology or smart contracts still have not been implemented, states face novel legal and legislative questions without any preemptive federal guidance.[117]

As of December 2018, federal agencies have taken two enforcement actions that may help provide guidance regarding protective measures states could employ. Both the U.S. Commodity Futures Trading Commission (CFTC) and the U.S. Securities and Exchange Committee (SEC) have issued publications, held hearings, and enforced their respective agency rules in blockchain-related matters.[118] Both enforcement actions, which will be discussed in greater detail below, demonstrate that U.S. regulators are increasing scrutiny, watching market participants closely, and are willing to utilize existing statutory rules at their disposal to regulate blockchain technologies.[119]

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117. States also face "potential federal pre-emption challenges and have the potential of harming the adoption of smart contracts." CHAMBER DIGITAL COM., *supra* note 4, at 11 n.2. Other than ESIGN and UETA, states may encounter preemption challenges in the near future if Congress decides to regulate blockchain technologies, including smart contracts. Given the cross-border and broad reach of smart contracts, the federal government likely has a valid regulation interest. *See generally id.*

118. *See A Primer on Smart Contracts*, U.S. COMMODITY FUTURES TRADING COMMISSION (Nov. 27, 2018), https://www.cftc.gov/sites/default/files/2018-11/LabCFTC_PrimerSmartContracts112718.pdf [https://perma.cc/3WV7-HVEL]; Press Release, U.S. Securities & Exchange Commission, *SEC Charges EtherDelta Founder with Operating an Unregistered Exchange* (Nov. 8, 2018), https://www.sec.gov/news/press-release/2018-258 [https://perma.cc/D6Y6-S7H3]; *see also Bitcoin*, U.S. COMMODITY FUTURES TRADING COMMISSION, https://www.cftc.gov/Bitcoin/index.htm [https://perma.cc/3WV7-HVEL] (last visited May 12, 2019).

119. James G. Gatto, *Smart Contract Developers Beware and Lawyer Up!*, NAT'L L. REV. (Nov. 27, 2018), https://www.natlawreview.com/article/smart-contract-developers-beware-and-lawyer [https://perma.cc/S2K7-5YQA].

Two recent federal enforcement actions by the CFTC and SEC reveal, in part, the stance of federal agencies regarding smart contract enforceability.[120] Both agencies approach smart contracts by applying existing trade and securities regulations, demonstrating an overall federal approach of interpreting smart contracts under existing statutes rather than implementing new and specific regulations.[121] The CFTC has broad regulatory control over the derivatives, futures, and swaps markets—the latter accounting for over $400 trillion traded between individuals.[122] Some smart contracts are designed to operate as derivative contracts, prompting the CFTC to issue preliminary guidance regarding how the agency may regulate smart contracts operating in the futures and swaps markets in the future.[123]

The CFTC identified smart contracts operating as derivative contracts as operational risks to market participants.[124] The CFTC even created an entire section of its website dedicated to Bitcoin and smart contract regulations and information.[125] The CFTC also notes that "governance standards and frameworks [for smart contracts] appear to be in early phases of development," and, ultimately, such standards adopted by agencies like the CFTC may be too presumptive given their basis on a

120. *See id.*

121. *See generally* sources cited *supra* note 120.

122. *See* U.S. COMMODITY FUTURES TRADING COMMISSION, MISSION & RESPONSIBILITIES, https://www.cftc.gov/About/MissionResponsibilities/index.htm [https://perma.cc/VRP7-GGP6] (last visited Apr. 9, 2019). The CFTC regulates financial markets avoiding "systematic risks" to "protect market users and their funds, consumers, and the public from fraud, manipulation, and abusive practices" relating to products subject to the Commodity Exchange Act. *Id.* A derivative contract is defined as a "financial instrument that is linked to a specific financial instrument or indicator or commodity, and through which specific financial risks can be traded in financial markets in their own right." Derivative contracts derive their value from the underlying assets or commodities of the contract and can be freely traded between parties in order to reduce risk, hedge against rising or falling costs, and speculation. The term "derivatives" generally includes future and swap contracts, all of which are regulated by the CFTC. *See Financial Derivatives*, INTERNATIONAL MONETARY FUND, https://www.imf.org/external/np/sta/fd/index.htm [https://perma.cc/WRV7-VT83] (last visited May 12, 2019).

123. *See A Primer on Smart Contracts*, *supra* note 120.

124. *See id.*

125. *See* U.S. COMMODITY FUTURES TRADING COMMISSION, BITCOIN, https://www.cftc.gov/Bitcoin/index.htm [https://perma.cc/2GCQ-VTYR] (last visited Apr. 26, 2019).

tenuous understanding of blockchain technology and its many complex applications.[126]

The SEC surpasses the CFTC in terms of its scrutiny of blockchain technology, having levied numerous rules and enforcement actions on virtual currencies,[127] security tokens,[128] initial coin offerings,[129] and smart contracts.[130] In one of the first related enforcement actions, the SEC brought action against EtherDelta, a decentralized cryptocurrency trading platform, for its operation of an unregistered national securities

126. *See A Primer on Smart Contracts*, *supra* note 120, at 31.

127. Report of Investigation Pursuant to Section 21(a) of the Sec. Exch. Act of 1934: The DAO, Release No. 81207 (July 25, 2017), https://www.sec.gov/litigation/investreport/34-81207.pdf [https://perma.cc/G7CT-EYGD] (the Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934 defined virtual currencies as "investment contracts" and, therefore, subject to the provisions of the Securities Exchange Act of 1934). The SEC continues to charge companies for unregistered virtual currency token sales, stating "we have made it clear that companies that issue securities through ICOs are required to comply with existing statutes and rules governing the registration of securities." *See Two ICO Issuers Settle SEC Registration Charges, Agree to Register Tokens as Securities*, U.S. SECURITIES & EXCHANGE COMMISSION (Nov. 16, 2018) https://www.sec.gov/news/press-release/2018-264 [https://perma.cc/JD7D-FABY].

