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Exploring the Legal Issues of Blockchain Applications

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ABSTRACT

A decade ago, blockchain technology made its mainstream debut with the introduction of Bitcoin, a cryptocurrency that has generated a lot of buzz in the financial sector. Blockchain's elegantly simple way of securely and reliably recording data gives the technology the power to disrupt multiple industries. Cryptocurrencies and smart contracts are blockchain's most common applications, but it can be implemented in a variety of ways.

This article examines blockchain's core characteristics and mechanics as they apply to its common applications like cryptocurrency and smart contracts, as well as other transactional uses. The author presents some of the legal issues that arise from the use of blockchain, and particular attention is paid to the tax treatment of cryptocurrency transactions, contract law challenges of smart contracts and blockchain's role as an industry disruptor.

I. INTRODUCTION

Technology is progressing at a rapid rate—futuristic ideas of self-driving cars and commercial space travel have come closer and closer to reality.[1] Just over 40 years ago, the first internet protocol was introduced at an international communication conference, but it wasn't available to the public until the 1990s![2] Since then, the internet has infiltrated nearly every industry and has revolutionized communication, business, and everyday lives. Ordinary people can use the internet to instantly communicate with others across the globe and share ideas with anyone

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1. *See generally* Cade Metz, *Competing With the Giants in Race to Build Self-Driving Cars*, N.Y. TIMES (January 4, 2018), https://www.nytimes.com/2018/01/04/technology/self-driving-cars-aurora.html [https://perma.cc/V94D-MMYB].

2. Barry M. Leiner et al., *A Brief History of the Internet*, COMPUTER COMMUNICATION REVIEW (Mar. 14, 2018), https://www.cs.ucsb.edu/~almeroth/classes/F10.176A/papers/internet-history-09.pdf [https://perma.cc/87MQ-SSVT].

that has internet access. Bottom line—the internet became a foundational technology that sparked massive economic growth and shaped the way people and businesses interact. Now, there is a new disruptive technology emerging that could have similar large-scale impact.

Technology enthusiasts are touting the power of blockchain:[3] a new invention that, like the internet, could bring about massive industry revolution.[4] Blockchain is the technology that underlies Bitcoin, the cryptocurrency that has generated a lot of buzz in the financial sector over the last decade.[5] Bitcoin has grown immensely since its introduction, skyrocketing in price and generating colossal media coverage—but most of Bitcoin's value lies in the technology that drives it—the blockchain. In 2017, over $4.5 billion in private funds were invested into blockchain, and more than 2,500 blockchain-related patents were filed.[6] Investments in 2018 have already surpassed 2017 levels.[7] So what exactly is blockchain, and how is it revolutionary?[8]

A pair of telecom researchers first described the blockchain platform in 1991 in their effort to satisfy "a need to certify the date a document was created or last modified," such as when an inventor puts a patentable idea into writing.[9] They analogized their time-stamping idea to dating daily entries in a lab notebook. A full, sequentially dated notebook becomes

3. The introduction to this comment briefly explains the function and mechanics of blockchain technology. Readers may better understand blockchain and gain more insight into the legal ramifications of it by learning more about the technology behind it, how it works, and related terms. I recommend Blockchain Revolution, by Alex and Dan Tapscott, whose works are cited throughout this paper.

4. *See generally* Maximilian Friedlmaier et al., *Disrupting Industries with Blockchain: The Industry, Venture Capital Funding, and Regional Distribution of Blockchain Ventures*, PROCEEDINGS OF THE 51ST ANNUAL HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES (Sept. 22, 2017), https://core.ac.uk/download/pdf/143481280.pdf [https://perma.cc/8H7Y-5M4V].

5. *See generally* Saran Singh Sound, *The Rise of Blockchain and Cryptocurrency*, STANFORD MANAGEMENT SCIENCE AND ENGINEERING BLOG (July 14, 2017, 11:02 AM), https://mse238blog.stanford.edu/2017/07/ssound/the-rise-of-blockchain-and-cryptocurrency/ [https://perma.cc/DZ2B-27EQ].

6. R. Jesse McWaters et.al., *The Future of Financial Infrastructure: An Ambitious Look at How Blockchain Can Reshape Financial Services*, WORLD ECONOMIC FORUM (August 2016), http://www3.weforum.org/docs/WEF_The_future_of_financial_infrastructure.pdf [https://perma.cc/B5MD-WEWB].

7. *The Pulse of Fintech 2018: Biannual Global Analysis of Investment in Fintech*, KPMG (July 31, 2018), https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2018/07/h1-2018-pulse-of-fintech.pdf [https://perma.cc/8782-T4FH].

8. *See generally* Jonathan Ponciano, *Blockchain tops $4.5 Billion in Private Funding This Year, But Deal Growth Stalls*, FORBES (Sep 22, 2017), https://www.forbes.com/sites/jonathanponciano/2017/09/22/blockchain-tops-4-5-billion-in-private-funding-this-year-but-deal-growth-stalls/#2e37731a74c6 [https://perma.cc/WB42-3QBF].

9. Stuart Haber & W. Scott Stornetta, *How to Time Stamp a Digital Document*, JOURNAL OF CRYPTOGRAPHY, Jan. 1991, at 1.

difficult to alter without detection, and becomes even more difficult if each page is stamped and notarized. Any omitted or altered page would be obvious. The goal then, was to apply this concept to digital documents, which can normally be altered without leaving a trace. To accomplish this, they introduced a computational method (which will be described later) to ensure that time-stamps are 1) conspicuous and 2) cannot be falsified. This method of time-stamping laid the groundwork for Bitcoin's digital cash platform.[10]

Bitcoin was introduced in 2008 in a white paper written under the pseudonym Satoshi Nakamoto.[11] Described as a peer-to-peer electronic cash network, Bitcoin "would allow online payments to be sent directly from one party to another without going through a financial institution."[12] Basically, Bitcoin is an attempt to create an online equivalent of physical cash transactions by eliminating the need for a trusted third party, such as a bank, to verify the transaction. Instead, trust is created by publishing independently verified transactions onto a public ledger. Each user can view the public ledger and agree that it is accurate. Instead of a central intermediary legitimizing and structuring transactions, many network users independently verify that the transaction is valid. Once verified, transactions are grouped into a *block*. The block is then cryptographically linked to the previous block, creating a permanent record that is broadcast to the network. Transactions are only added to the record if the entire network agrees it is valid.[13]

At its heart, blockchain is just a sophisticated bookkeeping product that securely and reliably stores data on a network.[14] This elegantly simple function is why blockchain is predicted to be ubiquitous. Blockchain technology has extended beyond Bitcoin and other cryptocurrencies. Vitalik Buterin, a programmer and blockchain pioneer, expanded the capabilities of Bitcoin's blockchain with the creation of Ethereum, a blockchain platform which added *smart contract* capabilities to Bitcoin's platform.[15] Smart contracts are self-executing agreements that are coded

10. *Id*.

11. Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, BITCOIN (2008), https://bitcoin.org/bitcoin.pdf [https://perma.cc/8NSW-6F3L].

12. *Id*. at 1.

13. *Id*. at 1-3.

14. Pierluigi Cuccuru, *Beyond Bitcoin: An Early Overview on Smart Contracts*, 25 INTERNATIONAL JOURNAL OF LAW AND INFORMATION TECHNOLOGY 179 (2017) (explaining that the blockchain broadcasts a database containing the complete transactions history for any given bitcoin).

15. Adam Hayes, *Is Ethereum More Important than Bitcoin?*, INVESTOPEDIA (Jan. 4, 2018), https://www.investopedia.com/articles/investing/032216/ethereum-more-important-bitcoin.asp [https://perma.cc/TJJ8-R9VE].

into the blockchain.[16] The agreements are cryptographically signed the same way users exchange Bitcoin, only instead of agreeing to exchange Bitcoin, users can agree to much more.[17] The contracts are "smart" because they have the ability to execute the obligations without any third-party intervention.[18] Smart contracts have advanced beyond Bitcoin because they "take the static ledger and turn it into a dynamic system capable of executing the business logic of a contractual agreement."[19] Smart contracts could have widespread applications which will inevitably raise legal questions.

The financial giant J.P. Morgan Chase has already implemented an Ethereum-based blockchain pilot program for certain international transactions.[20] Additionally, over 300 companies are working together to design and apply distributed ledger technologies to global financial markets, which could have huge economic implications.[21] Blockchain proponents contend that it could disrupt the entire banking industry, which contains over $16.8 trillion in assets.[22] Blockchain applications have already begun to penetrate industry and provoke legislative responses. Ohio[23], Nevada[24], Arizona[25], and Delaware[26] have all enacted some form of legislation recognizing blockchain. The statutory schemes aim to incentivize investment into blockchain, usually by restricting taxes and fees that can lawfully be applied to them.[27] This technology has the potential to disrupt businesses and entire industries, so the legal field must

16. *Id*.

17. Reggie O'Shields, *Smart Contracts: Legal Agreements for the Blockchain*, 21 N.C. BANKING INST. 177, 179 (2017).

18. Max Raskin, *The Law and Legality of Smart Contracts*, 1 GEO. L. TECH. REV. 305, 317 (2017).

19. Kevin Werbach & Nicholas Cornell, *Contracts Ex Machina*, 67 DUKE L.J. 313, 331 (2017).

20. *J.P. Morgan Deploys Blockchain With New Correspondent Banking Network*, J.P. MORGAN (Oct. 16, 2017), https://www.jpmorgan.com/country/US/en/detail/1320562088910 [https://perma.cc/7YF4-UCHR].

