University of Nevada, Reno

Blockchains, Smart Contracts, and the Future of the Judiciary

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Judicial Studies

by

Leslie J. Ranniger

Shawn C. Marsh, Ph.D., Thesis Advisor

May, 2019

THE GRADUATE SCHOOL

We recommend that the thesis prepared under our supervision by

LESLIE J. RANNIGER

entitled

Blockchains, Smart Contracts, and the Future of the Judiciary

be accepted in partial fulfillment of the
requirements for the degree of

MASTER OF JUDICIAL STUDIES

Shawn C. Marsh, Ph.D., Advisor

Daniel J. Crothers, J.D., Committee Member

Angela M. Lee, Ph.D., Committee Member

Mala Kaul, Ph.D., Graduate School Representative

David W. Zeh, Ph.D., Dean, Graduate School

May, 2019

Blockchains, Smart Contracts, and the Future of the Judiciary

ABSTRACT

The blockchain distributed ledger technology, evolved through the new array of cryptocurrency offerings, touts security, trust, and expediency features which have fostered the growth of smart contracts. Unlike traditional written agreements, smart contracts are coded to execute based on certain algorithms and digitally-defined events; consequently, upon satisfaction of specified criteria, payment is immediate, and usually effected through the cryptocurrency of the platform on which the smart contract is based. However, because a smart contract is self-executing, it may be more difficult to unwind in the event of a dispute, especially when most judges are not versed in the language of computer coding. This article will look at the growth of reliance on blockchain technology and the increasing prevalence of smart contracts, and will then explore some current, and hypothesized, options for decision-making in the event of a smart contract dispute, such as platform-embedded arbitration, a dedicated international court of the blockchain, crowd-sourced juries through which a decision is made by gaming theory, and even the evolution of artificial intelligence to transition the role of judge to a computer program.

TABLE OF CONTENTS

INTRODUCTION

Advances in technology and digitization have had profound effects on all aspects of our lives. In its infancy, the Internet was viewed by the public as "something strange, coming out of geekdom into mainstream perception, greeted by puzzlement over how it works, why it works and why anyone would think it's useful."[1] Of course, the Internet is now an integral part of our daily lives. Similarly, new digital advancements have been made which may also become an entrenched component of future societies. Cryptocurrencies based on blockchain platforms seek to eliminate the need for traditional banking intermediaries to accomplish payment, especially across national boundaries.[2] Based on those platforms, smart contracts have evolved, which evaluate digitized information and execute based on defined coding events, effecting payment, if needed, in the platform's cryptocurrency, and ostensibly eliminating the need for involvement of third parties.

The benefits of blockchain platforms for transactions are steadily gaining recognition. In the past year, blockchain platforms have become realities across a number of countries and transaction types:

- Real estate can be purchased and sold on the Brickblock[3] trading platform, with digital currency holders engaging in transactions that are secure and transparent

---

[1] Tindell, Ken. (April 5, 2013). Geeks Love the Bitcoin Phenomenon Like They Loved the Internet in 1995. In *Business Insider online*. Retrieved from http://www.businessinsider.com/how-bitcoins-are-mined-and-used-2013-4.

[2] Brito, J. & Castillo, A. (2013). Bitcoin: A Primer for Policymakers [PDF file]. *Mercatus Center, George Mason University*. Retrieved from https://www.mercatus.org/system/files/Brito_BitcoinPrimer.pdf

[3] Brickblock. (March 14, 2018). Tokenized Real Estate FAQ. Retrieved from https://blog.brickblock.io/faq-tokenized-real-estate-assets-24674ee47543

on this blockchain, free of geographical restrictions.[4]

- Voting took place in the November 2018 midterm elections in West Virginia, through a blockchain-based app called Voatz.[5] This app was used by nearly 150 people (primarily deployed military members or Peace Corps volunteers) who voted from 24 of out of 55 counties. The Voatz app will be tested in the Denver, Colorado May 2019 election by allowing its use for overseas military personnel to vote remotely via their mobile phones.[6]
- Insurance for marine vessels is being offered through the blockchain platform Insurwave, which is projected to support approximately 500,000 automated ledger transactions, thereby managing risk for more than 1,000 commercial ships in its first year.[7] Insurwave plans to expand coverage to marine cargo, global logistics, aviation, and energy sectors.[8]

---

[4] Stark, Harold. (October 27, 2017). Brilliant Startups Are Using ICOs To Revolutionize The World Of Blockchain. In Forbes online. Retrieved from https://www.forbes.com/sites/haroldstark/2017/10/27/brilliant-startups-are-using-icos-to-revolutionize-the-world-of-blockchain/#7b81c0184a79

[5] Dahlia, J. (September 25, 2018). History-Making, Mobile Voting App for Overseas Military Now in 24 Counties. *WVN News: The Independent Voice of West Virginia*. Retrieved from https://www.wvnews.com/news/wvnews/history-making-mobile-voting-app-for-overseas-military-now-in/article_0402b7dd-af11-56ed-a42d-5981a214f9c0.html. *See also* Kelly, Makena. (November 10, 2018). Nearly 150 West Virginians Voted with a Mobile Blockchain App. Retrieved from https://www.theverge.com/2018/11/10/18080518/blockchain-voting-mobile-app-west-virginia-voatz

[6] Kenney, Andrew. (March 19, 2019). Will Allow Smartphone Voting for Thousands of People (But Probably Not You): The City is Testing a Blockchain-Based App Called Voatz. In *Denver Post online*. Located at https://www.denverpost.com/2019/03/07/voting-smartphone-blockchain-denver/ *See also* Voatz. (n.d.). Voting Redefined: Voatz is on a Mission to Make Voting Safer and More Accessible. Retrieved from www.voatz.com

[7] Insurwave was designed in a joint venture between EY and Guardtime, using blockchain/distributed ledger technologies. *See* World's First Blockchain Platform for Marine Insurance Now in Commercial Use. (May 25, 2018). Retrieved from https://www.ey.com/en_gl/news/2018/05/world-s-first-blockchain-platform-for-marine-insurance-now-in-co

[8] *Id*.

- Food safety is being supported through blockchain technology. Walmart is requiring produce vendors such as Dole, Taylor Farms, and Fresh Express to join its blockchain-based supply chain by the end of January, 2020, to enable Walmart to swiftly trace the source of food-borne illness.[9]
- Carbon Emissions Trading, although not presently in play, has been proposed to be hosted on a blockchain platform. At the 21st Convention of Parties to the United Nations Framework Convention on Climate Change, mitigation of anthropogenic greenhouse gases through a climate change-related price or taxing scheme, with usage or credits traded between companies, industries, or countries, was proposed as a viable cooperative approach to implement the Paris Agreement.[10]
- Government Transactions in Dubai are on track to be handled almost wholly on blockchain platforms by 2020.[11] Presently, "Smart Dubai" is planning to issue commercial business licenses, license medical institutions and doctors, obtain and monitor e-prescriptions, enroll students in schools, and register electric vehicles, all with blockchain technology.[12]

---

[9] Mohan, G. (November 19, 2018). Walmart to Require Produce Growers to Use Blockchain Tracking. In *Los Angeles Times online*. Retrieved from https://www.cpapracticeadvisor.com/news/12437001/walmart-to-require-produce-growers-to-use-blockchain-tracking

[10] Macinante, J. (2017). A Conceptual Model for Networking of Carbon Markets on Distributed Ledger Technology Architecture. *Carbon & Climate Law Review*, 11(3), 243-260. Retrieved from https://www.jstor.org/stable/26245363

[11] Debusmann, B. (July 30, 2018). Smart Dubai, DIFC Courts to Launch World's First Court of the Blockchain. In *Arabian Business online*. Retrieved from https://www.arabianbusiness.com/technology/401774-smart-dubai-difc-courts-to-launch-worlds-first-court-of-the-blockchain

[12] Future Blockchain Summit. (n.d.). Smart Dubai Showcases Progress on Dubai Blockchain Use Cases. Retrieved from https://www.futureblockchainsummit.com/news/smart-dubai-showcases-progress-on-dubai-blockchain-use-cases

Blockchain, like other disruptive innovations,[13] has far-reaching ramifications with respect to dispute resolution, however. For instance, even though a blockchain contract may be self-executing and thereby "irrevocable" by its terms, a dispute might still arise. In this event, a traditional court system would be faced with interpreting an agreement written, not in English or French or any other country's language, but in code. It would seem that this disruptive technology would need an equally "disruptive" set of rules, as well as an adapted decision-making system to support and enforce them. As judges, and attorneys, are usually not coders (although, they may be in the future), one solution might be to submit blockchain disputes to an arbitrator who has these qualifications.[14] Or, a dedicated court could be created which has this expertise, such as the "First Court of the Blockchain" which is in fledgling stages in Dubai, through the Dubai International Financial Center (DIFC),[15] Another alternative might be a "computerized judiciary," with machines, instead of humans, deciding disputes based on coded blockchain agreements.[16] Other internet-based theories might provide an efficient solution, such as crowdsourcing a jury to decide blockchain conflicts.