128. *See Public Statement on Digital Asset Securities Issuance and Trading*, U.S. SECURITIES & EXCHANGE COMMISSION (Nov. 16, 2018), https://www.sec.gov/news/public-statement/digital-asset-securites-issuuance-and-trading [https://perma.cc/BR7X-6BHH] (noting that "market participants must still adhere to our well-established and well-functioning federal securities law framework when dealing with technological innovations, regardless of whether the securities are issued in certificated form or using new technologies, such as blockchain").

129. *See generally Spotlight on Initial Coin Offerings (ICOs)*, U.S. SECURITIES & EXCHANGE COMMISSION, https://www.sec.gov/ICO [https://perma.cc/5FM2-S8TW] (last visited Apr. 7, 2019) (clarifying the SEC's broad enforcement abilities and reminding participants that "[w]hile these digital assets and the technology behind them may present a new and efficient means for carrying out financial transactions, they also bring increased risk of fraud and manipulation because the markets for these assets are less regulated than traditional capital markets").

130. *See* Gatto, *supra* note 121. The SEC's action against EtherDelta was the first enforcement action levied by the SEC against an online platform specifically for its use of smart contracts.

exchange.[131] EtherDelta's product brought buyers and sellers together on a collective exchange where digital asset securities were exchanged via smart contracts.[132]

The SEC's action against EtherDelta clearly demonstrates that the SEC's definition of a "security" is expansive and that cryptocurrencies are no exception.[133] The SEC's action against EtherDelta ultimately revealed two key federal policies: (1) the trading apparatuses used to trade digital assets, such as cryptocurrencies, fall under the SEC's regulations in most circumstances where "securities" are involved in the exchange,[134] and (2) the SEC will regulate smart contracts involving securities pursuant to the Securities and Exchange Act of 1934.[135]

D. CANARIES IN THE MINE: ARIZONA, TENNESSEE, AND NEW YORK

Several states are pressing to pass comprehensive state laws regulating smart contracts, despite the threat of preemption challenges from federal laws and regulations. Arizona, Tennessee, and New York have passed, or are in the process of passing, individual state laws regulating and recognizing the use of smart contracts.[136] These states have legitimized smart contracts through proactive regulation, rather than by

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131. *See* Press Release, *supra* note 120. *See also* Daniel Nathan et al., *EtherDelta Founder's Settlement with the SEC Has Grim Implications for Smart Contract Developers*, ORRICK BLOCKCHAIN AND CRYPTOCURRENCY BLOG (Nov. 19, 2018), https://blogs.orrick.com/blockchain/etherdelta-founders-settlement-with-the-sec-has-grim-implications-for-smart-contract-developers/ [https://perma.cc/8TBH-AXNL] (noting that the SEC's first enforcement action served as notice to smart contract developers "that by releasing code into the [blockchain], they are inviting potential liability for any rule violations [of other participants on the blockchain].").

132. *See id.*

133. *See* Public Statement of Jay Clayton, Chairman, U.S. Securities and Exchange Commission, Statement on Cryptocurrencies and Initial Coin Offerings (Dec. 11, 2017), https://www.sec.gov/news/public-statement/statement-clayton-2017-12-11 [https://perma.cc/8WC9-A7TB].

134. *See* Public Statement, U.S. Securities and Exchange Commission, Divisions of Enforcement and Trading and Markets, Statement on Potentially Unlawful Online Platforms for Trading Digital Assets (Mar. 7, 2018), https://www.sec.gov/news/public-statement/enforcement-tm-statement-potentially-unlawful-online-platforms-trading [https://perma.cc/8JWZ-C6J8].

135. *See* Public Statement, *supra* note 130.

136. *See infra* Part III.D.

relying on the federal statute ESIGN,[137] uniform codes such as UETA,[138] or actions by federal enforcement agencies (the CFTC and SEC).[139]

Arizona was the first state to pass smart contract-specific legislation in 2017, authorizing the use of smart contracts in commerce and codifying into law the definitions of "blockchain technology" and "smart contracts."[140] The 2017 law amended the Arizona Electronic Transaction Act (AETA).[141] The statute specifically defines "smart contracts" as an "event-driven program . . . that runs on a distributed, decentralized, shared and replicated ledger [] that can take custody over and instruct transfer of assets on that ledger."[142] Whereas a narrower definition could have severely limited smart contract use, this broad definition allows smart contracts to handle transfers of any type of asset from cryptocurrencies to mortgages, securities, and other transferrable assets.[143]

In 2018, Tennessee passed legislation recognizing smart contracts.[144] Of the six states that have proposed or passed smart contract legislation,[145] only Tennessee and Ohio have passed smart contract legislation without first passing general blockchain technology legislation.[146] Tennessee's

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137. Electronic Signatures in Global and National Commerce Act, 15 U.S.C. §§ 7001-06 (2000).

138. Uniform Electronic Transactions Act, National Conference of Commissioners on Uniform State Laws (1999), http://euro.ecom.cmu.edu/program/law/08-732/Transactions/ueta.pdf [https://perma.cc/E8ME-6632].

139. *See A Primer on Smart Contracts*, *supra* note 120; *see also* Press Release, *supra* note 120.

140. H.B. 2417, 53rd Leg. (Ariz. 2017).

141. *See* Neuburger, *supra* note 90.