21. The Enterprise Ethereum Alliance is an organization that connects Ethereum experts to companies seeking to implement blockchain solutions in their businesses. *See generally* Rakesh Sharma, *What is the Enterprise Ethereum Alliance?*, INVESTOPEDIA (March 3, 2018), https://www.investopedia.com/tech/what-enterprise-ethereum-alliance/ [https://perma.cc/BL5M-XP3F].

22. *Id*.

23. S.B. 220, 132nd Gen. Assemb. (Ohio 2018).

24. Nev. Rev. Stat. § 719.090 (2017), Nev. Rev. Stat. § 719.250 (2001).

25. H.B. 2417, 53rd Leg. Reg. Sess., (Ariz. 2017); H.B. 2603, 53rd Leg. 2d Reg. Sess., (Ariz. 2018).

26. S.B. 69, 149th Gen. Assemb. (Del. 2017).

27. Michael Scott, *Nevada Takes a Chance on Pro-Blockchain Legislation*, BITCOIN MAGAZINE (Jun. 13, 2017), https://bitcoinmagazine.com/articles/nevada-takes-chance-pro-blockchain-legislation/ [https://perma.cc/35F5-2WYU].

adapt as blockchain is further implemented.

This comment seeks to inform readers about blockchain mechanics and applications so they can anticipate possible legal issues and ascertain the current legal landscape. In order to better predict legal issues and their outcomes, it is important to understand blockchain's mechanics and core characteristics. Part I is devoted to understanding blockchain technology, which can be explained using Bitcoin analogies because blockchain was virtually built to support it.[28] After a baseline knowledge is established, this comment will explore legal issues arising from the use of common blockchain applications including cryptocurrencies, smart contracts, and data storage, and will explain how these applications will cause industry disruptions.

Part II is divided into two sub-parts: Part A describes blockchain mechanics by explaining its three core characteristics. A Bitcoin transaction will illustrate how these elements fit together to form the blockchain. Part B explains how blockchain has been most commonly applied and why attorneys should be keeping an eye on the technology. Part III will delve into legal issues and questions that arise in relation to some of the most common blockchain applications—taxation and regulatory issues surrounding cryptocurrencies, contract law issues that arise from smart contracting technology, and further issues with blockchain uses beyond currency and contracting, such as recording property transfers. Parts IV, V, and VI will further analyze the legal consequences described in Part III and explain blockchain's role as an intermediary replacement. Part VII will briefly mention some limitations of blockchain, and part VIII will provide a succinct summary of the issues presented.

II. BLOCKCHAIN MECHANICS AND A TRANSACTION ILLUSTRATION

A. The Mechanics of Blockchain

Blockchain relies on three core elements in order to function: decentralization, proof-of-work consensus, and practical immutability.[29] Combined, these three features provide a unique solution to any digital transaction that eliminates the need for an intermediary to legitimize the transaction—a network of users to maintain and monitor the distributed

28. *See generally* Nakamoto, *supra* note 12.

29. *See generally* Elizabeth S. Ross, *Nobody Puts Blockchain In A Corner: The Disruptive Role of Blockchain Technology In The Financial Services Industry And Current Regulatory Issues*, 25 CATH. U.J.L. & TECH. 353, 360-61 (2017).

record, or *ledger*.[30] The ledger is broadcast across a network of computers and eliminates the need for a central intermediary.[31] To help the blockchain maintain an accurate record of transactions, the blockchain incentivizes a group of users on the network to verify valid transactions.[32] Once verified, the transaction is contained in a block, and cryptographically linked (more on this later) to the previous transaction, which is then linked to the preceding transactions, infinitely. This cryptographic linking makes it nearly impossible (or at least highly impractical) to falsify a transaction because all the previous transactions would also have to be altered.[33] A discussion of the mechanics of this process is crucial to understanding and predicting legal issues that arise from blockchain applications.

1. Decentralization

Cryptocurrencies are currently the most commonly used blockchain application, so blockchain mechanics are easily explained using cryptocurrency analogies. Blockchain relies on a peer-to-peer network of computers to work.[34] Each computer on the network is called a *node*, and each node corresponds to a user.[35] Each user has a *public key* (an anonymous user address displayed on the public ledger), a *private key* (a password that is used to authorize a transaction), and a *token* (commonly in the form of cryptocurrency but can be any form of data).[36] As long as users have a public key, a private key, and a token, they can freely and securely trade with each other.[37] The process is fairly straightforward.

Suppose that Anna wants to send a token to Bill. Anna logs on to the network and enters Bill's public key as the token recipient, and then executes the transaction by entering her private key (similar to authorizing a credit card transaction with a signature). But the transaction is not complete yet. After Anna signs her private key, the transaction is broadcast to the entire network and a certain group of users compete to verify these transactions so that they can be added to the public ledger. This group of users offer their computers' processing power to solve

30. *Id.*at 361-63.

31. Nakamoto, *supra* note 12, at 3.

32. Nakamoto, *supra* note 12, at 4.

33. Nakamoto, *supra* note 12, at 3, 6-7.

34. Carla L. Reyes, *Moving Beyond Bitcoin to an Endogenous Theory of Decentralized Ledger Technology Regulation: An Initial Proposal*, 61VILL. L. REV. 191, 197 (2016).

35. *Id.* at 197-98.

36. *Id.* at 200.

37. Bitcoin Project, *How Does Bitcoin Work*, BITCOIN, https://bitcoin.org/en/how-it-works [https://perma.cc/V9Y2-B59X].

complex problems that confirm certain aspects of the transaction. The users must verify that Anna has sufficient tokens, that her private key corresponds to her public key, and that Bill is willing to accept the payment.[38]

Decentralization makes blockchain fair and secure. Instead of a central authority holding data in a single location, copies of blockchain data are stored on nodes across an entire network. Therefore, there is less risk that the data gets altered or destroyed. Additionally, because multiple copies are distributed onto the network, it is difficult to alter the data because a hacker would have to alter every copy. This would be impractical due to complex consensus protocols and cryptographic security functions discussed later. Basically, once users agree on the state of the ledger through a process of network consensus, it ensures that only valid transactions are added to the ledger.[39]

2. Incentivized Network Consensus and Proof-of-Work

When a transaction is executed, it is broadcast to all nodes on the network, and a subset of users called *miners* compete to verify transactions.[40] Miners compete by offering their computers' processing power to solve cryptographic problems that certify the transaction is valid.[41] But why offer money and energy to contribute to a working blockchain? To create incentives, miners are rewarded with a certain amount of blockchain tokens if they are the first to verify a transaction.[42] However, the blockchain only incentivizes the miners for adding *legitimate* blocks to the chain.[43] Users can trust that each transaction is valid because the problems that the miners solve are difficult enough to make tampering impractical.[44] This feature is made possible through the *proof-of-work* concept.

Proof-of-work refers to the solutions to complex computations that

38. *Id.*

39. *Id.*

40. Nakamoto, *supra* note 12, at 4.

41. Nakamoto, *supra* note 10, at 3-4; *See also How Bitcoin Mining Works*, COINDESK (January 29, 2018), https://www.coindesk.com/information/how-bitcoin-mining-works/ [https://perma.cc/FD5Y-MQ6L].

42. Christian Catalini & Joshua S. Gans, *Some Simple Economics of the Blockchain*, (Massachusetts Institute of Technology (MIT), Sloan Research Paper No. 5191-16), https://ccl.yale.edu/sites/default/files/files/SSRN%20—%20Some%20Simple%20Economics%20About%20Blockchain.pdf [https://perma.cc/62BQ-FUEX].

43. *Id.* at 8-9.

44. Carla L. Reyes, *Conceptualizing Cryptolaw*, 96 NEB. L. REV. 384, 419 (2017).

miners' computers solve to validate a transaction.[45] This process allows cryptocurrencies to establish trust between users who do not know each other, sometimes called "trustless trust."[46] Instead of relying on a trusted central intermediary, trust is placed into the blockchain's underlying code in the form of cryptographic problems. A high level of expensive computing power is required to solve these problems, which deters users from verifying fraudulent transactions. The problems, called *hash functions*, serve an important role in securing the blockchain and ensuring its validity.[47]

Hash functions can be solved only through repeated trial and error. However, each attempt to solve the hash does not make the next attempt a more likely solution.[48] On the Bitcoin blockchain, the hashes are designed in a way where solving the function takes about 10 minutes. This means that a new block of transactions is added to the chain every 10 minutes. Once a miner finds the solution to the hash function, it cannot be reversed. However, the solution is computationally simple to check, so all nodes can agree that the proof-of-work is valid. If an officious node wants to verify an invalid transaction, such as transferring coins that a user doesn't actually possess, the user would have to control more than 50% of the total computer processing power in the network.[49]

It is improbable for a user or group of users to possess more than half of the processing power on the network because of the proof-of-work difficulty. When a new transaction is verified and packaged into a block, that block contains a timestamp and a unique identifier (the hash). This hash contains a reference to the previous block on the blockchain so that each block is linked to every previous transaction. Falsifying a transaction (or altering a block) would require a node to alter every block preceding the one it was attempting to alter, which is onerously difficult to execute. Therefore, a permanent, irreversible record of transactions is contained in all nodes on the network.[50]

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45. Kevin Werbach, *Trust, but Verify: Why the Blockchain Needs the Law*, BERKELEY TECHNOLOGY LAW JOURNAL, 13-14 (forthcoming 2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2844409 [https://perma.cc/NN7Z-R9TW].