Realistic expectations should be assessed as these technologies develop. This paper will explore current research and theory with respect to the handling of disputes arising from smart contracts, because these coded agreements may impact the future face

---

[13] Christensen, C. M., Raynor, M. E. & McDonald, R. (December 2016). What is Disruptive Innovation? *Harvard Business Review online*. Retrieved from https://hbr.org/2015/12/what-is-disruptive-innovation

[14] Bryanov, K. (June 30, 2018). Arbitration on a Governed Blockchain: EOS' Crisis of Dispute Resolution. *CoinTelegraph*. Retrieved from https://cointelegraph.com/news/arbitration-on-a-governed-blockchain-eos-crisis-of-dispute-resolution. EOS, one of the newest (and fastest) Blockchain platforms, has its own EOS Core Arbitration Forum (ECAF), effectively the 'judicial branch' of the EOS ecosystem.

[15] Debusmann, *supra*. This court is also being set up to reach internationally in order to "aid verification of court judgements for cross-border enforcement."

[16] Cf. D'Amato, A. (1977). Can/Should Computers Replace Judges? 11 Ga. L. Rev. 1277.

of our judiciary as blockchains become more established in the fabric of our global society.

I. EVOLUTION OF SMART CONTRACTS

A. Technology

Consequences of contractual dealings between parties have evolved significantly in the ninety years since *Hawkins v. McGee*.[17] The concept of the worldwide web for consumer transactions was introduced just a few decades ago.[18] Before the Internet, in the "paper-based world," commercial contracts were written (and often evolved through drafting and revision among parties), and facilitated by legislation (such as the Uniform Commercial Code (UCC) for specific types of commercial dealings); in addition, accounting and banking controls were employed for oversight and protection. In today's internet-based economy, smart contracts based on blockchain platforms and digitally-secure protocols seek to provide a trust network with security and speed, without the need for intermediaries, in order to facilitate commercial transactions.[19]

Satoshi Nakomoto's 2009 White Paper[20] launched Bitcoin, the first traded cryptocurrency. Bitcoin and its progeny are based on a blockchain platform, which is a type of distributed ledger technology (DLT). DLT is a decentralized database that is managed by various participants. Because it is decentralized, there is no central

---

[17] *Hawkins v. McGee*, 84 N.H. 114, 146 A. 641 (N.H. 1929).
[18] Tindell, *supra*. *See also* Agar, J. (2001). Book Reviews [Review of the book How the Web Was Born, by J. Gillies & R. Robert Cailliau]. *The British Journal for the History of Science*, 34(3), 370-373. Retrieved from http://www.jstor.org/stable/4028119
[19] *Id*.
[20] Nakomoto, S. (2009). Bitcoin: A Peer-to-Peer Electronic Cash System [PDF file]. Retrieved from https://bitcoin.org/bitcoin.pdf. Nakomoto has never been identified, and may, in fact, represent a group of persons.

governing or monitoring authority or intermediary but, instead, the transparency that stems from distribution of the log of records among participants makes fraud, manipulation, and hacking more complicated.[21] Blockchain is just one type of DLT, in that it is also a decentralized database with a shared log of records; however, the records are organized in blocks that form a chain, with a cryptographic signature (a "hash") at the beginning and end of each block, which verifies that the encrypted information has not been manipulated.[22]

Ethereum, proposed by Vitalik Buterin in 2013, went live in July, 2015,[23] and expanded blockchain capabilities beyond purely financial transactions. Ethereum has its own cryptocurrency (EOS), but also facilitates blockchain agreements which have been dubbed "smart contracts."[24] As smart contracts are premised on digitized information and defined coding events, these agreements automatically execute when events are satisfied. If payment is an outcome of event satisfaction, then payment is made through the platform's currency.[25] Other cryptocurrencies with smart contract hosting platforms evolved; in fact, at present, there are over 2,000 cryptocurrencies, many of which accommodate smart contracts.[26]

---

[21] See BBVA (Banco Bilbao Vizcaya Argentaria S.A.). (April 26, 2018). What is the Difference between DLT and Blockchain? Retrieved from https://www.bbva.com/en/internet-giants-eye-up-the-banking-business/

[22] *Id*.

[23] Vitalik Buterin was the founder of Bitcoin Magazine. *See* Who Created Ethereum? (n.d.). *Bitcoin Magazine*. Retrieved from https://bitcoinmagazine.com/guides/who-created-ethereum/

[24] Nick Szabo coined the term "smart contracts" in his 1996 article, Smart Contracts: Building Blocks for Digital Free Markets, published in *Extropy* #16 (which is no longer available), and which Szabo reworked in Formalizing and Securing Relationships on Public Networks, *First Monday: Peer-Reviewed Journal on the Internet*, Vol. 2, No. 9 (Sept. 1997), retrieved from https://ojphi.org/ojs/index.php/fm/article/view/548/469.

[25] For example, a smart contract on Ethereum is paid in Ethers, the cyptocurrency of this platform.

[26] CoinLore. (April 13, 2019). Cryptocurrency List. Retrieved from https://www.coinlore.com/all_coins. As of this date, the site reports that there are 2,009 cryptocurrencies, with a total market cap (market capitalization is the total value of all outstanding coins/cryptocurrency) of $166,700,308,780, and trading

The draw of smart contracts is that they dispense with intermediaries, such as NASDAQ or financial institutions. Intermediaries pose an opportunity for human failure, or computerized hacking, phishing, or scamming; consequently, by eliminating this "extra step," blockchain transactions are characterized as more secure, especially as the distributed ledger is available to participants, thus adding trust to the network. However, without a centralized governing authority, there is also no avenue for intervention or relief if a transaction processes contrary to the expectation of a party; the transaction irrevocably executes as programmed.

Lawyers spend years in school, and in practice, learning how to avoid drafting pitfalls and how to appropriately include or consider contingencies in a contract that may affect a client. However, if a lawyer does not code the blockchain transaction, then the lawyer may not be able to fully ensure that the client is adequately protected. Certainly, the lawyer will not be able to personally verify that all terms are included in the coding. In fact, if the lawyer is unable to proofread or understand the coding, it begs the question of whether the lawyer is even necessary to the transaction. Similarly, if a judge does not understand code, it may not be possible for this judge to adjudicate a transaction that both parties have agreed to, but that is now in dispute. As a threshold matter, it may not be possible to determine if there is a meeting of the minds when neither party writes nor understands code. With commercial transactions, the interpretational provisions of the UCC (such as requirements for timely cures, or battle of the forms) also become moot when a contract is immediately self-executing.