142. H.B. 2417, 53rd Leg. (Ariz. 2017).

143. *Id.*; *see generally* Neuburger, *supra* note 90. Arizona's legislature made clear that smart contracts are valid and enforceable, dictating: "Smart contracts may exist in commerce. A contract relating to a transaction may not be denied legal effect, validity or enforceability solely because that contract contains a smart contract term." H.B. 2417, 53rd Leg. (Ariz. 2017).

144. Tenn. Pub. Ch. 591 (2018) (interestingly, Tennessee passed this law before passing other legislation recognizing blockchain technology in general).

145. As of September 2018, the list of states with proposed or passed smart contract legislation includes: Arizona, Tennessee, Vermont, Ohio, New York, and Nebraska. *See* Kimpel & Adcock, *supra* note 9.

146. *See* Jonathan Mollod, *Ohio and California Join Other States in Passing Blockchain-Friendly Legislation*, PROSKAUER BLOCKCHAIN & L. (Oct. 8, 2018), https://www.blockchainandthelaw.com/2018/10/ohio-and-california-join-other-states-in-passing-blockchain-friendly-legislation/ [https://perma.cc/Z3MC-E5KJ].

new law closely imitates the provisions of Arizona's new law, Title 44, Chapter 26,[147] as it defines both "blockchain technology" and "smart contract" and legitimizes smart contracts.[148] While nearly identical in language to Arizona's law, Tennessee's measure to legitimize smart contracts is a clear indication of both the state's interest in the field of blockchain technology and its decision to preemptively regulate smart contracts and blockchain technology rather than rely on existing outdated state and uniform laws. Tennessee's nearly identical legislation demonstrates a new movement amongst states "to harmonize state laws around electronic records with blockchain-based data" and provides a common framework for other states to potentially adopt.[149]

New York is the last of these three states to pass smart contract legislation, making it somewhat innovative as an early adopter of smart contracts, but still fairly dependent on the legislative language enacted in Arizona and Tennessee.[150] The bill, S.B. 8858, amends New York's technology laws and reflects similar language utilized in the Arizona and Tennessee bills.[151] Using comparable legislative language is likely strategic—by passing uniform legislative measures, a state reduces redundancy, disparate definitions, and conflicting laws that could lead to conflicts among consumers.

New York's proposed bill was one of four blockchain-related bills proposed in New York in late 2017, demonstrating New York's efforts to recognize blockchain technologies, including smart contracts.[152] State legislators largely have supported the bill, with some, such as Representative Ron Kim (D–Whitestone, NY) declaring: "New York must be in the forefront of [blockchain technology adoption]."[153] Similar

147. H.B. 2417, 53rd Leg. (Ariz. 2017); Tenn. Pub. Ch. 591 (2018).

148. Tenn. Pub. Ch. 591 (2018).

149. Stan Higgins, *Tennessee Might Also Recognize Blockchain Data Through Proposed Law*, COINDESK (Jan. 12, 2018), https://www.coindesk.com/tennessee-might-also-recognize-blockchain-data-proposed-law [https://perma.cc/XEH3-KL73].

150. *See generally Smart Contracts State Legislation*, SAGEWISE, https://www.sagewise.io/smart-contracts-state-legislation/ [https://perma.cc/8PMX-VE6W] (last visited Apr. 9, 2019).

151. S.B. 8858 Gen. Assemb. (N.Y. 2017); *see generally* Tenn. Pub. Ch. 591 (2018); H.B. 2417, 53rd Leg. (Ariz. 2017).

152. Nikhilesh De, *4 Blockchain Bills Introduced in New York Legislature*, COINDESK (Dec. 4, 2017), https://www.coindesk.com/4-blockchain-bills-introduced-new-york-legislature [https://perma.cc/QP9D-7ZU9].

153. *See* Zima, *supra* note 80**.**

to the Arizona and Tennessee legislatures, New York is in the process of providing guidance to those market participants who are utilizing smart contracts.[154] This guidance is particularly important in New York given its status as the crossroads of the financial markets and the increasing prevalence of transactions that utilize smart contracts.[155]

All three states apply nearly identical language in their legislation, acknowledging two key legal aspects: (1) the laws authorize smart contracts to legally record information to store or transmit that information across a blockchain, and (2) the laws explicitly acknowledge that "smart contracts may exist in commerce" without prejudice because the contract is represented in digital code rather than a traditional format.[156]

Arizona, Tennessee, and New York have developed similar legislation to account for the increased utilization of blockchain technology and smart contracts.[157] As more constituents and companies incorporated in each state begin to use or explore the use of smart contracts, each state has an increasing interest in developing laws to provide assurances and protections. Individual states passing different legislation, however, with varying definitions, rules, and impacts, could create an inter-state headache for smart contract users.

IV. THE MINE: CHARTING A COURSE TOWARD UNIFORMITY

Thus far, this Note has addressed some of the legal and regulatory challenges faced by smart contract legislation, including preemption challenges that states face with existing federal laws such as ESIGN and actions taken by the CFTC and SEC.[158] As discussed, however, states have taken proactive steps by passing legislation despite potential future challenges and differences by other state statutes.

Beyond the legal and regulatory issues, this Note posits that any legitimization of smart contracts requires that all states, including the states that have already passed basic legislation, adopt uniform codes.

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154. *See id.*

155. *See id.*

156. *See* Tenn. Pub. Ch. 591 (2018); H.B. 2417, 53rd Leg. (Ariz. 2017); S.B. 8858 Gen. Assemb. (N.Y. 2017).

157. *Id.*

158. *See supra* Part III.