46. *Id*. at 9.

47. The Data Team, *How do Bitcoin Transactions Work*?, THE ECONOMIST (Jan. 9, 2015), https://www.economist.com/blogs/graphicdetail/2015/01/daily-chart-3 [https://perma.cc/8KUQ-NYR5].

48. Haber, *supra* note 8, at 3; *See also* Scott J. Shackelford & Steve Meyers, *Block by Block: Leveraging the Power of Blockchain Technology to Build Trust and Promote Cyber Peace*, 19 YALE J. L. & TECH. 334, 383-384 (2017) (specifically describing hash functions in Bitcoin transactions).

49. Shackelford, *supra* note 47, at 347.

50. Marc Pilkington, *Blockchain Technology: Principles and Applications*, RESEARCH HANDBOOK ON DIGITAL TRANSFORMATIONS, 3 (Sept. 24, 2015).

3. Immutable Record

The immutability, or extreme resistance to tampering, gives cryptocurrencies and other blockchain applications their intrinsic value because most businesses and industries rely on accurate untampered records.[51] "The power to create certainty and permanency in records theoretically enables changes to virtually every social system that we have, as all rely to some extent on keeping track of things in a reliable and trusted way."[52] The blockchain has the ability "to declare a truth, globally and without a centre of authority, regardless of what anyone else does to change this truth."[53] That is, users can be assured that they have accurate records that are not susceptible to influence of a central authority or outside intruders. Certain other features of the blockchain can be modified or relaxed, but not immutability.[54]

However, some scholars dispute whether the term immutable accurately reflects the nature of the blockchain.[55] The definition of the "immutability" concept, as it relates to the blockchain, aligns more closely to the term "unchangeable."[56] Suppose that a user possesses more than 50% of the network's processing power and verifies an invalid transaction. Since the transaction would not align with all of the previous transactions, a new chain would result in a *fork* off of the previously valid chain.[57] Ideally, users will ignore the new chain and continue adding valid transactions to the original blockchain. However, the fork can cause confusion because users will be adding blocks to two distinct blockchains each with a unique transaction history.[58] Because both Bitcoin and Ethereum have encountered forks in their blockchains, some argue the definition of immutability may need to be defined or substituted for a more accurate term.[59] At the very least, immutability can be characterized as extremely difficult to change, as opposed to permanently

51. *Id.* at 15.

52. Angela Walch, *The Path of the Blockchain Lexicon (and the Law)*, 36 REV. BANKING & FIN. L. 713, 737 (2017).

53. Pilkington, *supra* note 51, at 15.

54. Pilkington, *supra* note 51, at 15.

55. Walch, *supra* note 53, at 735.

56. Walch, *supra* note 53, at 736-739.

57. Amy Castor, *A Short Guide to Bitcoin Forks*, COINDESK (May 16, 2017, 5:05 PM), https://www.coindesk.com/short-guide-bitcoin-forks-explained/ [https://perma.cc/Z8B6-SNMF].

58. Jamie Redman, *A Simple Guide to What Bitcoin Forks Are and Why They Happen*, BITCOIN (Nov. 5, 2017), https://news.bitcoin.com/a-guide-to-what-a-bitcoin-fork-is-and-why-they-happen/ [https://perma.cc/9PXP-335S].

59. Gideon Greenspan, *The Blockchain Immutability Myth*, COINDESK (May 9, 2017), https://www.coindesk.com/blockchain-immutability-myth/ [https://perma.cc/6QUK-MDJ7].

unchangeable.[60]

In the case of forks, the blockchain relies on the free market to identify why the fork occurred and decide whether to add transaction blocks to either the newly forked chain, or the old chain.[61] A deeper discussion of blockchain forks is beyond the scope of this paper, but it is important to recognize that these can occur and that they indicate a shift or change in the blockchain's protocol and transaction history. Immutable transaction history is the core of blockchain technology, and the preceding concepts work together to form a platform for smooth, frictionless transactions.

4. Putting It All Together—A Bitcoin Illustration

A simple Bitcoin transaction combines the preceding properties and characteristics and illustrates them quite well. Remember that when Anna wants to send a Bitcoin to Bill, Anna enters Bill's public key, the amount of Bitcoin, and signs the transaction with his private key. The transaction is then broadcast to all nodes on the network. A subset of those nodes, miners, then compete to verify the transaction. The miner solves the cryptographic hash function that certifies that the information contained in the transaction is correct and valid. Once the problem is solved and the information is verified, the group of verified transactions are contained in a block and added to the blockchain.[62]

Each block contains a bundle of validated transactions and a link to all previous transactions, which ensures that the ledger is accurate. Users can trust that this ledger is accurate because nodes can independently verify all the transactions that occur through the proof-of-work concept. The Bitcoin is not physically transferred, but the ledger that contains all users' balances is placed on each node's computer. Since the ledger is unchangeable without 51% of the network's processing power, every user can be assured that the ledger and their balances are accurate.[63]

B. Blockchain Applications

The blockchain platform is considered a foundational technology that is capable of being implemented into a wide variety of industries and

60. *Id*.

61. *Id*.

62. *See generally How Does Bitcoin Work*, BITCOIN, https://bitcoin.org/en/how-it-works [https://perma.cc/V9Y2-B59X].

63. *Id.*

practice areas.[64] Exploring every application of blockchain is beyond the scope of this paper and requires a much more in-depth analysis, but I will summarize current applications here.

Financial markets, simple contracts, probate, property transfers, taxes, corporate governance, and insurance agreements are areas already penetrated by blockchain, mainly for monetary transactions and tracking data changes.[65] Many businesses are searching for ways to incorporate cryptocurrencies and blockchain technology into their operations, and corporate attorneys may soon be encountering blockchain-related legal issues.[66] As such, they are obligated to "keep abreast of changes in the law and its practice, including the benefits and risks *associated with relevant technology*, engage in continuing study and education and comply with all continuing legal education requirements to which the lawyer is subject."[67]

Because money and research are pouring into blockchain technology, attorneys should stay ahead of the curve and devote some time thinking about how blockchain will infiltrate their practice areas.[68] Therefore, this paper will discuss the legal issues surrounding current blockchain applications and attempt to anticipate legal issues in areas that are ripe for blockchain disruption.

III. BLOCKCHAIN'S LEGISLATIVE AND REGULATORY CHALLENGES

Blockchain has developed from version 1.0 to 3.0. "Blockchain 1.0 emphasizes virtual currency, Blockchain 2.0 isolates technology and protocol applications as to contracts, and Blockchain 3.0 is the expansion of the technological applications beyond finance and markets."[69] Depending on how blockchain is used, blockchain's novel and distinct characteristics present regulatory and legal challenges. Regulation regarding the issuance and taxation of cryptocurrencies and treatments of blockchain tokens raise important questions about how digital assets should be classified. Smart contracts may demand different treatment

64. Stephanie Alexander & Tripp Scott, *How Bitcoin Will Bring About a Legal Practice Revolution*, TRIPP SCOTT (June 4, 2014, 10:17 AM), http://www.trippscott.com/newsroom/6-how-bitcoin-will-bring-about-a-legal-practice-revolution [https://perma.cc/T577-CBFQ].

65. *Id*.

66. *Id.*

67. Dennis Kennedy & Gwynne Monahan, *Lawyers Get Ready, There's a Blockchain Coming*, LAW PRACTICE TODAY (Jan. 13, 2017), https://www.lawpracticetoday.org/article/lawyers-blockchain/ [https://perma.cc/3WPH-3XNU] (citing MODEL RULES OF PROF'L CONDUCT R. 1.8 (2009)).

68. *Id*.

69. Ross, *supra* note 28, at 359-60.

from traditional contract law. Disputes over real property transfers could be virtually eliminated. The current legal landscape will be briefly will be discussed, analyzed, some viable solutions presented.

A. Cryptocurrency Regulation and Taxation

Cryptocurrency is the blockchain's most obvious and prolific application. Bitcoin launched in 2008 and now has a $175 billion market cap.[70] Since its introduction, hundreds of cryptocurrencies have flooded the marketplace, with thirty-nine of them having market capitalizations of over $1 billion—the total cryptocurrency market value is $710 billion.[71] Regulatory and legislative bodies have had difficulties keeping up with variations on cryptocurrency transactions given its rapid growth and innovations. In addition to using cryptocurrencies as currencies to buy goods, many entrepreneurs are also issuing their own cryptocurrencies to raise money to fund their products.[72]

Blockchain startups are building capital using a new form of public offering called an *initial coin offering* (ICO).[73] Alternatively called a token sale, an ICO simply makes blockchain tokens available for sale to the public.[74] Once users purchase the tokens, they can use them as part of a network application, whatever that may be.[75] "The value of the tokens is linked to the value of the network, the functional utility of the platform, or speculation of its potential value."[76] Since not all tokens are built alike, there are regulatory and compliance issues that could arise under federal securities laws.[77]

Federal agencies have been debating ideas about how to regulate a

70. *Bitcoin (BTC)*, COINMARKETCAP (as of Feb. 26, 2018), https://coinmarketcap.com/currencies/bitcoin/historical-data/?start=20180226&end=20180228 [https://perma.cc/W3GA-T3TE].