---

volume of $28,458,911,331. Cryptocurrencies are traded on a variety of exchanges. *See generally* Blockgeeks. (2017). Best Cryptocurrency Exchanges. Retrieved from https://blockgeeks.com/guides/best-cryptocurrency-exchanges/

B. Mechanics of Smart Contracts

The term "smart contract" was originated in an article published by Nick Szabo[27] in 1996.[28] Szabo provided a very understandable, simplified explanation of the way in which a smart contract works, by making the comparison a vending machine.[29] The premise is that, if you want to purchase an item from a vending machine, you put your money into the machine, push the button corresponding to your product, and voilà, your product is dispensed. The vending machine implements the contract terms by defining the coins needed and buttons to be pushed for a desired item. The contract is enforced by executing the outcome only if all conditions are met. In fact, if programmed to do so, the vending machine may even give back change if you have input more than the cost. Anyone with enough money can purchase an item from the machine. There is no middleman involved. The money collected by the machine is kept safe inside, in a lockbox that provides security from vandals. There is no negotiating on the price, and there is no discrimination among patrons. The transaction is straightforward and immediate.[30]

As described, smart contracts are coded agreements on a blockchain platform that automatically execute (enforce) agreed obligations between parties when digitized (objectified) conditions are met. Similar to the array of paper contracts in current use, smart contracts may involve multiple parties and numerous events as prerequisites to

---

[27] Nick Szabo has degrees in computer science (University of Washington) and law (George Washington University Law School). He is a cryptographer and legal scholar.
[28] Sazbo, Nick. *Smart Contracts: Building Blocks for Digital Free Markets, supra.*
[29] Szabo, Nick. *Formalizing and Securing Relationships on Public Networks, supra.*
[30] *Id*.

execution, or interim execution, and ultimate enforcement and satisfaction. As explained by Szabo, "[b]y using cryptographic and other security mechanisms, we can secure many algorithmically specifiable relationships from breach by principals, and from eavesdropping or malicious interference by third parties, up to considerations of time, user interface, and completeness of the algorithmic specification."[31]

Szabo also hypothesized, by way of example, a smart contract with multiple parties in the form of a digital lien system for automobile purchases, which would embed in the car the contractual terms of the conveyance and security. Protocols would give the cryptographic keys for operating the car to the buyer (based on the purchase terms), and the car could be "shut down" if a proper challenge-response is not completed, thereby preventing theft.[32] If there is a creditor's lien on the car, a protocol could be embedded to return control to the lender if required payments are not made. However, when the loan is paid off, the lien protocol would be removed.[33]

Although the explanations are simple, the underlying mechanisms of smart contracts are complex. The potential implications of this disruptive technology have been likened to the those of the Internet, which has dramatically changed the world economy since its inception in the mid-90s.[34] Blockchain technology may be similarly integrated into every aspect of business, and personal, transactions in the near future. If so, it is critically important that our judiciary and alternative dispute resolution models be

---

[31] *Id*.
[32] This has also been explained in terms of a "starter-interrupter." Raskin, M. (2017). The Law and Legality of Smart Contracts [PDF file]. 1 *Geo. L. Tech. Rev*. 305. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2959166
[33] Szabo, *supra,* lists the logic as follows: "(1) A lock to selectively let in the owner and exclude third parties; (2) A back door to let in the creditor; (3a) Creditor back door switched on only upon nonpayment for a certain period of time; and (3b) The final electronic payment permanently switches off the back door."
[34] *See* Tindell, *supra.*

able to evolve in order to handle disputes and decide outcomes arising under this new technology.

II. DISPUTE RESOLUTION FOR SMART CONTRACTS

The DLT and coding community, in particular, recognize the need for smart contract dispute resolution:

> The world is experiencing an accelerated pace of globalization and digitalization. An exponentially growing number of transactions are being conducted online between people across jurisdictional boundaries. If the blockchain promise comes to a reality, in a not so distant future, most goods, labor and capital will be allocated through decentralized global platforms. Disputes will certainly arise.[35]

A. Computer as Judge

Smart contracts are written in code, a language which is not native to most courts. Evaluating disputes on this new platform will involve expertise that is not, for the most part, currently available in the U.S. court system.[36] In light of the fact that coders are proposing dispute resolution models that take into account current computerized technologies,[37] and at least one blockchain platform has embedded arbitration for dispute

---

[35] Lesaege, C. & Ast, F. (November 2018). Kleros: Short Paper v1.0.6 [PDF file]. Retrieved from https://kleros.io/assets/whitepaper.pdf

[36] However, Dubai has instituted a "First Court of the Blockchain," to be set up to adjudicate blockchain contract disputes across the globe. Debusmann, *supra.*

[37] *See* Section II(C), *infra.*

resolution (which would allow for a decision-maker with industry expertise),[38] it makes sense to also explore the potential for a computerized civil justice system for the resolution of smart contract disputes.

It may be said that legal reasoning is an art, and more nuanced than can be grasped in a computer program. In *Helvering v. Gregory*,[39] Judge Learned Hand reflected that "the meaning of a sentence may be more than that of the separate words, as a melody is more than the notes, and no degree of particularity can ever obviate recourse to the setting in which all appear, and which all collectively create."[40] Similarly, Justice Oliver Wendell Holmes, Jr. famously stated, in *Towne v. Eisner*,[41] that "[a] word is not a crystal, transparent and unchanged; it is the skin of a living thought and may vary greatly in color and content according to the circumstances and time in which it is used."[42]

Regardless, even before the invention of the personal computer, legal scholars have argued that artificial intelligence might handle legal reasoning.[43] A 1970 law review article stated that "the time has come for serious interdisciplinary work between lawyers and computer scientists to explore the computer's potential in law."[44] As computers gained traction in our society, scholars have proposed computer models to generate outcomes that could support, or supplant, aspects of the legal system.[45]

---

[38] *See* Section II(B), *infra.*
[39] 69 F.2d 809 (1934).
[40] *Id*. at 810.
[41] 245 U.S. 418, 425 (1918).
[42] *Id*. at 425.
[43] Buchanan, B. G. & Headrick, T. E. Some Speculation about Artificial Intelligence and Legal Reasoning. 23 *Stan. L. Rev.* 40 (1970).
[44] *Id*. at 40.
[45] *See* Warner, D. (1989). Toward a Simple Law Machine. *Jurimetrics*, 29(4), 451-467. Retrieved from http://www.jstor.org/stable/29762145

"Expert systems," which use knowledge from human experts as a basis for computer system programming, have been developed since the late 1970s.[46] Expert systems apply knowledge about a class of user problems from the computer's database to a current problem and, using reasoning logic termed an "inference engine," determine an outcome.[47] The resulting "knowledge acquisition" has been defined as "the transfer and transformation of problem-solving expertise from some knowledge source to a computer program."[48] Very detailed computer logic was described in a 1977 Harvard Law Review article in the context of a program named TAXMAN,[49] which was crafted to analyze cases and determine a litigation outcome involving taxation of corporate reorganizations. TAXMAN sought to give "more precise understanding of the structure and dynamics of legal concepts."[50] It was hypothesized that this type of program could be used by attorneys to proactively determine the outcome of a particular case (to ostensibly aid in early resolution);[51] in addition, this laid the potential to streamline the judiciary by having the computer dictate the case outcome in these types of cases.