Rather than individual state regulations, a uniform code instead should recognize and authorize the use of smart contracts across the entire United States.[159]

Some blockchain supporters, such as the Chamber of Digital Commerce, are already suggesting uniformity to combat uncertainty.[160] The Chamber of Digital Commerce released several policy arguments that smart contracts are enforceable under current laws including the ESIGN Act (federal law) and UETA (uniform code).[161] The Chamber of Digital Commerce's argument to utilize existing uniform laws, however, is already past ripeness. Arizona, Tennessee, New York, and other states with pending smart contract legislation demonstrate that states are generally interested in directly regulating a new class of contracts through new, federal statutes rather than waiting to adopt uniform statutes.[162]

There are two options for a uniform code that recognizes and legitimizes smart contracts: (1) draft and adopt new uniform provisions in conjunction with the Uniform Law Commission,[163] the National College of State Legislatures,[164] and state legislators; or (2) amend the UETA to include smart contract-specific provisions. Both options respond to the growing use of smart contracts and preemptively prevent cross-jurisdiction conflicts.

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159. Some lawmakers have become vocal about the need for their specific states to pass legislation or risk being regarded as too slow to innovate. For example, Nebraska State Senator Carol Blood argued during a committee hearing for her Bill LB694 that: "Several states like Vermont, Utah, and Arizona, have passed laws similar to LB694. The bottom line is that it won't be long before all of the states have to start making decisions and have missed the window of opportunity to define the technology and lay a good foundation for its use." Transcript, Neb., Government, Military and Veterans Affairs Committee at 26 (Feb. 21, 2018) https://www.nebraskalegislature.gov/FloorDocs/105/PDF/Transcripts/Government/2018-02-21.pdf [https://perma.cc/5ZEL-T7RQ].

160. *See* Chamber of Digital Commerce, *"Smart Contracts" Legal Primer* (Jan. 2018), https://digitalchamber.org/wp-content/uploads/2018/02/Smart-Contracts-Legal-Primer-02.01.2018.pdf [https://perma.cc/LU2Q-HWUV]

161. *See generally id.*

162. *See generally* Levi & Lipton, *supra* note 44, at 4-5 (explaining that the fact that these states have adopted decidedly different definitions of those critical terms suggests that as more states follow their lead, there may be increasing pressure to adopt unified definitions to reflect blockchain and smart contract developments).

163. *Overview*, UNIFORM LAW COMMISSION, https://my.uniformlaws.org/aboutulc/overview [https://perma.cc/76J4-5TAS] (last visited Apr. 9, 2019).

164. NAT'L CONF. ST. LEGISLATURES, http://www.ncsl.org/ [https://perma.cc/2VPD-VYBG] (last visited Apr. 9, 2019).

Based on the above discussion and accounting for the complex legislative process—especially when dealing with fifty different legislatures—this Note proposes that the most effective means of implementing uniformity is to amend the Uniform Electronic Transactions Act (the "Amended UETA"). Amending an existing uniform act that has already been enacted across the United States would reduce inter-jurisdiction friction, expeditiously resolve gaps currently in state laws, and provide a legal framework for smart contracts. An Amended UETA should include blockchain and smart contract-specific language and definitions. Additionally, further provisions must cover potential liabilities, disputes between contracting parties, and account for future advances in blockchain and smart contract technology.

This Note summarizes below a proposed Amended UETA that includes blockchain technology and smart contracts.[165] While not complete, this proposed amendment to the existing uniform code is likely the fastest way to render each states' agreement to formally regulate and recognize smart contracts. Additionally, this Note has drafted a complete iteration of the Amended UETA incorporating all the proposals below in the Appendix, titled the Proposed Amended Uniform Electronic Transactions Act.

A. NEW DEFINITIONS

The Amended UETA must include additional definitions to ensure smart contracts, and the blockchain technology underlying those contracts, are specifically defined in the Act and explicitly covered by its provisions. Terms including "Blockchain," "Smart Contract," and "Digital Signature" should be added to provide clarity of the Act's scope and purpose.

Since blockchain technology forms the foundation of smart contracts, the definition should be broad enough to capture the function of smart contracts as well as the other countless technologies it enables.[166] "Blockchain" should be defined as "a digital database in the form of a distributed ledger containing information, such as records of financial

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165. See *infra* Appendix.

166. *See* Andrew R. Sorkin, *Demystifying the Blockchain*, N.Y. TIMES (Jun. 27, 2018), https://www.nytimes.com/2018/06/27/business/dealbook/blockchain-technology.html [https://perma.cc/8K62-X3CJ].

transactions, that can be simultaneously used and shared by participants within a large decentralized network."[167] This definition broadly encompasses three major components of any blockchain: (i) a digital database, (ii) in the form of a decentralized or distributed ledger, and (iii) containing important information.

Digital signatures are also an important feature of the blockchain technology that make smart contracts possible. "Digital Signatures" are the mathematical scheme for presenting the authenticity of Electronic Signatures and electronic records using asymmetric cryptography.[168] Confirming the authenticity of each party's consent via mathematical coding is a core concept of smart contract's appeal as a secure method of contracting. The UETA requires signature, or some form of electronic signature, to confirm the authority of the parties entering into contracts. The same process should be followed for smart contracts, although with more technical aspects. This definition is imperative to connect the execution authority of smart contracts to the UETA's existing framework for confirming party identity.

Lastly, "Smart Contracts" should be defined as "electronic code that, upon the occurrence of (a) specified condition(s), is capable of running automatically according to pre-specified functions to execute a transaction between parties, stored and processed on a Blockchain or other distributed network and authenticated by a Digital Signature."[169] The definition for smart contracts must be sufficiently broad to encompass all types of contracts that parties may enter into. While smart contracts are not widely used at the moment, smart contracts have the potential for use across many different types of transactions, industries, and parties.