71. Chloe Cornish, *Growing Number of Cryptocurrencies Spark Concerns*, FINANCIAL TIMES (Feb. 26, 2018), https://www.ft.com/content/a6b90a8c-f4b7-11e7-8715-e94187b3017e [https://perma.cc/UL74-FR8H] .

72. Joseph D. Moran, *The Impact of Regulatory Measures Imposed on Initial Coin Offerings in the United States Market Economy*, 26 CATH. U.J.L. & TECH. 7, 1-5 (2018); *See also* Jack Tatar, *Initial Coin Offerings (ICOs) are Becoming the new IPO*, THE BALANCE (April 9, 2018), https://www.thebalance.com/cryptocurrencies-are-changing-capital-raising-process-for-new-companies-4115445 [https://perma.cc/8TSX-NCC7].

73. *Initial Coin Offering*, INVESETOPEDIA, https://www.investopedia.com/terms/i/initial-coin-offering-ico.asp [https://perma.cc/L725-SFTX].

74. *Id*.

75. *Id*.

76. Jorge Pesok & Samuel Brylski, *SEC's Blockchain Stance Will Likely Impact Exchanges*, LAW360 (August 8, 2016), https://www.law360.com/articles/952055/sec-s-blockchain-stance-will-likely-impact-exchanges [https://perma.cc/WGW7-F54J].

77. *Id.*

currency that seemingly has no value. The SEC, attempting to prosecute a Bitcoin Ponzi scheme, encountered a factual dispute on whether Bitcoin should be considered a security and thus subject to SEC jurisdiction.[78] The Court ruled that since Bitcoin can be used as money, and the investments at issue met the requirements for an investment contract, the SEC could exercise jurisdiction.[79] However, the decision was flexible and cautioned courts to decide the nature of cryptocurrencies on a case-by-case basis, considering the way the currencies were acquired, exchanged, and used, which could lead to different classifications of Bitcoin or cryptocurrencies held in assets.[80] This lack of a regulatory framework presents challenges to tax and transaction attorneys whose clients hold digital assets in the form of cryptocurrencies.[81]

The IRS has also tried to classify cryptocurrencies as "virtual currency." Despite the name, they are not taxed as currencies, which presents challenges for users who use cryptocurrencies in different ways. In 2014, the IRS defined the term "virtual currency" as a "digital representation of value that functions as a medium of exchange, a unit of account, and/or a store of value."[82] Most, if not all, blockchain currency would fall under this category, but there is still uncertainty revolving around the classifications and taxation of digital assets.[83] Bitcoin is further classified as a "convertible virtual currency" which means that it "can be easily valued and exchanged for real currency or that acts as a substitute for real currency."[84]

Attorneys should be aware of these classifications when they appear in statutory language; and just like other certain financial assets, the way cryptocurrencies are received will impact how they are taxed.[85] For example, if someone acquired Bitcoin by "mining" at home for extra

78. Sec. & Exch. Comm'n v. Shavers, No. 4:13-CV-416, 2013 WL 4028182 (E.D. Tex. Aug. 6, 2013), *adhered to on reconsideration*, No. 4:13-CV-416, 2014 WL 12622292 (E.D. Tex. Aug. 26, 2014).

79. *Id.* *2.

80. *Id.* *2; *See also* Elizabeth E. Lambert, Note, *The Internal Revenue Service and Bitcoin: A Taxing Relationship*, 35 VA. TAX REV. 88, 14-15 (2015-2016).

81. *Id.*

82. NOTICE, 2014-16 I.R.B. 938 (2014), VIRTUAL CURRENCY GUIDANCE, https://www.irs.gov/pub/irs-drop/n-14-21.pdf [https://perma.cc/5YWU-SWNR]. It may be easier to think of virtual currency as a debit card with an account balance that can be spent at anytime and anywhere instantaneously on the Internet. The money in the account may be accepted by anyone over the Internet, but the fair market value of the account in currencies, like dollars or euros, will vary depending upon demand.

83. *Id.*

84. Lambert, *supra* note 79, at 13.

85. *See generally* Lambert, *supra* note 79.

income, it would be considered self-employment income and subject to tax.[86] But if someone held the Bitcoin as a capital asset in the same manner as a stock or bond, they could realize a capital gain or loss on the sale of exchange of the currency.[87] However, these are only guidelines that come from IRS notices, which do not have the authoritative force that codified statutes have.[88] Further, regulating entities have failed to adequately address certain aspects and treatments of digital currencies that are important for their tax categorization.[89]

B. Smart Contracting

Beyond cryptocurrencies, blockchain can be used to support many transactions. One of the most prevalent uses of blockchain is for smart contracts, which are automatically executing agreements that are made seamless by blockchain protocols. Smart contracts are essentially software programs that automatically execute complex agreements.[90] In addition to automated execution, the contracts would be automatically enforceable as well.[91]

For example, if someone has an obligation to pay rent on the 1st of every month, the payment will automatically execute, and enforcement would be unavoidable. However, these smart contracts are technically not legally binding, they are a tool to execute agreements. This virtually removes the ability of a contracting party to voluntarily breach the contract because smart contracts don't rely on the threat of litigation as an enforcement mechanism. Even if the agreement underlying the smart contract meets all technical aspects of contract law: offer, acceptance, consideration, and mutual assent, any contract overturned on public policy grounds such as unconscionability will be difficult to reverse given blockchain's immutable nature.[92]

86. 26 U.S.C. Code § 1402.

87. *Id.*

88. *Understanding IRS Guidance - A Brief Primer*, IRS (May 9, 2018), https://www.irs.gov/newsroom/understanding-irs-guidance-a-brief-primer [https://perma.cc/7TPB-CZQX].

89. *See* Donna Leinwand Leger, *IRS: Bitcoin is not currency*, USA TODAY (March 25, 2014), https://www.usatoday.com/story/money/business/2014/03/25/irs-says-bitcoin-is-property/6873569/ [https://perma.cc/EE6L-5TMF].

90. Don Tapscott & Alex Tapscott, *The Impact of Blockchain Goes Beyond Financial Services*, HARVARD BUSINESS REVIEW (May 10, 2016), https://hbr.org/2016/05/the-impact-of-the-blockchain-goes-beyond-financial-services [https://perma.cc/RLC7-P34W].

91. R. Douglas Vaughn & Anna Outzen, *Understanding How Blockchain Could Impact Legal Industry*, LAW360 (Jan. 11 2017), https://www.law360.com/articles/879810/understanding-how-blockchain-could-impact-legal-industry [https://perma.cc/J7W6-MCTZ].

92. O'Shields, *supra* note 18, at 183-87.

Nonetheless, smart contracts will likely adhere to the same formation and performance rules as traditional contracts, but actual formation will be anything but traditional.[93] Smart contracts will increase the communication skills required to transact these contracts because English agreements will need to be translated into a language that the blockchain will understand, i.e. computer code.[94] Making sure the parties' agreement is accurately reflected in the computer code requires clarity and precision in communicating the client's needs and desires. Obviously, most attorneys will not have coding expertise, so those drafting these agreements would have to collaborate with technical specialists who are well-versed in programming languages.[95]

Many firms could use smart contracts to significantly reduce costs and gain efficiency by automating contracts. However, as firms continue to replace traditional contracting practices with smart contracting, courts, legislators, and other regulatory bodies will be challenged to mold traditional contract law to accommodate the enforcement of smart contracts. The problem with applying contract law to smart contracts is that traditional contract law is structured to address issues that arise after the contract is formed and the parties have agreed to certain terms.[96]

Alternatively, smart contracts are designed to eliminate the ability to breach. This isn't to say that adjudication of grievances is impossible because the parties may not be able to predict all possible outcomes of the smart contract. But some results may differ from the parties' intent and the smart contract would need to be modified to achieve the intended results, leaving the court without a justiciable solution.[97]

Although technically "code isn't law," some financial institutions and law firms have joined the Enterprise Ethereum Alliance, which purports to inject blockchain-based smart contracts into businesses and law firms across the globe.[98] As a result, emerging ideas about regulating and governing smart contracts are inevitable as more firms join the conversation surrounding blockchain technology.[99] This could cause changes in contract doctrine at a fundamental level, as smart contracts are

93. O'Shields, *supra* note 18, at 186-87.

94. Cuccuru, *supra* note 15, at 179.

95. O'Shields, *supra* note 18, at 183.

96. Werbach, *supra* note 20, at 317-18.

97. Jeremy M. Sklaroff, Comment, *Smart Contracts and the Cost of Inflexibility*, 166 U. PA. L. REV. 263, 274 (2017).

98. Press Release, Enter. Ethereum All. Legal Indus. Working Grp., Legal Indust. Working Grp. Launches with Leading Glob. Law Firms, Corp., Law Sch., & Acad. Inst. Working to Collaborate & Explore Blockchain Tech. & Smart Contracts (Aug. 14, 2017) (on file with author).