The possibility that a computer could replace a judge is an intriguing concept.[52] Certainly, there could be an advantage to having a computer as judge, in that industry

---

[46] Hayes-Roth, F. (September 1984). The Knowledge-Based Expert System. IEEE Computer, Vol. 17, pp. 11-28. DOI: 10.1109/MC.1984.1659242
[47] *Id*. at 11.
[48] Byrd, T. L., Cossick, K.W. & Zmud, R. (1992). A Synthesis of Research on Requirements Analysis and Knowledge Acquisition Techniques. MIS Quarterly. 16. 117-138. Retrieved from https://www.jstor.org/stable/249704. These expert systems are sometimes known as knowledge-based systems (KBS).
[49] McCarty, L. T. (1977). Reflections on "Taxman": An Experiment in Artificial Intelligence and Legal Reasoning, 90 *Harv. L. Rev*. 837.
[50] *Id*. at 892.
[51] Gruner, Richard. (September 1986). Thinking Like a Lawyer: Expert Systems for Legal Analysis. *Berkeley Technology Law Review*, Vol. 1 Issue 2.
[52] D'Amato, *supra.*

knowledge could be embedded in the programming. A computer-generated decision might also avoid the potential of human fallibilities. Even more, a computer-generated decision might avoid the *perception* of the human fallibilities in our judicial system, whether realized or not. In fact, a computerized judiciary might be the solution to the problem of implicit bias or other unconscious failings in our current judicial system.[53]

Although present-day computer systems are sophisticated, with robust processing capabilities, the legal literature to date has wisely constrained the discussion of computerized justice to specific areas of the law. Certainly, it is possible that, some day in the future, a decision-processing program incorporating all law and legal reasoning may be developed. That is not necessary for this discussion, however, because, at present, smart contracts are primarily commercial in nature. Just as the UCC is focused on facilitating commerce, smart contracts also seek to facilitate commerce by streamlining legal requirements for contract formation and enforcement. Consequently, for purposes of this argument, it is only necessary to contemplate a computer program that would adjudicate disputes involving areas of the law which affect smart contracts, such as contract law and the statute of frauds, as well as areas which are, primarily, statutorily driven, including the UCC, the Electronic Signatures in Global and National Commerce Act (E-Sign Act), and state laws modeled on the Uniform Electronic Transactions Act (UETA).[54] There seems to be, at present, no common law in the U.S.

---

[53] *Id*. at 1278. Professor D'Amato describes his proposed computer program as follows: "The task I suggest . . . involves a multiple regression 'fit' of programmed facts of numerous prior cases (some decisions of which may conflict with others) to a current programmed set of facts. . . [This] would yield a statistic that measures the fit between a current cluster of facts and all the previous cases in the jurisdiction according to whether the cluster signifies a relative "win" for the plaintiff or defendant."

[54] Cardozo Blockchain Project. (October 16, 2018). "Smart Contracts" & Legal Enforceability: Research Report #2. Retrieved from https://cardozo.yu.edu/sites/default/files/Smart%20Contracts%20Report%20%232_0.pdf

which governs the substance of disputes arising from smart contracts;[55] consequently, for purposes of this paper, the contemplation of computerized justice is limited to smart contracts and the particular areas of law in which they operate.

1. Elimination of Judicial "Discretion"

As a practical matter, if the smart contract code needs to be examined, a computer may be the best resource for this analysis in order to decide the consequent outcome, as neither attorneys nor judges are usually facile with digital code interpretation. However, even if computers can be loaded with statutory and common law to date, and algorithms can be written to address and process facts based on the rule of law, one practical aspect of a computerized judiciary might be the de facto elimination of judicial discretion.[56]

Although legal scholars acknowledge that discretion can be programmed to some extent, it has been argued that the elimination of discretion may be a positive attribute of computerization. "[Y]ou cannot exercise a discretion by considering what, as between the parties, would be fair to be done; what one person may consider fair, another may consider very unfair; you must have some settled rule and principle upon which to determine how that discretion is to be exercised."[57] "Discretion, when applied to a court of justice, means sound discretion guided by law. It must be governed by rule not by

---

[55] However, there are presently two federal court decisions which agree that a company which operates with or includes a blockchain platform may be subject to jurisdiction where any physical nodes of the system are located. *See* Section II(A)(3), *infra,* and Poldma, J. (November 28, 2018). Dragged to the U.S. Courts (Part I): Jurisdiction and the Location of Blockchain Nodes. Retrieved from https://blogs.orrick.com/blockchain/dragged-to-the-u-s-courts-part-1-jurisdiction-and-the-location-of-blockchain-nodes/

[56] *See* D'Amato, *supra*.

[57] *Haywood v. Cope*, (1858, Ch.) 25 Beav. 140, 151, quoted with approval in *Heyward v. Bradley*, 179 Fed. 325, 330 (1910).

humour; it must not be arbitrary, vague and fanciful, but legal and regular."[58] Of course, rules or principles can be programmed, and consequently an elimination of judicial discretion might not, in itself, be a bad aspect of a computerized judicial decision. For instance, when decisions are based solely on the rule of law, this may facilitate early settlement or avoidance of litigation altogether, as the parties will not be inclined to throw the dice, so to speak, in the hope that they may be a get a different result at trial by playing on a judge's sympathies. The upshot would be that computerization of judicial decision-making, taking this process away from persons and transferring it to machines, would also allow us to "live under the rule of law and not under the rule of persons."[59]

Of course, this would require a very complex set of algorithms to adequately encompass the law on any given matter. However, the search for such algorithms has been a regular topic among many legal theorists, in an effort to make sense of judicial decisions that might otherwise be termed "discretion." These scholars, including Ronald Dworkin, Rolf Sartorius,[60] R. Kent Greenawalt,[61] D.A.J. Richards,[62] and, more recently Stephen Guest,[63] have attempted to fill in some of the area left open by positivists like H.L.A. Hart,[64] by connecting case precedent or other published "norms" that would

---

[58] Isaacs, Nathan. (1923). The Limits of Judicial Discretion, 32 *Yale L. J.* 339, 343, quoting Lord Mansfield in *Rex v. Wilkes*, (1770, K. B.) 4 Burr. 2527, 2539.
[59] D'Amato, *supra*, at 1277.
[60] Rolf Sartorius authored many legal articles, including The Justification of the Judicial Decision, Ethics 78 (3):171 (1968).
[61] R. Kent Greenawalt is a Professor at Columbia Law School.
[62] Richards, D.A.J. (1977). Rules, Policies and Neutral Principles: The Search for Legitimacy in Common Law and Constitutional Adjudication, 11 *Ga. L. Rev*. 1069.
[63] Stephen Guest is a former student of Dworkin, and current Professor of Legal Philosophy at the University College London Faculty of Laws. Guest recently authored *Ronald Dworkin*, Stanford University Press (2012), in which he discusses Dworkin's writings and theories.
[64] Hart, H.L.A. (1958). Positivism and the Separation of Law and Morals, 71 *Harv. L. Rev*. 593.

support or explain a basis for decisions besides leaving them as "discretion."[65] Although the coding of these algorithms would be time-intensive, the present capabilities of computerization would be more than able to include these rubrics in any formal judicial decision-making model. Ultimately, it is feasible to make law "determinable."[66]

> "[E]ven if we succeed in getting away from the academic considerations in favor of a law that acts automatically, there is on the human side of the question a desire for a government of law and not of men, especially in a democratic state, a desire that urges us to minimize, if not to eliminate, the power of the personal judge in the regulation of our affairs."[67]

Of course, this would not mean that there is no place for judges. A computerized judicial decision-making model would potentially be effective for initial trial court decisions, but it would make sense that there be an avenue for appeal and review. In all, though, in the federal court system for the twelve-months ended March 31, 2018, only 0.16 percent of the 277,010 cases filed were for civil contract disputes (including insurance claims), and approximately 17.8% of all federal cases (civil and criminal) in this same time frame were appealed.[68] Consequently, a computerized trial court decision-

---

[65] D'Amato, *supra*, at 1277.
[66] *Id*.
[67] Isaacs, *supra*, at 343.
[68] Even though contract case filings were up 94% as of the year ending March 31, 2018 due to insurance claims that occurred in the Middle District of Louisiana, the total number of contracts claims in federal district court for that twelve-month period were 445 cases. Of the 277,010 cases heard in federal district court during this same period, this accounts for a meager 0.16 percent of cases filed. Overall, filings of appeals from federal district court decisions in the U.S. Courts of Appeals (for all types of cases) fell by 16 percent to 49,363 total appeals; extrapolating this for contact case appeals (as specific appeal numbers were not given for this category), this would indicate that less than 80 of these appeals were for contract claims. *See* United States Courts. (2018). *Federal Judicial Caseload Statistics 2018* [Data file]. Retrieved from https://www.uscourts.gov/statistics-reports/federal-judicial-caseload-statistics-2018

making system for smart contract cases could streamline human involvement on the bench, but would still leave plenty of cases for the present judiciary to handle.