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167. *See, e.g.*, *Blockchain*, MERRIAM-WEBSTER DICTIONARY, https://www.merriam-webster.com/dictionary/blockchain [https://perma.cc/6VHM-XLV9] (last visited Apr. 9, 2019). This definition is largely based on the definition available in the Merriam Webster Dictionary, with some additions.

168. *See* Ravikant Agrawal, *Digital Signature for Blockchain Context*, MEDIUM (May 24, 2018), https://medium.com/@xragrawal/digital-signature-from-blockchain-context-cedcd563eee5 [https://perma.cc/WC6W-25P6].

169. Many different definitions have been proposed by different policy groups, lawyers, and researchers. However, the definition from the Chamber of Digital Commerce is inclusive of both the legal and technical aspects of a smart contract. *See "Smart Contracts" Legal Primer*, *supra* note 162.

B. LEGAL RECOGNITION

Legal recognition of the enforceability of smart contracts must take precedence in the Amended UETA to ensure consistent legal interpretation, regardless of which states' jurisdiction may apply to a specific smart contract—if any state jurisdiction is applicable at all. The electronic code underlying the smart contract must be recognized as the smart contract's written "language" that can be interpreted to encompass the smart contract's scope, consideration, performance, and other important provisions.

C. ERRORS

Errors resulting from a smart contract's execution or faulty coding is a serious concern by many commentators.[170] The irreversible nature of smart contracts causes concern since there is currently no doctrine, law, or legal precedence for reversing an error or mistake in a smart contract.

New provisions and language in the Amended UETA should address two major areas. First, errors must be reversible by request of either party by completing a reversed transaction. Second, any such reversal should be recorded on the same blockchain where the original transaction occurred.

D. CONTROLLING SUBSTANTIVE LAW

Much of the legal debate over smart contracts relates to concerns regarding a smart contract's enforceability in a court of law.[171] However, a more fundamental issue is determining which jurisdiction's laws will interpret the terms of the agreement. Jurisdictional challenges and interstate conflicts should be addressed since the underlying electronic code of smart contracts freely permeates state and federal jurisdiction boundaries. Therefore, the Amended UETA should specify the choice of law jurisdiction, especially when dealing with smart contracts that often

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170. *See* Theodore J. Mlynar & Ira J. Schaefer, *Blockchain smart contracts need a new kind of due diligence*, LEXOLOGY (Mar. 21, 2018) https://www.lexology.com/library/detail.aspx?g=bebe2353-69c3-425b-89ad-d22ffd7b469c [https://perma.cc/R45J-6XTL] (citing a statistic that out of roughly 19,000 smart contracts hosted on ethereum, forty-four percent had vulnerabilities or errors that could negatively impact either party).

171. *See* Levi & Lipton, *supra* note 44.

cross inter-state borders. Most smart contracts likely will not contain choice of law provisions like a traditional written contract, so it is imperative to give guidance in the Amended UETA for parties to understand which venue will be used in the case of a dispute.[172]

E. DISPUTES, ARBITRATION

Disputes inevitably will occur between contracting parties utilizing smart contracts. The irreversible nature, unclear jurisdiction, and potential anonymous parties contribute to the uncertainty of resolving disputes. The Amended UETA should require parties to submit disputes to dispute resolution proceedings or arbitration hearings to efficiently and conclusively provide contracting parties with tools to resolve disputes.[173]

CONCLUSION

Blockchain technology, including smart contracts, has proliferated over the past decade and continues to attract new adherents, investors, developers, and applications. With major private institutions including IBM and regulatory agencies such as the SEC and CFTC already taking vested interests in smart contracts, it is time for legislators to seriously consider how smart contracts will begin to perform an integral requirement of commerce. By instantaneously self-executing agreements between parties without human error or other inefficiencies, smart contracts are likely here to stay.

State legislatures should take proactive steps to regulate smart contracts and to provide assurances to transacting parties. While a few states have already laid some statutory groundwork, a different approach is necessary to permit all states to regulate smart contracts uniformly. Because a smart contract exists on a decentralized network that does not recognize state boundaries, it is imperative that states operate uniformly to allow this explosive and promising technology to continue to grow.

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172. *See id.* (noting that smart contracts, even though they are not technically in writing, still fall under the general purview of state contract laws and likely within the parameters on the Uniform Commercial Code).

173. *See* James Rogers, et. al., *Arbitrating Smart Contract Disputes*, 9 INT'L ARB. REPORT 21, 21 (Oct. 2017) http://www.nortonrosefulbright.com/knowledge/ publications /157162/arbitrating-smart-contract-disputes [https://perma.cc/UGA8-9E JQ].

APPENDIX

PROPOSED *AMENDED* UNIFORM ELECTRONIC TRANSACTIONS ACT (ABBREVIATED TEXT)[174]

SECTION 1. SHORT TITLE. This Act may be cited as the *Amended* Uniform Electronic Transactions Act.

SECTION 2. DEFINITIONS. In this Act:

(1) "Agreement" means the bargain of the parties in fact, as found in their language or inferred from other circumstances and from rules, regulations, and procedures given the effect of agreements under laws otherwise applicable to a particular transaction. *For clarification, "language" shall include electronic codes recorded on a blockchain and transmitted between parties.*

(2) "Automated Transaction" means a transaction conducted or performed, in whole or in part, by electronic means, electronic records, *or on a blockchain,* in which the acts or records of one or both parties are not reviewed by an individual in the ordinary course in forming a contract, performing under an existing contract, or fulfilling an obligation required by the transaction.