99. *Id.*

beyond a simple agreement intended to be legally enforceable.[100] There is little legislation on the topic of smart contracts, but regulatory bodies have acknowledged blockchain technologies and have generated minimalist legislative responses to the emerging technology.[101]

C. Real Property Records

Many real estate transactions are poised to be streamlined by blockchain technology. Law school property classes are filled with problems involving title disputes based on various types of recording statutes and the existence of defeasible estates. In the most extreme case, the government could eliminate these disputes by maintaining a public blockchain of real estate records, where a property purchaser could record a deed from a seller on a blockchain. Because all transactions on a blockchain are timestamped, no deed would be able to be recorded twice. In future blockchain based real estate transactions, the buyer can be sure that the seller has the right to sell the asset and the seller can be sure that the buyer possesses the funds to complete the purchase.[102]

The Cook County Recorder's office in Illinois experimented with blockchain technology in precisely this manner: tracking real property transfers.[103] There may be new legal issues involving regulation of those entering information onto the blockchain, since mistakes made on the blockchain are easily traceable and accessible, but cannot be reversed unilaterally.[104] If workarounds exist, then a broad adoption of recording deeds on blockchain could eliminate the need for title insurance and smooth a layer of friction within real estate transacting.[105] Smart contracts can also be used as a form of escrow in property transfers.[106] They could potentially automate transfer of funds, deed recording, and other

100. *Id.*

101. *See* S.B. 220, 132nd Gen. Assemb. (Ohio 2018); *See also* Nev. Rev. Stat. § 719.090 (2017), Nev. Rev. Stat. § 719.250 (2001); *See also* H.B. 2417, 53rd Leg. Reg. Sess., (Ariz. 2017); H.B. 2603, 53rd Leg. 2d Reg. Sess., (Ariz. 2018); *See also* S.B. 69, 149th Gen. Assemb. (Del. 2017).

102. Matthew Murphy, *Three Ways Blockchain Could Transform Real Estate in 2018*, FORBES REAL ESTATE COUNCIL IN FORBES COMMUNITY VOICE (Jan. 12, 2018, 8:30 AM), https://www.forbes.com/sites/forbesrealestatecouncil/2018/01/12/three-ways-blockchain-could-transform-real-estate-in-2018/#6bf3e3383638 [https://perma.cc/NQ57-2XQ6].

103. *Id.*

104. Garry Gabison, *Policy Considerations for the Blockchain Technology Public and Private Applications*, 19 SMU SCI. & TECH. L. REV. 327, 328 (2016).

105. Marc S. Voses et. al., *Blockchain: Cryptocurrency Foundation and the Future of Information Management and Security*, 33 No. 04 WESTLAW J. DEL. CORP. 02, 1-2 (August 27, 2018).

106. S.H. Spencer Compton & Diane Schottenstein, *Blockchain Technology and Its Applicability to the Practice of Real Estate Law*, 2017 LEXISNEXIS EMERGING ISSUES 7512, 1, 5, (March 17, 2017).

necessary payments in one simple computer program. Transactional attorneys, especially those managing real estate, should be aware of blockchain's fundamentals in the event more states adopt blockchain recording methods.[107]

D. Financial Transactions

The entire financial infrastructure is ripe for disruption by distributed ledger technology.[108] "Banking and financial intermediaries operate through a centralized control of authority and the autonomous, self-serving, and decentralized applications of blockchain replace the intermediaries."[109] Parties transact with the help of intermediaries because they have authority and a reputation to be trusted, whereas blockchain creates "trustless trust" by relying on members of the network to validate legitimate transactions.[110] This way, there is no single point of failure. If a bank that is funding hundreds of multimillion-dollar transactions is hacked, consumers and investors would be irreparably harmed.[111] Because the blockchain is distributed individually across a network, there is little risk in losing data because each computer has access to a constantly updating, current version of the ledger.[112]

As financial intermediaries lose their clout to decentralized ledgers, many of the complexities that come from attorneys acting as bridges between clients and financial intermediaries are eliminated. However, attorneys can stay ahead of the curve and be prepared to advise clients on the impacts such as risk, transacting speed, security, fraud, and the cost of adopting blockchain systems.[113]

IV. REGULATION AND TAXATION OF VIRTUAL CURRENCIES

The valuation of Bitcoins, the mining of Bitcoins, withholdings from Bitcoin payments, the use of Bitcoins in peer-to-peer trading, the use of Bitcoins as capital assets, the use of Bitcoins as gifts or donations, and the verification of Bitcoin transactions all lack official categorization by the

107. Kennedy, *supra* note 68.

108. Cuccuru, *supra* note 15, at 2.

109. Ross, *supra* note 30, at 367.

110. *See* Ryan Surujnath, *Off the Chain! A Guide to Blockchain Derivatives Markets and the Implications on Systemic Risk*, 22 FORDHAM J. CORP. & FIN. L. 257, 262 (2017).

111. *See id.*

112. *See id.*

113. Caitlin Moon, *Blockchain for Lawyers 101: Part 2*, A.B.A.: L. TECH. TODAY (Jan. 31, 2017), https://www.lawtechnologytoday.org/2017/01/blockchain-lawyers-101-part-2/ [https://perma.cc/6YMB-H53A].

IRS for tax purposes.[114] Given the uncertainty surrounding the taxation of Bitcoin, tax and transaction attorneys need to have a working knowledge of Bitcoin and other cryptocurrency transactions and acquisitions. Additionally, tax and transaction attorneys should have an idea of where the current tax law surrounding cryptocurrencies is heading.

A. Issues with Classifying Cryptocurrencies as Property and a Proposal to Adopt a Foreign Currency Classification for Taxation Purposes

One of the problems with treating Bitcoin and other virtual currencies as if they were property is that many people do not treat them as property. Holders of virtual currency might use them as a medium of exchange to buy goods and conduct many transactions in a single day. It would be unduly burdensome to require users to maintain records detailed enough to accurately calculate their taxes.[115] Someone that transacts hundreds of Bitcoins a day will likely have a wallet full of Bitcoins with different tax implications because the value of Bitcoin sharply fluctuates.[116] An accounting method would have to be prescribed unless each transacted Bitcoin could be specifically identified.[117] However, the analysis does not end here. The values of the items transacted for would need to be determined in order to calculate the gain or loss from each transaction.[118] The effort to calculate these values for a heavy volume user of virtual currency would be unreasonably burdensome and nearly impossible to comply with.

There are simply too many taxable events with respect to Bitcoin transactions, so an easier valuation method should be used to calculate the tax implications and relieve the burden on the taxpayer. There are basically three different taxable events in the lifecycle of a Bitcoin: receipt from mining, sale of investment, or use as a currency.[119] The tax effects

114. *Id.*

115. *See* John Ungerman, *The IRS Approach to Taxation of Bitcoin*, FORBES: IRS WATCH (Dec. 4, 2014, 1:02 AM), https://www.forbes.com/sites/irswatch/2014/12/04/irs-approach-to-taxation-of-bitcoin/#201aedd182b9 [https://perma.cc/QKN3-977W]; *See also* Austin Elliott, Note, *Collection of Cryptocurrency Customer- Information: Tax Enforcement Mechanism or Invasion of Privacy?*, 16 DUKE L. & TECH. REV. 1, 7 (2017).

116. Ungerman, *supra* note 116.

117. Ungerman, *supra* note 116.

118. 26 U.S.C. § 1001 (2018).

119. *See* Stephen Fishman, *IRS' Bitcoin Guidance Turns Every Transaction into a Reportable Capital Gain or Loss at Tax Time*, INMAN (March 31, 2017), https://www.inman.com/2014/03/31/irss-bitcoin-guidance-turns-every-transaction-into-a-reportable-capital-gain-or-loss-at-tax-time/ [https://perma.cc/5JQN-KZE8].

on these three types of transactions would differ based on their use and the IRS should distinguish between them.[120] Since the Bitcoin transactions can be easily related to tax treatments already in the code, it should be fairly easy to address.

There is another issue about whether virtual currencies should be treated as a capital asset or a non-capital asset.[121] The IRS specifies what's *not* a capital asset, but does not affirmatively state what types of assets *are* considered capital assets.[122] The issue here is whether Bitcoin or other virtual currencies are considered "financial instruments" for purposes of determining whether an asset is capital or non-capital.[123] This issue could be relieved by treating Bitcoin as a foreign currency. Not only would this simplify record-keeping for taxpayers who hold digital assets, it would also allow those with large, short-term losses to write off "foreign currency" losses against ordinary income.[124] Taxing Bitcoin as a foreign currency would create a *de minimis* exception for small gains on each transaction.[125] For example, if you buy a Bitcoin for $100 and its value rises to $120 when you want to purchase something, you don't have to recognize the gain because it is lower than the minimum value for reporting. Creating a *de minimis* exception for cryptocurrencies would simplify record-keeping and encourage people to use Bitcoin because this eliminates a large inconvenience for most individual cryptocurrency users.

Additionally, classifying cryptocurrencies as foreign currencies fits with how daily users of cryptocurrencies treat them. Many users buy Bitcoin and use them to buy goods and services. If users are given an easy way to pay their taxes on cryptocurrency transactions, the government will have an easier time collecting taxes and creating revenue. However, as it stands, the IRS is likely losing out on revenue due to how complicated cryptocurrency taxation can get, and there are still more obstacles that stand in the way.[126]

120. *Id.*

121. Christopher Rajotte et al., *Bitcoin Taxation: Understanding the IRS Notice 2014-21*, BITCOIN MAGAZINE (Apr. 4, 2014, 9:20 PM), https://bitcoinmagazine.com/articles/bitcoin-tax-understanding-irs-notice-2014-21-1396660800/ [https://perma.cc/4DNC-ESA8] .