2. Constitutional Considerations

Article III, Section 1 of the U.S. Constitution provides: "The judicial power of the United States, shall be vested in one supreme Court . . ."[69] Certainly, even with the prospect of a computerized judiciary at the trial court level, the United States Supreme Court will continue as the final arbiter, pursuant to the Constitution, so there would be no constitutional conflict with implementing a computerized trial court for smart contract disputes. Any decisions on appeal would be required to be incorporated into the computerized model so that subsequent cases would be subject to current precedents.

It might give comfort to litigants to require, or at least suggest, that "close" computerized decisions be automatically re-examined by an appellate tribunal. For instance, a coded rule could be implemented to prompt a notice of the right to judicial review of all computer judicial decisions within a particular confidence or numerical range, such as between 0.05 and -0.05 on a scale of 1 to -1;[70] in the event of such appeals, it could be productive to have a higher court reexamine the precedents applied (as the factual determinations would have already occurred at the computerized, or "trial," level, as in our present court system). In all, the law may become more predictable,[71] decisions

---

[69] However, lower courts are discretionary. The full text of Article III, Section 1 of the U.S. Constitution provides: "The judicial Power of the United States, shall be vested in one supreme Court, *and in such inferior Courts as the Congress may from time to time ordain and establish.* The Judges, both of the supreme and inferior Courts, shall hold their Offices during good Behaviour, and shall, at stated Times, receive for their Services, a Compensation, which shall not be diminished during their Continuance in Office." (emphasis added).

[70] D'Amato, *supra*, at 1296.

[71] Predictability would be supported by minimization of discretion.

could be rendered quickly, and potentially "vast amounts of money spent in litigation can be saved, and confidence in the impartiality and justice of the legal system will be greatly improved"[72] with computerized jurisprudence.

The right to a jury trial, pursuant to the Seventh Amendment, is not necessarily impaired with a computerized judiciary.[73] It is well-established that a jury trial can be waived in order to take advantage of certain legal dispute forums, such as in a Chapter 7 bankruptcy filing, or indeed in any alternative dispute resolution mechanism. Also, a blockchain platform may designate a dispute resolution method in its platform, such as EOSIO embeds arbitration as its sole dispute resolution avenue.[74] In fact, the potential of a crowdsourced jury has been proposed, with remote jurors reviewing the case and voting on a decision.[75] In all, it is feasible to envision platforms where, as part of the initial smart contract, parties agree to waive determination by a jury, or judge, of the outcome, or alternately agree to a remote, crowdsourced jury.

In all, waiver of trial by jury works well for smart contracts, as these agreements are based on digitally-realized events, which are time-stamped and sequenced in a trust network through distributed network technology. Similar to the financial issues addressed in a Chapter 7 bankruptcy proceeding, the matters that might be subject to litigation in a smart contract should be more constrained than, say, in a personal injury action where intangibles such as pain and suffering may come into play (which may be

---

[72] *Id*. at 1298.
[73] The Seventh Amendment to the U.S. Constitution provides: "In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law."
[74] *See* Section II(B), *infra*.
[75] Coders have even proposed a crowd-sourced jury scheme. *See* Section II(C), *infra*.

better evaluated by a jury). In general, the evidence involved a smart contract dispute should lend itself to more objective calculation and balancing than in other areas of the law. As our legal system has already validated the propriety of requiring a waiver of jury trial to participate in certain forums,[76] it would not be inappropriate to have parties agree to embedded code in a smart contract that requires dispute resolution without a jury as well.

3. Other Ramifications of Computerized Justice

One negative aspect of computerizing the judiciary could be a decline in new common law. Uncertainties in legislation leave way for judicial decisions that may create new law, although this evolution comes at the expense of the justifiable expectations of at least one of the parties in a case where new law is determined.[77] The cure is more legislation, but at least this process gives prospective notice. A decline in new common law is not unique to computerized justice, however; it will also result if the primary vehicle for dispute resolution of smart contracts is through arbitration. In addition, as already mentioned, it seems that U.S. courts have yet to decide a substantive smart contract dispute.[78]

On the flip side, however, are a number of foreseeable benefits to computerization of the judiciary. As mentioned previously, a decision from a computer will be much

---

[76] In example, as previously mentioned, a jury is not available in Chapter 7 bankruptcy proceedings.
[77] D'Amato, *supra*, at 1296.
[78] Cardozo Blockchain Project, *supra*, at 8. There have been disputes regarding jurisdiction of disputes involving cryptocurrency companies that incorporate blockchain platforms, however; *see* the following discussion in this section and the next two footnotes.

speedier than waiting to get a court date, and spending time in litigation, under the current system. Cost and time savings will be significant.

In addition, computerization may be better situated to discern issues unique to the blockchain – such as jurisdiction. In two current federal district court cases, *In re Tezos Securities Litigation*[79] (a class action on cryptocurrency issue) and *Alibaba Group Holdings Ltd. v. Alibabacoin Foundation et al.*, (a dispute about the use of the Alibaba name on a new, unrelated, cryptocurrency),[80] the "physical location of the verifying nodes" were an important factor in determining jurisdiction.[81] Clearly, it would be an easier task for a computer program to locate "verifying nodes" than trying to find this information through the traditional discovery process.

Dehumanization of the justice system may seem like a negative, but overall it may add to trust in the legal system. No matter how impartial a judge may be, the appearance that the judge has a different background, economic status, educational attainments, may be daunting to litigants; however, computers are unembodied, raising no such concerns. Further, computers are blind to litigants' color, ethnic background, age, disabilities, gender, or other considerations that may give rise to a claim of implicit bias.

As previously stated, it is expected, initially, that parties might include a coded provision in the blockchain contract in which the parties commit to computerized dispute resolution, or an entire platform might embed a similar requirement for all smart contracts on its DLT. Ultimately, an "official" computerized court venue may evolve,

---

[79] 17-CV-06779-RS, D.N.D.Cal.
[80] No. 18-02897, Southern District of New York.
[81] *See* Poldma, *supra.*

similar to Chapter 7 bankruptcy, or other agency areas such as immigration and patent courts. This would avoid time spent in posturing and debating among other alternatives.

In all, replacing judges with computers for dispute resolution is a viable option for conflicts that may arise with smart contracts.

B. Arbitration

Arbitration is well established, domestically and internationally, as a venue for a binding decision outside of a traditional court system. In fact, arbitration has been successfully used as an opportunity for alternative dispute resolution since Roman times, if not before.[82] Arbitration decisions are not, per se, persuasive authority for subsequent decisions, and do not augment the common law. Arbitration decisions are governed by existing law, but do not make new law.[83] This is not a significant concern for smart contract dispute resolution.[84]

To date, only one blockchain platform has embedded arbitration as the sole dispute resolution venue for its users: EOS.

Block.One, a private company registered in the Cayman Islands, developed EOS, and raised funding to launch an initial coin offering (ICO) for Version Dawn 1.0 on June

---

[82] Wolaver, Earl S. (1934). The Historical Background of Commercial Arbitration , 83 *U. Pa. L. Rev*. 132. Retrieved from https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=8693&context=penn_law_review

[83] *Id*. at 132. Wolaver explains: "The history of arbitration, unlike the history of law, is not an account of the growth and development of principles and doctrines that have come, through a long use, to have a general validity and force. While arbitration probably antedates all the former legal systems, it has not developed any code of substantive principles, but is, with very few exceptions, a matter of free decision, each case being viewed in the light of practical expediency and decided in accord with the ethical or economic norms of some particular group. One case is not authority for another . . ."

[84] Cf. *supra,* Section II(A).