(3) *"Blockchain" means a digital database in the form of a distributed ledger containing information, such as records of financial transactions, that can be simultaneously used, shared, and authenticated by participants within a decentralized network.*[175]

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174. *See* Electronic Signatures in Global and National Commerce Act, 15 U.S.C. §§ 7001-06 (2000). The proposed changes as depicted in the Appendix are based on the author's analysis and understanding of smart contracts, blockchain technology, and the existing UETA statute. This appendix includes the Uniform Electronic Transactions Act in normal text with the author's proposed additions identified in italics and removals identified with strikethroughs. The author has named the proposed act the "Amended Uniform Electronic Transactions Act," as no such Act as been officially proposed or published at the time of this writing.

175. *See, e.g.*, "Blockchain," MERRIAM-WEBSTER DICTIONARY, https://www.merriam-webster.com/dictionary/blockchain [https://perma.cc/6VHM-XLV9] (last visited Feb. 9, 2019). This definition is largely based on the definition available in the Merriam Webster Dictionary, with some additions.

(4) "Computer Program" means a set of statements or instructions to be used directly or indirectly in an information processing system in order to bring about a certain result.
(5) "Contract" means the total legal obligation resulting from the parties' agreement as affected by this Act and other applicable law.
(6) *"Digital Signature" means a mathematical scheme for presenting the authenticity of Electronic Signatures and electronic records using asymmetric cryptography.*[176]
(7) "Electronic" means relating to technology having electrical, digital*, blockchain*, magnetic, wireless, optical, electromagnetic, or similar capabilities.
(8) "Electronic Agent" means a computer program or an electronic or other automated means used independently to initiate an action or respond to electronic records or performances in whole or in part, without review or action by an individual.
(9) "Electronic Record" means a record created, generated, sent, communicated, received, or stored by electronic means*, including on a blockchain.*
(10) "Electronic Signature" means an electronic sound, symbol, or process attached to or logically associated with a record and executed or adopted by a person with the intent to sign the record.
(11) "Governmental Agency" means an executive, legislative, or judicial agency, department, board, commission, authority, institution, or instrumentality of the federal government or of a State or of a county, municipality, or other political subdivision of a State.
(12) "Information" means data, text, images, sounds, codes, computer programs, software, databases, or the like.
(13) "Information processing system" means an electronic system for creating, generating, sending, receiving, storing, displaying, or processing information.
(14) "Person" means an individual, corporation, business trust, estate, trust, partnership, limited liability company, association, joint venture, governmental agency, public corporation, or any other legal or commercial entity*, whether represented in person or in electronic form*.

176. *See* Agrawal, *supra* note 170.

(15) "Record" means information that is inscribed on a tangible medium or that is stored in an electronic or other medium*, including on a blockchain*~~, and is retrievable in perceivable form~~.

(16) "Security Procedure" means a procedure employed for the purpose of verifying that an Electronic Signature, record, or performance is that of a specific person or for detecting changes or errors in the information in an electronic record. The term includes a procedure that requires the use of algorithms or other codes, identifying words or numbers, encryption, or callback or other acknowledgment procedures.

(17) "State" means a State of the United States, the District of Columbia, Puerto Rico, the United States Virgin Islands, or any territory or insular possession subject to the jurisdiction of the United States. The term includes an Indian tribe or band, or Alaskan native village, which is recognized by federal law or formally acknowledged by a State.

(18) *"Smart Contracts" means electronic code that, upon the occurrence of a specified condition(s), is capable of running automatically according to pre-specified functions to execute a transaction between parties. The code may be stored and processed on a Blockchain or other distributed network and authenticated by a Digital Signature.*[177]

(19) "Transaction" means an action or set of actions occurring between two or more persons relating to the conduct of business, commercial, *personal,* or governmental affairs.

SECTION 3. SCOPE.

(a) Except as otherwise provided in subsection (b), this Act applies to electronic records*, smart contracts,* and electronic signatures relating to a transaction *contemplated, negotiated, transferred, or recorded through electronic means including a blockchain*.

(b) This Act does not apply to a transaction to the extent it is governed by:

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177. Many different definitions have been proposed by different policy groups, lawyers and researchers. However, the definition included in Section 2, (17) is a definition from the Chamber of Digital Commerce that is inclusive of both the legal and technical aspects of a smart contract. *See "Smart Contracts" Legal Primer*, *supra* note 162.

(1) a law governing the creation and execution of wills, codicils, or testamentary trusts;
(2) The Uniform Commercial Code other than Sections 1-107 and 1-206, Article 2, and Article 2A;
(3) The Uniform Computer Information Transactions Act; and
(4) Other laws, if any, identified by State.

(c) This Act applies to an electronic record or electronic signature otherwise excluded from the application of this Act under subsection (b) to the extent it is governed by a law other than those specified in subsection (b).

(d) A transaction subject to this Act is also subject to other applicable substantive law.

SECTION 4. PROSPECTIVE APPLICATION.

(1) This Act applies to any electronic record*, smart contract,* or electronic signature created, generated, sent, communicated, received, or stored on or after the effective date of this Act.

(2) *Transactions involving smart contracts are considered electronic records which are created, generated, sent, communicated, received, and stored on a blockchain on or after the effective date of this Act.*

SECTION 5. USE OF ELECTRONIC RECORDS AND ELECTRONIC SIGNATURES; VARIATION BY AGREEMENT.

[No changes necessary to Section 5. The original language remains unchanged.]

SECTION 6. CONSTRUCTION AND APPLICATION. This Act must be construed and applied:

(1) to facilitate electronic transactions*, including smart contracts*, consistent with other applicable law;

(2) to be consistent with reasonable practices concerning electronic transactions*, including smart contracts,* and with the continued expansion of those practices; and

(3) to effectuate its general purpose to make uniform the law with respect to the subject of this Act among States enacting it.

SECTION 7. LEGAL RECOGNITION OF ELECTRONIC RECORDS, ELECTRONIC SIGNATURES, AND ~~ELECTRONIC~~ *SMART* CONTRACTS.