122. *Id.*

123. *Id.*

124. 28 USC § 998.

125. *Id.*

126. Jerry Brito, *Bitcoin Taxation is Broken. Here's How to Fix it.*, COIN CENTER (Apr. 12, 2017), https://coincenter.org/entry/bitcoin-taxation-is-broken-here-s-how-to-fix-it [https://perma.cc/4DNC-ESA8]; *See also* Kevin Ruse, *Think Cryptocurrency is Confusing? Try Paying Taxes on It*, N.Y. TIMES (March 21, 2018), https://www.nytimes.com/2018/03/21/technology/think-cryptocurrency-is-confusing-try-paying-taxes-on-it.html [https://perma.cc/N538-BYEK].

B. Blockchain's Obstacles to Tax Collection

The IRS classification of cryptocurrencies is likely to evolve as more and more people invest in them. "Some proponents of Bitcoin say that it is a currency that should be taxed as such.[127] Many use cryptocurrencies to purchase goods and use them as a medium of exchange as opposed to holding them for investment."[128] Usually, a holder of a currency, say a dollar, would not have to pay taxes on that dollar if its purchasing power rose in relation to the Euro, and if they did, it would be extremely difficult to track this activity all the time.[129] Regardless of whether the IRS expects users to meticulously track the exchange rates of each token they own, there still exists a question on how the IRS expects to enforce taxation of assets that are usually exchanged anonymously.

The IRS attempted to exercise its enforcement powers against the users of Coinbase, the world's largest cryptocurrency exchange. "In late 2016, upon realizing that it was unable to enforce and monitor compliance with Notice 2014-21 due to Bitcoin's pseudonymous nature, the IRS requested that the Northern District of California authorize a John Doe Summons requiring Coinbase to deliver customer information to the IRS."[130] While the IRS does have an interest in collecting taxes, and Bitcoin does make skirting the IRS easier, some believe that the "John Doe Summons" violates customer privacy and it is being used solely to sniff out users who are using cryptocurrencies to avoid paying taxes.[131] Whether the IRS even has the authority to request such a summons is up for debate.[132] Coinbase may be considered an exchange, classifying it as a financial institution and making it subject to the Right to Financial Privacy Act of 1978.[133] If this is the case, then issuing the John Doe Summons was out of the purview of IRS authority and should not apply

127. Elliott, *supra* note 116, at 6.

128. *Id.*

129. *See* Adam Chodorow, *How Do You Tax Bitcoin? Should Governments Consider it a Currency or Property? The Answer Could Determine Bitcoin's Ultimate Viability.*, MONEYBOX: COMMENTARY ABOUT BUSINESS AND FINANCE. (Jan. 11, 2016, 11:26 AM), http://www.slate.com/articles/business/moneybox/2016/01/bitcoin_s_future_depends_on_what_the_world_s_tax_authorities_rule.html [https://perma.cc/76Y8-ZJQN].

130. Elliott, *supra* note 116, at 11.

131. Laura Shin, *Is the IRS Justified In Demanding Information on Millions of Bitcoin Users?*, FORBES: PERSONAL FINANCE (Jan. 24, 2017, 8:00 AM), https://www.forbes.com/sites/laurashin/2017/01/24/is-the-irs-justified-in-demanding-information-on-millions-of-bitcoin-users/#7c31bc5b52c0 [https://perma.cc/L6YJ-WLLH].

132. *See* Nathan Reiff, *"John Doe" Bitcoin Summons Has Coinbase Users Fighting Back*, INVESTOPEDIA (Jan. 17, 2017), https://www.investopedia.com/news/john-doe-bitcoin-summons-has-coinbase-users-fighting-back/ [https://perma.cc/9UTT-E6L6].

133. *See* 12 U.S.C. § 3402 (2012).

to any future cases.[134] The IRS would benefit from simplifying and providing clear guidance on the taxation of virtual currency so that users are more likely to comply.

It is easy to understand the IRS's position and its interest in monitoring Bitcoin transactions because the technology is susceptible to unlawful activity.[135] The federal government has sought to regulate virtual currencies under the money laundering framework because Bitcoin exchanges are classified as a money services business.[136] Therefore, any "administrators and exchangers of virtual currency would be considered money transmitters subject to regulation and oversight."[137] However, whether a party is a money transmitter will depend on the facts and circumstances.[138] But this has not been tested and there is no useful guidance for users to know if they would be considered a money transmitter, and thus subject to oversight by the Financial Crimes Enforcement Network.[139] The law surrounding cryptocurrencies will undergo rigorous testing and interpreting as new fact scenarios are analyzed. However, courts have little experience with the newest blockchain capability: smart contracting.

V. SMART CONTRACTING

Blockchain enthusiasts envision a future where commercial transactions are conducted solely using smart contracts. Obscurities of written language, threats of litigation, and costly contract drafting will cease to exist in favor of frictionless code-only agreements. Despite the many advantages of smart contracting, supporters often overstate the benefits and gloss over the costs and pitfalls. There are certain situations where smart contracting is appropriate, while in other situations using smart contracting creates a host of problems. There are three components of smart contracts of which attorneys should be aware: automation, decentralization, and anonymity. Since decentralization is the central aspect of blockchain technology, the focus will be on automation and anonymity.[140]

134. *Id.*

135. *See* Sean Foley et al., *Sex, Drugs, and Bitcoin: How Much Illegal Activity is Financed through Cryptocurrencies?* (Jan. 15, 2018), http://dx.doi.org/10.2139/ssrn.3102645 [https://perma.cc/4HHJ-VZLC].

136. *Id.*

137. Kelly J. Winstead, Note, *The North Carolina State Tax Treatment of Virtual Currency: An Unanswered Question*, 21 N.C. BANKING INST. 501, 509 (2017).

138. *See id.* at 510.

139. *See id.* at 509-510.

140. *See* Sklaroff, s*upra* note 98, at 266-67.

A. Automation

The quintessential element of a smart contract is its automated nature. Once a certain set of agreed upon conditions are met, the contract will automatically execute and eliminate any form of voluntary breach.[141] Although counterintuitive, consider the following illustration of a somewhat futuristic car lease achieved through smart contracting. Suppose that Anna operates a car dealership that leases cars that can only be operated by a digital "key" through an iPhone app, and that the "key" can be terminated remotely. Bill leases a car from Anna, agreeing to a down payment, monthly payment, interest rate, car specifications, etc. Anna runs a blockchain program that will match Bill's terms to a car in her inventory, and Bill runs a blockchain program connected to his bank accounts and ensures he possesses sufficient funds for the monthly payment. The smart contract program operates on continuous "if then" configurations to account for "breaches" between the parties.[142] If Bill has insufficient funds to pay the monthly lease payment, the smart contract could respond in many ways, such as terminating Bill's operating "key," or activate a bank's key so that it can repossess the car. Smart contracting virtually forces the parties into compliance and removes any flexibility in remedying possible breach since the terms are secured in the immutable blockchain until the contract period ends.[143]

This lack of flexibility means that the contract must be meticulously "drafted" so that the code matches the parties' agreement, otherwise it may generate long-term problems for the parties involved. This is where the lawyer's role changes in relation to structuring blockchain transactions. Most lawyers are not well-versed in computer coding languages used in smart contracts, so there needs to be a close relationship between those that are programming the contracts and the lawyers who need to make sure their clients understand the terms of the agreement. Therefore, the computer code must be translated into prose so that non-programmers can understand the agreement. Conversely, the computer code must properly execute according to the terms of the prose translation.[144]

This will necessarily drive up the initial costs of transacting through

141. Cuccuru, *supra* note 15, at 7.

142. *See* Sklaroff, s*upra* note 98, at 275.

143. *See* Sklaroff, s*upra* note 98, at 274.

144. *See* Brent Miller, *Smart Contracts and the Role of Lawyers (Part 3) - About Lawyering Transactions on Blockchains*, BIG LAW KM (Oct. 25, 2016), http://biglawkm.com/2016/10/25/smart-contracts-and-the-role-of-lawyers-part-3-about-lawyering-transactions-on-blockchains/ [https://perma.cc/FCV5-SG8P].

smart contracts given that "code is not law."[145] Nevada is the one state that has adopted legislation that considers these smart contracts and gives courts a basis for enforcing agreements created and placed on a blockchain.[146] The Nevada statute defines a smart contract as, "a contract stored as an electronic record pursuant to chapter 719 of NRS which is verified by the use of a blockchain."[147] This definition allows contracts to be used as evidence, and even allows the electronic record to be used to satisfy the statute of frauds where a writing is required to enforce the contract.[148] However, if the smart contract is not in a form that can be retained and accurately reproduced for "later reference by all parties," enforceability may be denied.[149] The Act also places restrictions on what notices can be issued by blockchain, such as cancellation of a service, a notice of default, acceleration, repossession, foreclosure, and even product recalls.[150] When advising on the use of smart contracts, it is important to note the limitations that the law places on them. Additionally, Nevada has placed limitations on taxation and fees of blockchain use, which will likely bring about innovation and more widespread use of the technology.[151]

This combination of translation and enforceability problems creates an obvious policy concern due to blockchain's immutable construction. Once a transaction (block) is verified and added to the chain, it is irreversible and permanent. Therefore, the accuracy of records on the blockchain are only as reliable as those that are entering the information. Hypothetically, a user could erroneously record a deed and cause a property owner to lose rights to a property, because the blockchain "ensure(s) that the seller can sell, but it does not ensure that the 'correct' buyer receives the title."[152] Basically, blockchain's verification system only verifies whether the transaction *can* occur, but it does not check whether the input information is accurate. This problem should prompt legislators to consider a rebuttable presumption of validity regarding

145. *See* Brent Miller, *Smart Contracts and the Role of Lawyers (Part 2) - About "Code is Law"*, BIG LAW KM (Oct. 22, 2016), http://biglawkm.com/2016/10/22/smart-contracts-and-the-role-of-lawyers-part-2-about-code-is-law/ [https://perma.cc/4E6D-LT22].