1, 2018.[85] The EOS blockchain has its own cryptocurrency (EOS) and blockchain platform (EOSIO) for smart contracts. Unlike other platforms, however, EOSIO has embedded arbitration, called the EOSIO Core Arbitration Forum (ECAF), as the sole vehicle for dispute resolution for smart contracts on its platform.[86] ECAF is structured as an independent, self-governing body that is not linked to Block.One.[87]

Arbitration is used by PayPal[88] and Venmo,[89] two large digital payment systems that are not decentralized. EOS may be establishing a credibility connection with similar, more traditional, financial markets by using a similar dispute resolution system. Conversely, EOS has been criticized by embedding an arbiter in its system, thereby superseding the trust network inherent in DLT.[90] Whatever the reasoning, users in the EOS network have been actively utilizing the arbitration venue during the short time it has been in existence, with new cases presently pending.[91]

The EOS arbitration procedure has some similarities with that of the American Arbitration Association (AAA).[92] ECAF has rules, which are published on its website, and the AAA also publishes its rules on the web. Similar to the AAA, ECAF has a fee structure which includes an initial filing fee and requires payment for the arbitrator's time; of course, payment for arbitration must be made in the EOS cryptocurrency, and not

---

[85] Attic Labs. (September 11, 2018). History of EOS - Part 1. Retrieved from https://medium.com/eosatticlab/history-of-eos-part-1-744a34535790
[86] EOSIO Core Arbitration Forum, Home Page, https://eoscorearbitration.io/
[87] *Id*.
[88] PayPal User Agreement, located at https://www.paypal.com/us/webapps/mpp/ua/useragreement-full
[89] Venmo User Agreement, located at https://venmo.com/legal/us-user-agreement/
[90] Faife, C. (November 13, 2018). EOS Arbitrator Intervention Raises More Questions from Critics. Retrieved from https://breakermag.com/eos-arbitrator-intervention-raises-more-questions-from-critics/
[91] In the less than year of operation of this blockchain, 864 cases have been filed for arbitration, and 3,479 actions have been taken by arbitrators including e-mails, waivers, emergency arbitration orders and evidence requests. ECAF, Overview of Case Load, https://eoscorearbitration.io/disputes/cases/
[92] American Arbitration Association, Home Page, https://www.adr.org/

in "conventional" currency. EOS allows parties are to have lawyers, experts, or any "external person" represent or support them in the arbitration process,[93] and AAA also allows legal representation in proceedings under its rules.

There are definitely differences between ECAF and the AAA, however. In order to be an arbitrator for ECAF, it is necessary to be "[n]ominated by someone known to the ECAF."[94] Although the AAA does cull through applications for arbitrators to be included on their list, there is no similar nomination requirement. Under the AAA rules, the parties are able to choose the arbitrator(s); the AAA facilitates this by providing a list of arbitrators that parties may consider.[95] With ECAF, an arbitrator is assigned; the parties have no choice in the arbitrator, nor do they have advance knowledge of who the arbitrator will be before filing their claim. The definition of "arbitration" in Black's Law Dictionary indicates that the arbitrator is chosen by the parties to the dispute;[96] but this is not settled law. In his first written opinion as a member of the U.S. Supreme Court, Justice Kavanaugh delivered the unanimous decision:

> "When the parties' contract delegates the arbitrability question to an arbitrator, the courts must respect the parties' decision as embodied in the contract . . ."[97]

As parties to every smart contract on the EOSIO blockchain are required, under the terms of that blockchain, to submit contract disputes through the ECAF, and to an arbitrator

---

[93] ECAF, Frequently Asked Questions, https://eoscorearbitration.io/faq/
[94] ECAF, Frequently Asked Questions, *supra.*
[95] American Arbitration Association, Arbitrator Selection, at https://www.adr.org/ArbitratorSelection
[96] Black's Law Dictionary (5th ed. 1979) states, in pertinent part: "Arbitration. . . The reference of a dispute to a neutral (third) person chosen by the parties to the dispute who agree in advance to abide by the arbitrator's award after a hearing at which both parties have an opportunity to be heard. An arrangement for taking and abiding by the judgment of selected persons in some disputed matter, instead of carrying it to established tribunals of justice, and is intended to avoid the formalities, the delay, the expense and vexation of ordinary litigation. . ."
[97] *Schein, et al. v. Archer & White Sales, Inc.*, 586 U. S. ____, 2 (2019).

assigned by ECAF, then clearly the parties have agreed to the authority of the ECAF arbitrator to decide any dispute by electing to contract on EOSIO.

1. Current Arbitration Decisions

To date, there are four final arbitration rulings and numerous interim emergency orders (to freeze named accounts and/or keys pending a final decision) posted on the ECAF website,[98] but in light of the fact that this platform has only been operating for less than a year, this is not surprising. The final rulings fall into two general categories of decisions determining ownership of property, both accounts and funds, which was in dispute due to:

- Private keys that were changed, hacked, spammed, phished, or stolen, and an unauthorized transfer of funds was made to another account; claimant seeks restoration of funds.
- Private keys to the account that were lost; claimant seeks restoration of ownership.[99]

The published decisions include the discovery/evidence provided to the arbitrator, as well as the arbitrator's reasoning used to determine the outcome. The EOS user community has not always been happy with the published outcomes, however.

2. User Satisfaction

[98] ECAF, Arbitral Orders and Rulings, https://eoscorearbitration.io/disputes/notifications/
[99] A large number of cases (39% overall) involve lost keys. ECAF Overview of Case Load, *supra.*

Because of its arbitration feature, EOS touts its platform as a "governed blockchain."[100] This embedded dispute resolution system adds "security" in a traditional sense, by allowing restoration of an account or funds in the event of phishing or hacking (as example), upon the final decision of a designated individual (the assigned arbitrator). Some users see this as a negative, however, in that by duplicating safeguards from traditional financial systems, EOS is acting more like a centralized network. Further, the arbitration feature could allow a bad actor to purposefully tie up the system by flooding it with baseless claims, effectively freezing institutional accounts.[101] In all, however, EOS has already achieved a significant market cap in its short existence,[102] which is evidence that many users/investors are clearly happy with the present structure.

C. Decentralized Dispute Resolution

It has been argued that "[e]xisting dispute resolution technologies are too slow, too expensive and too unreliable for a decentralized global economy operating in real time. A fast, inexpensive, transparent, reliable and decentralized dispute resolution mechanism that renders ultimate judgments about the enforceability of smart contracts is a key institution for the blockchain era."[103] It may make sense to offer a decentralized dispute resolution system for blockchain contracts which, by definition, dispenses with intermediaries.

---

[100] Faife, *supra.*
[101] *Id*.
[102] Market capitalization for EOS is presently the fifth highest of approximately 2,000 cryptocurrencies, at $4,813,159,658 as of April 13, 2019, per CoinLore, *supra.*
[103] Lesaege & Ast, *supra,* at 1.

As mentioned above, Ethereum was the first major cryptocurrency which expanded its blockchain platform to support smart contracts. Kleros was developed independently, as a decentralized decision-making system for Ethereum, with coding which can be included in Ethereum-based smart contracts to require Kleros for dispute resolution. Kleros relies on crowdsourcing, blockchain, and game theory to produce a final decision.[104]

Specifically, Kleros is a program that crowdsources[105] a contractually-defined number of "jurors" (anonymous individuals) who have bid, with pinakion (PKN) tokens,[106] on the right to be involved in a decision on a particular dispute. The model selects jurors based on their PKN bids, with the probability of being drawn as a juror for a specific dispute being proportional to the number of tokens a juror deposits. If the vote of the juror is ultimately consistent with the majority, the juror receives a positive return on his PKN investment. Otherwise, if the juror votes in the minority, or does not vote, the juror has a negative investment return. This gaming structure incentivizes the juror to vote "the truth." Consequently, Kleros, with anonymous crowd-sourced individuals who have a stake in voting a true outcome, supports a decentralized, expeditious decision.

D. Other Evolving Alternatives

Other alternative dispute-resolution models proposed to date range from the traditional to the unconventional.

---

[104] *Id*.
[105] Crowdsourcing. (n.d.). In *Merriam Webster online*. Retrieved from https://www.merriam-webster.com/dictionary/crowdsourcing
[106] The cost of a PKN token is not defined in the Kleros: Short Paper (*see* Lesaege & Ast, *supra*); however, this is not operative to the description of the dispute resolution system.