(a) A record, signature*, or smart contract* may not be denied legal effect or enforceability solely because it is in electronic form.

(b) A *[smart]* contract may not be denied legal effect or enforceability solely because an electronic record was used in its formation. *The electronic code representing a smart contract may not be denied legal effect in determining the rights, duties, obligations, or consideration of either party to a transaction utilizing a smart contract.*

(c) If a law requires a record to be in writing, an electronic record*, including a transaction recorded on a blockchain*, satisfies the law.

(d) If a law requires a signature, an electronic signature satisfies the law.

SECTION 8. PROVISION OF INFORMATION IN WRITING; PRESENTATION OF RECORDS.

(a) If parties have agreed to conduct a transaction by electronic means and a law requires a person to provide, send, or deliver information in writing to another person, the requirement is satisfied if the information is provided, sent, or delivered, as the case may be, in an electronic record capable of retention by the recipient at the time of receipt. An electronic record is not capable of retention by the recipient if the sender or its information processing system inhibits the ability of the recipient to print or store the electronic record. *Such requirement for retention is satisfied by recording the transaction on a blockchain or other distributed network.*

(b) If a law other than this Act requires a record (i) to be posted or displayed in a certain manner, (ii) to be sent, communicated, or transmitted by a specified method, or (iii) to contain information that is formatted in a certain manner, the following rules apply:

(1) The record must be posted or displayed in the manner specified in the other law.

(2) Except as otherwise provided in subsection (d)(2), the record must be sent, communicated, or transmitted by the method specified in the other law.

(3) The record must contain the information formatted in the manner specified in the other law.

(c) If a sender inhibits the ability of a recipient to store or print an electronic record, the electronic record is not enforceable against the recipient.

(d) The requirements of this section may not be varied by agreement, but:

(1) to the extent a law other than this Act requires information to be provided, sent, or delivered in writing but permits that requirement to be varied by agreement, the requirement under subsection (a) that the information be in the form of an electronic record capable of retention may also be varied by agreement; and

(2) a requirement under a law other than this Act to send, communicate, or transmit a record by [first-class mail, postage prepaid] *or* [regular United States mail], may be varied by agreement to the extent permitted by the other law.

SECTION 9. ATTRIBUTION AND EFFECT OF ELECTRONIC RECORD AND ELECTRONIC SIGNATURE.

(a) An electronic record or electronic signature is attributable to a person if it was the act of the person. The act of the person may be shown in any manner, including a showing of the efficacy of any security procedure applied to determine the person to which the electronic record or electronic signature was attributable*, including a digital signature*.

(b) The effect of an electronic record or electronic signature attributed to a person under subsection (a) is determined from the context and surrounding circumstances at the time of its creation, execution, or adoption, including the parties' agreement, if any, and otherwise as provided by law.

SECTION 10. EFFECT OF CHANGE OR ERROR. If a change or error in an electronic record *or smart contract* occurs in ~~a~~ transmission between parties to a transaction, the following rules apply:

(1) If the parties have agreed to use a security procedure*, including a digital signature,* to detect changes or errors and one party has conformed to the procedure, but the other party has not, and the

nonconforming party would have detected the change or error had that party also conformed, the conforming party may avoid the effect of the changed or erroneous electronic record.

(2) In an automated transaction involving an individual, the individual may avoid the effect of an electronic record*, contract, or smart contract* that resulted from an error made by the individual in dealing with the electronic agent of another person if the electronic agent did not provide an opportunity for the prevention or correction of the error and, at the time the individual learns of the error, the individual:

(A) promptly notifies the other person of the error and that the individual did not intend to be bound by the electronic record received by the other person;

(B) takes reasonable steps, including steps that conform to the other person's reasonable instructions, to return to the other person or, if instructed by the other person, to destroy the consideration received, if any, as a result of the erroneous electronic record; and

(C) has not used or received any benefit or value from the consideration, if any, received from the other person.

(3) If neither paragraph (1) nor paragraph (2) applies, the change or error has the effect provided by other law, including the law of mistake, and the parties' contract, if any.

(4) *In a transaction utilizing a smart contract, a person may avoid the effect of an electronic record stored on a blockchain that resulted from an error made by either party through mutual agreement (or otherwise determined by a court) to revert the execution of the smart contract by completing a reverse transaction and recording such electronic transaction on the same blockchain. If a transaction was made in error, the parties shall agree to revert the performance of the smart contract and record such reversion on the original blockchain containing the electronic record and any other location where the original transaction was recorded.*

(5) Paragraphs (2), (3)*, and (4)* may not be varied by agreement.

SECTION 11. NOTARIZATION AND ACKNOWLEDGMENT.

[No changes necessary to Section 11. The original language remains unchanged.]

SECTION 12. RETENTION OF ELECTRONIC RECORDS; ORIGINALS.

(a) If a law requires that a record be retained, the requirement is satisfied by retaining an electronic record of the information in the record which:
  (1) accurately reflects the information set forth in the record after it was first generated in its final form as an electronic record or otherwise; and
  (2) remains accessible for later reference*, including by referencing the information contained on a blockchain*.

(b) A requirement to retain a record in accordance with subsection (a) does not apply to any information the sole purpose of which is to enable the record to be sent, communicated, or received.

(c) A person may satisfy subsection (a) by using the services of another person if the requirements of that subsection are satisfied.

(d) If a law requires a record to be presented or retained in its original form, or provides consequences if the record is not presented or retained in its original form, that law is satisfied by an electronic record retained in accordance with subsection (a).

(e) If a law requires retention of a check, that requirement is satisfied by retention of an electronic record of the information on the front and back of the check in accordance with subsection (a).