146. *See* N.R.S. § 719 (2017).

147. *See id.* at § 719.090.

148. *Id*.

149. John Mirkovic, *Blockchain Pilot Program Final Report*, RECORDER OF DEEDS (May 30, 2017), http://cookrecorder.com/wp-content/uploads/2016/11/Final-Report-CCRD-Blockchain-Pilot-Program-for-web.pdf [https://perma.cc/4U5A-RJGD].

150. *See* N.R.S. § 719 (2017).

151. *See* Gayle M. Hyman & Matthew P. Digesti, *New Nevada Legislation Recognized Blockchain and Smart Contract Technologies*, 25 NEV. LAW. 13 (2017).

152. *See* Gabison, *supra* note 105, at 344.

enforceable blockchain contracts.[153] In order for courts to understand the agreement contained in the blockchain, it needs to be in a form that is readily understood and reproducible. However, this is not a requirement of the Nevada statute, it is merely a suggestion subject to the discretion of the judge.[154] Since blockchain's immutable technology is at odds with traditional contract law, a new "smart contract doctrine" will necessarily rise to give new meanings to offer, acceptance, consideration, and mutual assent within the realm of irreversible electronic contracting.[155]

B. Decentralization Creates Legal Uncertainties Governing Smart Contracts

There are also jurisdictional issues to consider. Since the blockchain is located on a decentralized ledger on a network of many computers, a determination needs to be made as to where the contract was formed in order to know which law to apply in enforcing the agreement.[156] There are also many defenses to a "technically enforceable" contract such as mistake, duress, misrepresentation, undue influence, unconscionability, and public policy grounds.[157] Issues like these are unresolved due to blockchain's novelty and its sparse implementation. With states enacting new legislation and large amounts of money pouring into blockchain technologies and applications, many new issues surrounding contract enforcement law need to be considered.

Most smart contracts are small and simple transactions. However, as their use becomes more sophisticated, certain legal issues may arise as to jurisdiction and choice of law. If there is ambiguity in regard to the location where the contract was formed, the courts must address a method for determining the place of formation of a smart contract. Additionally, if there is some type of malfunction or unpredictable result of the smart contract, the individuals harmed may not know who to sue. Due to the ledger being distributed across a large network, there is no central authority which determines who can be sued for malfunctions of agreements that are executed on the network's platform. However, there is an operator of the blockchain who could be held accountable if the malfunction was fairly traceable to their actions. The operator could also help determine jurisdiction and choice of law. There are many paths the

153. *See* Gabison , *supra* note 105, at 344-45.
154. *See* N.R.S. § 719 (2017).
155. O'Shields, *supra* note 18, at 186.
156. O'Shields, *supra* note 18, at 190.
157. O'Shields, *supra* note 18, at 185.

court could take in considering the location of the operator, such as where its physical operations are, the place where the conduct is most substantially influencing the maintenance of the network, etc. Adjudication of smart contract disputes has not been tested in U.S. courts, but there will almost certainly be a continuing discussion of the issues surrounding the technology and the law.[158]

C. Anonymity Threatens Right to Relief and Creates Possible Opportunities for Criminal Activity

Users of smart contracts on distributed networks are often identifiable by a public key, but this cannot necessarily be linked to an identifiable, locatable person. The benefit of blockchain is to allow users who do not know or trust each other to transact freely without uncertainty as to whether the information on their ledger is true. This could make it difficult for law enforcement responsible for investigating financial crimes like money laundering, securities fraud, and tax evasion. As a result, regulatory bodies will need to address these issues and find ways to build compliance rules into blockchain networks. This way, smart contracts that do not conform to certain regulations can be designed to pause when they encounter a regulatory hurdle, and the parties can have a chance to revise the agreement or cancel it altogether.[159]

Tracking financial crimes and following the money trail will also be more difficult because of anonymous users.[160] Users could create any number of wallets with separate public keys to transact with other parties who are using similar tactics to remain untraceable. Innocent users could be harmed by a counterparty and have no reasonable way of finding or identifying the person on the other end of the blockchain network. Although anonymity is a strong benefit to many users on the network, regulators will be concerned that unlawful users will be able to circumvent the law anonymously without any fear of punishment. Regulators should mandate identification disclosure requirements for certain types of blockchain applications so that they can adequately monitor illegal activity and enforce the law.[161]

158. *See generally* Wulf A. Kaal & Craig Calcaterra, *Crypto Transaction Dispute Resolution*, 73 BUS. LAW. 109 (2018).

159. O'Shields, *supra* note 18, at 187.

160. O'Shields, *supra* note 18, at 184.

161. *See generally* Douglas Heaven, *Sitting with the Cyber-Sleuths who Track Cryptocurrency Criminals*, MIT TECH. REV. (April 19, 2018), https://www.technologyreview.com/s/610807/sitting-with-the-cyber-sleuths-who-track-cryptocurrency-criminals/ [https://perma.cc/2DL9-2HFS].

VI. BLOCKCHAIN AND ITS ROLE IN REDUCING TRANSACTIONAL FRICTION

A. Blockchain and Its Role as a Bank Replacement

The biggest proponents and creators of blockchain technology are committed to dismantling financial intermediaries in favor of distributed blockchains.[162] While banking and financial intermediaries "operate through centralized control of authority," the blockchain offers "autonomous, self-serving, and decentralized applications" that replace the intermediaries.[163] Parties transact with intermediaries, not because it is the most efficient method, but because they have the authority and a reputation to be trusted. As discussed, blockchain creates this trust by distributing the ledgers across an entire network, creating a fully transparent and unchangeable record of transactions. This effectively reduces a substantial amount of risk involved in transacting through centralized authorities.[164]

The news has been barraged by a series of reports about hacking and data dumps that have affected millions of people worldwide.[165] This happens when a few single intermediaries possess an enormous amount of assets and clout. Blockchain's distributed ledgers remove this single point of failure. If a single bank is funding hundreds of multimillion-dollar transactions and is then infiltrated by an opportunistic hacker, consumers and investors alike would be severely harmed.[166] The blockchain solves this problem by distributing a copy of the data on each and every computer on the network, and since the ledger is constantly being verified and updated, there is very little risk of losing any data (or money).[167]

The world of finance is already largely digitized, and transfers of funds are usually executed according to highly standardized terms and measurable variables.[168] Statistical and mathematical models currently drive many transactions and are easily translatable into computer coded languages.[169] Financial institutions stand to reduce transactional friction by automating a large portion of their transfers when these models get

162. Kennedy, *supra* note 68.

163. Cuccuru, *supra* note 14, at 3-4.

164. Ross, *supra* note 30, at 366.

165. Seth Fiegerman, *The Biggest Data Breaches Ever*, CNNTECH (September 7, 2017), http://money.cnn.com/2017/09/07/technology/business/biggest-breaches-ever/index.html [https://perma.cc/SCX4-U4XM].

166. Surujnath, *supra* note 111, at 282.

167. Surujnath, *supra* note 111, at 262.

168. Cuccuru, *supra* note 15, at 12-13.

169. Surujnath, *supra* note 111, at 283-84.

incorporated into the blockchain.[170] Some financial intermediaries are already using blockchain technology to expedite certain types of transactions.[171] J.P. Morgan, a large financial institution that holds over $2.5 trillion in assets, has implemented a blockchain pilot program for certain international exchanges.[172] The bank has joined forces with the Royal Bank of Canada and New Zealand Banking Group Limited to launch the Interbank Information Network, which utilizes blockchain for the purpose of "minimizing payments in the global payments process."[173] The "costly, laborious, and error-prone" process where different currencies are involved stall international transactions, but have been significantly sped up due to automation and the blockchain's unique form of trust.[174]

In blockchain applications, trust is built in to the system, creating a sort of "trustless trust."[175] Using an open-source code, many blockchain providers rely on its network users to update and improve the underlying code of the blockchain.[176] This way, as long as every user trusts the code underlying the blockchain, the system remains reliable unless someone has more than 51% of the total computing power on the network.[177] In regards to consumer banking initiatives, blockchain proponents face challenges in "developing a ledger that properly balances transparency to financial markets with protecting consumers' financial and identity information."[178] There is contention between whether the ledger should be *permissionless*, meaning it is openly public and transparent, or *permissioned*, meaning it is only distributed to a network of authorized users.[179] Businesses holding sensitive data and information will likely choose, or be required to operate, a permissioned network in order to keep

170. Surujnath, *supra* note 111, at 283-84.

171. Frank Chaparro, *Banks Have a Big Appetite to Join JPMorgan's Blockchain Party*, BUSINESS INSIDER (Feb. 28, 2018, 9:14 PM), https://www.businessinsider.com/blockchain-jpmorgan-says-banks-have-big-appetite-to-join-party-2018-2 [https://perma.cc/R75E-RGFN].