On the traditional side, the Dubai International Financial Center (DIFC) court system and Smart Dubai announced the inception of a joint taskforce to launch the First Court of the Blockchain.[107] The DIFC Courts were created over ten years ago to lead the international community with standards for commercial litigation, especially cases involving technological advances.[108] The plan was for these courts to "be providing the blueprint for the commercial courts of the future."[109] Following through on this, the First Court of the Blockchain is to be a digital court system, initially set up to date-stamp and publish judicial decisions on the blockchain, so that courts around the world will have access to case judgments in real time.[110] Prospectively, the plan for this new court is to handle disputes arising out of public and private blockchains.[111]

On the unconventional side, a blog self-named the Crypto Law Review, ostensibly written by individuals who understand the technology but are not lawyers, touts itself as "[a] journal pushing the bounds of our legal imaginaries, on-chain, off-chain, and against the chain."[112] One article states, in bold, underlined text, that "crypto needs to immediately move away from unnecessary and counter-productive usage of Legalese."[113] In particular, the premise is that a self-executing transaction might best not

---

[107] DIFC Courts. Press Release: DIFC Courts and Smart Dubai Launch Joint Taskforce for World's First Court of the Blockchain. July 30, 2018. Located at https://www.difccourts.ae/2018/07/30/difc-courts-and-smart-dubai-launch-joint-taskforce-for-worlds-first-court-of-the-blockchain/ *See also* Debusmann, *supra*.
[108] Khaled, Ali. (June 11, 2017). How DIFC Courts Have Helped Connect the UAE's Legal System. In *Arabian Business online*. Retrieved from https://www.arabianbusiness.com/the-court-of-public-opinion-676522.html
[109] *Id*.
[110] Aishah, S.B. (July 31, 2019). Dubai Launches First Ever Blockchain Powered Judiciary. Retrieved from https://bitlegal.io/2018/07/31/dubai-launches-first-ever-blockchain-powered-judiciary/
[111] *Id*.
[112] The Crypto Law Review is located at https://medium.com/cryptolawreview
[113] CleanApp. (July 11, 2018). Contract Law Primer for DLT/Crypto. *Crypto Law Review*. Retrieved from https://medium.com/cryptolawreview/contract-law-primer-for-dlt-folks-9b85230f9eb6

be termed a "smart contract."[114] A distinction is made between law-coders (attorneys) and tech-coders (those who write the blockchain transaction).[115] However, the fact that a transaction is self-executing does not take it out of the realm of potential disputes. The replacement, or synthesis, of traditional legal theories through systems proposed by coders familiar with the workings of the blockchain and smart contracts is being actively discussed.

CONCLUSION

Whether, ultimately, decisions on smart contract disputes are made by a computer-as-judge, or through arbitration, or by a crowd-sourced jury, or in a dedicated global court, it is clear that there will likely be some evolution in current dispute resolution models. With the global proliferation of new cryptocurrencies and blockchain platforms to host smart contracts, it is important for our current judiciary and legal community as a whole to be aware of decision-making models which may support a more informed resolution of smart contract disputes and also allow for efficient utilization of judicial resources.

Although it may seem that the dispute resolution models discussed herein vary significantly, in fact there are two main sources of these models – lawyers, and coders. Both of these contributors speak somewhat different languages, and very few[116] are fluent in both. In light of the disruptive nature of blockchain DLT, and smart contracts in particular, it might best serve future litigants to pay heed to both the legal scholars and

---

[114] *Id*.
[115] *Id*.
[116] Such as Nick Szabo, *supra*.

programming geniuses. It would be a shame to lose the bodies of knowledge developed in both the law and in technology by myopically insisting on models that ignore one or the other.

The dispute resolution models explored in this article all incorporate some aspects of both traditional legal theory and dynamic technological advances. A computerized judiciary would embed, in its programming, legal precedents and theories, as well as statutory requirements. Crowdsourced juries which decide cases based on gaming theory will still need to side with a majority in order to produce a decision and obtain a return, not unlike our current civil jury system. Arbitration has always benefited litigants by allowing a subject matter expert (whether or not chosen by the litigants), who may not be a lawyer or even have a legal background, to decide a case based on established rules and procedures. And, an international court dedicated to blockchain/smart contract dispute resolution on a global scale would bring technical expertise to a judicial forum, similar to many agency courts.

In all, it seems a first step for both lawyers and coders will be to understand what each other can bring to the table so that, optimally, synergistic approaches may continue to evolve that will be able to keep up with technological advances while benefiting from the success of historical models. Disruptive innovation does not require total abandonment of prior lessons; rather, it leverages those lessons in a formerly-unexpected manner. Dispute resolution models for smart contracts should experience similar, positive, disruption.

BIBLIOGRAPHY

Agar, J. (2001). Book Reviews [Review of the book *How the Web Was Born,* by J. Gillies & R. Robert Cailliau]. *The British Journal for the History of Science*, 34(3), 370-373. Retrieved from http://www.jstor.org/stable/4028119

Aishah, S. B. (July 31, 2019). Dubai Launches First Ever Blockchain Powered Judiciary. Retrieved from https://bitlegal.io/2018/07/31/dubai-launches-first-ever-blockchain-powered-judiciary/

Alibaba Group Holdings Ltd. v. Alibabacoin Foundation et al., No. 18-02897, Southern District of New York

American Arbitration Association, located at https://www.adr.org/

Attic Labs. (September 11, 2018). History of EOS - Part 1. Retrieved from https://medium.com/eosatticlab/history-of-eos-part-1-744a34535790

BBVA (Banco Bilbao Vizcaya Argentaria S.A.). (April 26, 2018). What is the Difference between DLT and Blockchain? Retrieved from https://www.bbva.com/en/internet-giants-eye-up-the-banking-business/

Black's Law Dictionary (5th ed. 1979).

Blockgeeks. (2017). Best Cryptocurrency Exchanges. Retrieved from https://blockgeeks.com/guides/best-cryptocurrency-exchanges/

Brickblock. (March 14, 2018). Tokenized Real Estate FAQ. Retrieved from https://blog.brickblock.io/faq-tokenized-real-estate-assets-24674ee47543

Brito, J. & Castillo, A. (2013). Bitcoin: A Primer for Policymakers [PDF file]. *Mercatus Center, George Mason University*. Retrieved from https://www.mercatus.org/system/files/Brito_BitcoinPrimer.pdf

Bryanov, K. (June 30, 2018). Arbitration on a Governed Blockchain: EOS' Crisis of Dispute Resolution. *CoinTelegraph*. Retrieved from https://cointelegraph.com/news/arbitration-on-a-governed-blockchain-eos-crisis-of-dispute-resolution

Buchanan, B. G. & Headrick, T. E. (1970). Some Speculation about Artificial Intelligence and Legal Reasoning. 23 *Stan. L. Rev.* 40.

Byrd, T. L., Cossick, K.W. & Zmud, R. (1992). A Synthesis of Research on Requirements Analysis and Knowledge Acquisition Techniques. MIS Quarterly. 16. 117-138. Retrieved from https://www.jstor.org/stable/249704

Cardozo Blockchain Project. (October 16, 2018). "Smart Contracts" & Legal Enforceability: Research Report #2 [PDF file]. Retrieved from https://cardozo.yu.edu/sites/default/files/Smart%20Contracts%20Report%20%232_0.pdf

Christensen, C. M., Raynor, M. E. & McDonald, R. (December 2016). What is Disruptive Innovation? In *Harvard Business Review online*. Retrieved from https://hbr.org/2015/12/what-is-disruptive-innovation

CleanApp. (July 11, 2018). Contract Law Primer for DLT/Crypto. *Crypto Law Review*. Retrieved from https://medium.com/cryptolawreview/contract-law-primer-for-dlt-folks-9b85230f9eb6

CoinLore. (April 13, 2019). Cryptocurrency List. Retrieved from https://www.coinlore.com/all_coins

Crowdsourcing. (n.d.). In *Merriam Webster online.* Retrieved from https://www.merriam-webster.com/dictionary/crowdsourcing

Crypto Law Review, located at https://medium.com/cryptolawreview

Dahlia, J. (September 25, 2018). History-Making, Mobile Voting App for Overseas Military Now in 24 Counties. *WVN News: The Independent Voice of West Virginia*. Retrieved from https://www.wvnews.com/news/wvnews/history-making-mobile-voting-app-for-overseas-military-now-in/article_0402b7dd-af11-56ed-a42d-5981a214f9c0.html

D'Amato, A. (1977). Can/Should Computers Replace Judges? 11 *Ga. L. Rev*. 1277.