(f) A record retained as an electronic record in accordance with subsection (a) satisfies a law requiring a person to retain a record for evidentiary, audit, or like purposes, unless a law enacted after the effective date of this Act specifically prohibits the use of an electronic record for the specified purpose.

(g) This section does not preclude a governmental agency of this State from specifying additional requirements for the retention of a record subject to the agency's jurisdiction.

SECTION 13. ADMISSIBILITY IN EVIDENCE. In a proceeding, evidence of a record or signature may not be excluded solely because it is in electronic form *or contained solely on a blockchain*.

SECTION 14. CONTROLLING SUBSTANTIVE LAW. *Any contract, including a smart contract, covered by this Act shall be governed by the laws of the jurisdiction indicated in the body of the*

contract. If no choice of law jurisdiction is indicated and agreed to by the parties, then either (1) the parties may mutually agree in writing to a preferred jurisdiction after the execution of the contract; or (2) the Uniform Commercial Code ("UCC") shall apply.

SECTION 15. DISPUTES, ARBITRATION. *Any disputes arising between the parties of a contract or smart contract shall be governed by the substantive law indicated in the terms of the contract. In the event that no jurisdiction was specified, the parties are disputing the substantive law jurisdiction, or both parties reside in different states and did not specify a substantive law jurisdiction in the terms of the contract or smart contract, disputes shall be conducted via dispute resolution and/or arbitration proceedings agreed to separately by the parties.*

SECTION 16. AUTOMATED TRANSACTION. In an automated transaction, the following rules apply:

(1) A contract*, including a smart contract,* may be formed by the interaction of electronic agents of the parties, even if no individual was aware of or reviewed the electronic agents' actions or the resulting terms and agreements.

(2) A contract*, including a smart contract,* may be formed by the interaction of an electronic agent and an individual, acting on the individual's own behalf or for another person, including by an interaction in which the individual performs actions that the individual is free to refuse to perform and which the individual knows or has reason to know will cause the electronic agent to complete the transaction or performance.

(3) The terms of the contract *or smart contract* are determined by the substantive law applicable to it.

(4) Parties entering into any contract, including a smart contract, are liable to complete the terms of performance agreed to according to the applicable substantive law.

SECTION 17. TIME AND PLACE OF SENDING AND RECEIPT.

[No changes necessary to Section 17. The original language remains unchanged.]

SECTION 18. TRANSFERABLE RECORDS.

(a) In this section, "transferable record" means an electronic record that:
  (1) would be a note under Article 3 of the Uniform Commercial Code or a document under Article 7 of the Uniform Commercial Code if the electronic record were in writing; and
  (2) the issuer of the electronic record expressly has agreed is a transferable record.

(b) A person has control of a transferable record if a system employed for evidencing the transfer of interests in the transferable record*, including a blockchain,* reliably establishes that person as the person to which the transferable record was issued or transferred.

(c) A system satisfies subsection (b), and a person is deemed to have control of a transferable record, if the transferable record is created, stored, and assigned in such a manner that:
  (1) a single authoritative copy of the transferable record exists which is unique, identifiable, and, except as otherwise provided in paragraphs (4), (5), and (6), unalterable;
  (2) the system is unalterable;
  (3) In transactions involving the use of a blockchain, the system is a distributed network of electronic code that records an immutable authoritative copy of the transferable record that is unique and identifiable;
  (4) the authoritative copy identifies the person asserting control as:
    (A) the person to which the transferable record was issued; or
    (B) if the authoritative copy indicates that the transferable record has been transferred, the person to which the transferable record was most recently transferred;
  (5) the authoritative copy is communicated to and maintained by the person asserting control or its designated custodian;
  (6) copies or revisions that add or change an identified assignee of the authoritative copy can be made only with the consent of the person asserting control;

(7) each copy of the authoritative copy and any copy of a copy is readily identifiable as a copy that is not the authoritative copy; and
(8) any revision of the authoritative copy is readily identifiable as authorized or unauthorized.

(d) Except as otherwise agreed, a person having control of a transferable record is the holder of the transferable record and has the same rights and defenses as a holder of an equivalent record or writing under the Uniform Commercial Code, including, if the applicable statutory requirements under Section 3-302(a), 7-501, or 9-308 of the Uniform Commercial Code are satisfied, the rights and defenses of a holder in due course, a holder to which a negotiable document of title has been duly negotiated, or a purchaser, respectively. Delivery, possession, and indorsement are not required to obtain or exercise any of the rights under this subsection.

(e) Except as otherwise agreed, an obligor under a transferable record has the same rights and defenses as an equivalent obligor under equivalent records or writings under the Uniform Commercial Code.

(f) If requested by a person against which enforcement is sought, the person seeking to enforce the transferable record shall provide reasonable proof that the person is in control of the transferable record. Proof may include access to the authoritative copy of the transferable record and related business records sufficient to review the terms of the transferable record and to establish the identity of the person having control of the transferable record. *Proof may also include review of the records contained on the appropriate blockchain record to determine control of the transferable record.*

SECTION 19. CREATION AND RETENTION OF ELECTRONIC RECORDS AND CONVERSION OF WRITTEN RECORDS BY GOVERNMENTAL AGENCIES.

[No changes necessary to Section 19. The original language remains unchanged.]

SECTION 20. ACCEPTANCE AND DISTRIBUTION OF ELECTRONIC RECORDS BY GOVERNMENTAL AGENCIES.

[No changes necessary to Section 20. The original language remains unchanged.]

SECTION 21. INTEROPERABILITY.

[No changes necessary to Section 21. The original language remains unchanged.]

SECTION 22. SEVERABILITY CLAUSE.

[No changes necessary to Section 22. The original language remains unchanged.]