172. *Id.*

173. J.P. Morgan, *supra* note 21.

174. *See generally* Ryan Brown, *IBM Has a New Blockchain for Banks to Speed Up Cross-Border Payments*, CNBC: THE FINTECH EFFECT (October 16, 2017, 6:12 AM ET), https://www.cnbc.com/2017/10/16/ibm-has-a-new-blockchain-for-banks-to-speed-up-cross-border-payments.html [https://perma.cc/7QKT-BZE6].

175. Catherine Martin Christopher, *The Bridging Model: Exploring the Roles of Trust and Enforcement in Banking, Bitcoin, and the Blockchain*, 17 NEV. L.J. 139, 141 (2016).

176. Jim Gatto, *Understanding Bitcoin and Virtual Currency*, LEXISNEXIS PRACTICE ADVISOR (July 31, 2018).

177. *Id*.

178. Ross, *supra* note 30, at 373.

179. Ross, *supra* note 30, at 373.

matters private.[180]

B. Blockchain and its Potential Impact on Stock Markets and Venture Capital

The stock market has experienced multiple crashes throughout history. The largest loss in the shortest amount of time occurred in 2010 where investors lost approximately $862 billion in a single day.[181] This was caused by high-frequency trading firms' algorithms that were responding erratically due to erroneous signals about market behavior.[182] A cryptographic stock exchange would solve this using the proof-of-work concept.

Depending on the verification difficulty that can be built into the blockchain's code, verifying a transaction can take anywhere from a few seconds to ten minutes. The slight delay in adding the transaction to the ledger would prevent erroneous responses from high frequency trading algorithms and only verify legitimate transactions. Additionally, cryptographic securities markets could be open twenty-four hours a day, seven days a week, which would lower the barrier to entry by having no time restrictions on transactions.[183]

VII. LIMITATIONS OF BLOCKCHAIN TECHNOLOGY

Despite the widespread buzz about the problems that blockchains solve, this technology also presents limitations and new challenges. Notwithstanding the notion that blockchain is totally decentralized, there are still a few individuals who are in control of developing and maintaining the code on blockchains. Bitcoin and blockchain platforms need to be maintained and improved as technology advances, and this creates an imbalance of power between the entity running the blockchain containing companies' most valuable assets, and the actual companies who do not have the resources to maintain their own decentralized databases. This could actually drive up the cost of transactions instead of lowering them. If blockchain middlemen emerge, they would just take the place of a financial intermediary, only the relationship would be based on

180. Ross, *supra* note 30, at 373.

181. Edgar Ortega Barrales, Note, *Lessons From the Flash Crash for the Regulation of High-Frequency Traders*, 17 FORDHAM J. CORP. & FIN. L. 1195, 1196 (2012); *See also*, Larissa Lee, Note, *New Kids on the Blockchain: How Bitcoin's Technology Could Reinvent the Stock Market*, 12 HASTINGS BUS. L.J. 81 (2016).

182. Lee, *supra* note 182, at 120.

183. Lee, *supra* note 182, at 120.

leverage instead of trust.[184]

Bitcoin utilizes an open-source approach, allowing users on the network to add improvements to the code, benefitting every user on the network by creating a smoothly operating platform on which to transact.[185] But this will not work for permissioned networks built for organizations who cannot afford to establish their own blockchain operator. There must be regulations in place for these types of relationships and laws must establish obligations and duties of the parties to ensure that the blockchain operators have incentive to keep company data safe.

It is still very difficult to utilize blockchain because it is such a specialized field and there are many barriers to entry. Blockchain technology is complex, and understanding it takes considerable research and effort, so many prospective users who would benefit miss out because they do not have time to adequately inform themselves. Until it becomes more widely adopted, its uses are limited due to the large network on which the blockchain depends.[186]

One of blockchain's biggest features, its immutability, as seen in the house recording case, depends on user error. A mistaken entry into a blockchain could be irreversible, potentially bringing about massive losses by clerical mistake. However, there are supposed workarounds and adjustments for situations like this, such as forking, which refers to an inconsistent entry onto the blockchain that splits off and forms a new blockchain on the same network.[187] When a fork is created, either through a blockchain software update or change in blockchain's protocol, the network can either ignore the fork and continue adding blocks to the previous chain or adopt the new chain as the official one.[188] This has only happened twice in Bitcoin's history, but presents a concern unique to blockchain.

Blockchain is a cutting-edge, emerging technology that has its proponents touting its game-changing properties for financial markets and

184. *See generally* Patrick Murk, *Who Contrlols the Blockchain?*, HARVARD BUSINESS REVIEW: TECHNOLOGY (April 19, 2017), https://hbr.org/2017/04/who-controls-the-blockchain [https://perma.cc/R3FV-RAG9].

185. Bitcoin Project, *supra* note 38.

186. Jason Bloomberg, *Eight Reasons to Be Skeptical About Blockchain*, FORBES (May 31, 2017), https://www.forbes.com/sites/jasonbloomberg/2017/05/31/eight-reasons-to-be-skeptical-about-blockchain/#6149f5755eb1 [https://perma.cc/9H58-FNZ9] .

187. Castor, *supra* note 58.

188. Amy Castor, *A Short Guide to Bitcoin Forks*, COINDESK (May 16, 2017, 5:05 PM), https://www.coindesk.com/short-guide-bitcoin-forks-explained/ [https://perma.cc/Z8B6-SNMF].

record keeping.[189] Money is pouring into the industry and token offerings are becoming more commonplace.[190] The potential for different uses is overwhelming. Transactional lawyers need to be aware of this technology and the legislation surrounding it to serve future clients who are utilizing this technology and even to become early adopters to increase efficiency in their firms. By shifting their practices to accommodate the adoption of blockchain, lawyers can better serve their clients and business will continue to grow.

VIII. CONCLUSION

Blockchain is a development that could become as significant as the internet in regard to technological advancement and innovation. The internet created a platform for free-flowing information and revolutionized communication, commerce, finance, education, taxation, and more. Blockchain technology is poised to pervade every one of those industries and more as its applications continue to be understood. Just as the internet allowed the free flow of information, blockchain allows the free flow of money and data between users all over the world. Currency now trades seamlessly and rapidly on cryptocurrency exchanges, keeping users anonymous and providing maximum security and predictability.

Financial institutions are salivating at the potential transaction costs that could be cut from implementing blockchain transaction platforms.[191] But the changes are not going to emerge without many regulatory and oversight challenges. The courts and governing agencies have attempted to address certain issues that have arisen as blockchain has grown. However, this guidance is limited, and regulation has certainly not caught up to many blockchain functions.[192]

Blockchain's decentralization, immutability, and anonymity characteristics attract many users seeking a secure and anonymous transaction platform. Although this also attracts users who have illegal intentions, it does not outweigh the benefits of the technology and appropriate regulation can address the limitations of the technology. Smart contracts will remove friction by seamlessly including agreement and enforcement into one protocol, thereby eliminating the possibility of

189. Castor, *supra* note 58.

190. *See generally Blockchain Investment Trends in Review*, CBINSIGHTS https://www.cbinsights.com/research/report/blockchain-trends-opportunities/ [https://perma.cc/JJ2N-VUP6].

191. Tapscott, *supra* note 93.

192. David Fialkow et al., *Cryptocurrency 2018: When the law catches up with game-changing technology*, 33 No. 20 WESTLAW J. CORP. OFFICERS & DIRECTORS LIAB. 01 (April 2, 2018).

breach. Legislative responses must consider an application of contract law to this new form of agreement and possibly adjust the rules or create a new regulatory scheme that governs contracts of this type.

This type of technology sounds futuristic, but blockchain is simply an efficient and secure bookkeeping tool that could be used in any industry that records transactions. Property transfers could be paired with smart contracts to include multiple regulatory requirements into one automated agreement. This would cause a drop-in title insurance industry and reduce title dispute litigation.

Finally, since the blockchain is being primarily used for exchanging cryptocurrencies, tax treatment of different tokens is a major regulatory hurdle and agencies are still grappling with their classifications. As it stands, the tax requirements are overly burdensome for normal users and there needs to be clear guidance on tax valuations and methods for accounting virtual currency wallets where coins are being used in many different types of transactions. Taxation also raises privacy concerns because blockchain platforms are pseudonymous.[193]

There are many limitations to this technology and we could be far away from any substantial infusion of blockchain into everyday society, but the technology is evolving fast and is attractive to many big banks and investors. Because the applications are far-reaching, it is wise for professionals to inform themselves about the technology and start consideration regulatory solutions.

193. *See generally* Jordan Clifford, *Privacy on the Blockchain*, HACKERNOON (Oct. 17, 2017), https://hackernoon.com/privacy-on-the-blockchain-7549b50160ec [https://perma.cc/Y76M-RC4U].