Debusmann, B. (July 30, 2018). Smart Dubai, DIFC Courts to launch world's first Court of the Blockchain. In *Arabian Business online*. Retrieved from https://www.arabianbusiness.com/technology/401774-smart-dubai-difc-courts-to-launch-worlds-first-court-of-the-blockchain

DIFC Courts. (July 30, 2018). Press Release: DIFC Courts and Smart Dubai Launch Joint Taskforce for World's First Court of the Blockchain. Retrieved from https://www.difccourts.ae/2018/07/30/difc-courts-and-smart-dubai-launch-joint-taskforce-for-worlds-first-court-of-the-blockchain/

EOSIO Core Arbitration Forum, Home Page, located at https://eoscorearbitration.io

Faife, C. (November 13, 2018). EOS Arbitrator Intervention Raises More Questions from Critics. Retrieved from https://breakermag.com/eos-arbitrator-intervention-raises-more-questions-from-critics/

Future Blockchain Summit. (n.d.). Smart Dubai Showcases Progress on Dubai Blockchain Use Cases. Retrieved from https://www.futureblockchainsummit.com/news/smart-dubai-showcases-progress-on-dubai-blockchain-use-cases

Gruner, Richard. (September 1986). Thinking Like a Lawyer: Expert Systems for Legal Analysis. *Berkeley Technology Law Review*, Vol. 1 Issue 2.

Guest, Stephen. (2012). *Ronald Dworkin*, Stanford University Press.

Hart, H.L.A. (1958). Positivism and the Separation of Law and Morals, 71 *Harv. L. Rev*. 593.

Hawkins v. McGee, 84 N.H. 114, 146 A. 641 (N.H. 1929).

Hayes-Roth, F. (September 1984). The Knowledge-Based Expert System. *IEEE Computer*, Vol. 17, pp. 11-28. DOI: 10.1109/MC.1984.1659242

Haywood v. Cope, (1858, Ch.) 25 Beav. 140.

Helvering v. Gregory, 69 F.2d 809 (1934).

Heyward v. Bradley, 179 Fed. 325 (1910).

In re Tezos Securities Litigation, 17-CV-06779-RS, D.N.D.Cal.

Isaacs, Nathan. (1923). The Limits of Judicial Discretion, 32 *Yale L. J.* 339, 343.

Khaled, Ali. (June 11, 2017). How DIFC Courts Have Helped Connect the UAE's Legal System. In *Arabian Business online*. Retrieved from https://www.arabianbusiness.com/the-court-of-public-opinion-676522.html

Kelly, Makena. (November 10, 2018). Nearly 150 West Virginians Voted with a Mobile Blockchain App. Retrieved from

https://www.theverge.com/2018/11/10/18080518/blockchain-voting-mobile-app-west-virginia-voatz

Kenney, Andrew. (March 19, 2019). Will Allow Smartphone Voting for Thousands of People (But Probably Not You): The City is Testing a Blockchain-Based App Called Voatz. In *Denver Post online*. Located at https://www.denverpost.com/2019/03/07/voting-smartphone-blockchain-denver/

Lesaege, C. & Ast, F. (November 2018). Kleros: Short Paper v1.0.6 [PDF file]. Retrieved from https://kleros.io/assets/whitepaper.pdf

Macinante, J. (2017). A Conceptual Model for Networking of Carbon Markets on Distributed Ledger Technology Architecture. *Carbon & Climate Law Review*, 11(3), 243-260. Retrieved from https://www.jstor.org/stable/26245363

McCarty, L. T. (1977). Reflections on "Taxman": An Experiment in Artificial Intelligence and Legal Reasoning, 90 *Harv. L. Rev*. 837.

Mohan, G. (November 19, 2018). Walmart to Require Produce Growers to Use Blockchain Tracking. In *Los Angeles Times online*. Retrieved from https://www.cpapracticeadvisor.com/news/12437001/walmart-to-require-produce-growers-to-use-blockchain-tracking

Nakomoto, Satoshi. (2009). Bitcoin: A Peer-to-Peer Electronic Cash System [PDF file]. Retrieved from https://bitcoin.org/bitcoin.pdf

PayPal User Agreement, located at https://www.paypal.com/us/webapps/mpp/ua/useragreement-full

Poldma, J. (November 28, 2018). Dragged to the U.S. Courts (Part I): Jurisdiction and the Location of Blockchain Nodes. Retrieved from

https://blogs.orrick.com/blockchain/dragged-to-the-u-s-courts-part-1-jurisdiction-and-the-location-of-blockchain-nodes/

Raskin, M. (2017). The Law and Legality of Smart Contracts [PDF file]. 1 *Geo. L. Tech. Rev*. 305. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2959166

Richards, D.A.J. (1977). Rules, Policies and Neutral Principles: The Search for Legitimacy in Common Law and Constitutional Adjudication, 11 *Ga. L. Rev*. 1069.

Sartorius, Rolf. (1968). The Justification of the Judicial Decision. *Ethics* 78 (3):171.

Schein, et al. v. Archer & White Sales, Inc., 586 U. S. ____ (2019).

Stark, Harold. (October 27, 2017). Brilliant Startups Are Using ICOs To Revolutionize The World Of Blockchain. In *Forbes online*. Retrieved from https://www.forbes.com/sites/haroldstark/2017/10/27/brilliant-startups-are-using-icos-to-revolutionize-the-world-of-blockchain/#7b81c0184a79

Szabo, Nick. (September 1997). Formalizing and Securing Relationships on Public Networks, *First Monday: Peer-Reviewed Journal on the Internet*, Vol. 2, No. 9. Retrieved from https://ojphi.org/ojs/index.php/fm/article/view/548/469

Szabo, Nick. (1996). Smart Contracts: Building Blocks for Digital Free Markets, *Extropy* #16.

Tindell, Ken. (April 5, 2013). Geeks Love the Bitcoin Phenomenon Like They Loved the Internet in 1995. In *Business Insider online*. Retrieved from http://www.businessinsider.com/how-bitcoins-are-mined-and-used-2013-4.

Towne v. Eisner, 245 U.S. 418, 425 (1918).

United States Courts. (2018). *Federal Judicial Caseload Statistics 2018* [Data file]. Retrieved from https://www.uscourts.gov/statistics-reports/federal-judicial-caseload-statistics-2018

Venmo User Agreement, located at https://venmo.com/legal/us-user-agreement/

Voatz. (n.d.). Voting Redefined: Voatz is on a Mission to Make Voting Safer and More Accessible. Retrieved from www.voatz.com

Warner, D. (1989). Toward a Simple Law Machine. *Jurimetrics*, 29(4), 451-467. Retrieved from http://www.jstor.org/stable/29762145

Who Created Ethereum? (n.d.). *Bitcoin Magazine*. Retrieved from https://bitcoinmagazine.com/guides/who-created-ethereum/

Wolaver, Earl S. (1934). The Historical Background of Commercial Arbitration , 83 *U. Pa. L. Rev.* 132. Retrieved from https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=8693&context=penn_law_review

World's First Blockchain Platform for Marine Insurance Now in Commercial Use. (May 25, 2018). Retrieved from https://www.ey.com/en_gl/news/2018/05/world-s-first-blockchain-platform-for-marine-insurance-now-in-co