PATENTING BLOCKCHAIN: MITIGATING THE PATENT INFRINGEMENT WAR

Shlomit Yanisky-Ravid*
Edward Kim**

ABSTRACT

Blockchain, the technology underlying the bitcoin cryptocurrency, has the potential to revolutionize much of daily life. Its peer-to-peer, open-ledger, consensus-driven, irreversible, and encrypted nature, among other features, enables transactions that do not rely on third parties, have global reach and are easily accessible, trustworthy, and everlasting. Dozens of businesses have poured money into blockchain in the belief that it is the next disruptive technology to transform economies and industries worldwide.

This Article, while acknowledging blockchain's potential, focuses on certain misperceptions that are often associated with the technology. More specifically, the Article argues that blockchain platforms are wrongly perceived as immune from intellectual property (IP) rights claims because they are open-source and

accessible to users. This is simply not true. Blockchain platforms are patentable. The U.S. Patent and Trademark Office (USPTO) has already granted patents to various blockchain platforms and related technologies. As a result, the industry may soon face a flood of patent wars.

This Article argues that these misperceptions are based on several factors: first, a misunderstanding of the technology itself; second, the popular belief that the technology is not subject to intellectual property rights because it was freely donated to society in 2009 by the mysterious figure Satoshi Nakamoto; and third, misunderstandings with respect to the common features associated with blockchain.

The Article further addresses the threat of indirect patent infringement, which has the potential to trigger the same kind of patent wars that have hampered the development of new technologies in the past. The authors propose a new, simple, and innovative method to avoid those legal risks and prevent blockchain innovation from becoming enmeshed in litigation that will limit its full potential.

I. BLOCKCHAIN PLATFORM TECHNOLOGY

A. Is Blockchain Technology Already in Use?

Blockchain is viewed by many as the next disruptive technology to transform a vast range of industries.[1] Deloitte, the consulting firm, predicted a few years ago that spending on blockchain technology would increase dramatically in the years to come.[2] The technology provides a secure platform that allows people (users) who have never met and likely never will, to conduct secure, permanent and trusted transactions without a central authority controlling, approving, or otherwise scrutinizing the transaction.[3] While the technology is more

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[1] *See* Bernard Marr, *30+ Real Examples of Blockchain Technology in Practice*, FORBES (May 14, 2018, 1:38 AM), https://www.forbes.com/sites/bernardmarr/2018/05/14/30-real-examples-of-blockchain-technology-in-practice/ [https://perma.cc/XM6X-LC8N].

[2] David Schatsky et al., *Blockchain and the Five Vectors of Progress*, DELOITTE (Sept. 28, 2018), https://www2.deloitte.com/insights/us/en/focus/signals-for-strategists/value-of-blockchain-applications-interoperability.html [https://perma.cc/X9HU-9JCL].

[3] *See* Nolan Bauerle, *What is the Difference Between a Blockchain and a Database?*, COINDESK, https://www.coindesk.com/information/what-is-the-difference-blockchain-and-database [https://perma.cc/8EKM-CPCP].

widely known for its application to the cryptocurrency bitcoin,[4] blockchain is being used for many more purposes.[5] It can be used to sell tangible commodities, such as land and houses, as well as intangible assets, such as copyrighted works (for example, electronic books).[6] Additionally, blockchain platforms enable digital contracts between companies, individuals, and even sophisticated autonomous systems, such as AI systems. Smart contracts based on blockchain technology are already used for insurance agreements, sales contracts, and more.[7] Because of its unique features, such as being open-ledger, encrypted, decentralized, and accessible, blockchain technology has the unique potential to replace governmental

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[4] *See* SATOSHI NAKAMOTO, BITCOIN: A PEER-TO-PEER ELECTRONIC CASH SYSTEM 1 (2009), https://bitcoin.org/bitcoin.pdf [https://perma.cc/PRC5-PX7Y]; *Frequently Asked Questions*, BITCOIN, https://bitcoin.org/en/faq#what-is-bitcoin [https://perma.cc/96EM-W6WP].

[5] *See* Marr, *supra* note 1 (discussing different types of real-world examples of blockchain technology in different industries, not limited to digital currencies).

[6] *See* Jessie Willms, *Is Blockchain-Powered Copyright Protection Possible?*, BITCOIN MAG. (Aug. 9, 2016), https://bitcoinmagazine.com/articles/is-blockchain-powered-copyright-protection-possible-1470758430/ [https://perma.cc/AEJ9-3APG] (providing examples of services using blockchain technology to register and protect against copyright infringement, such as, Blockai, Pixy, TinEye, Ascribe, Mediachain, and Proof of Existence). "[A] public decentralized ledger like blockchain is ideal for cataloging and storing original works of art, documents, manuscripts, photographs and images, away from central authority. Even if the copyright service ceases to exist, there will still be a verifiable copy of an original work on the blockchain." *Id.*; *see also* Marie Huillet, *KodakOne Blockchain Beta Test Sees $1 Mln in Content Licensing Claims* (Jan. 8, 2019), https://cointelegraph.com/news/kodakone-blockchain-beta-test-sees-1-mln-in-content-licensing-claims [https://perma.cc/62CB-ZJ5Q] ("KodakONE Image Rights Management Platform is an image copyright protection, monetization and distribution platform secured via blockchain technology."); KODAK ONE, https://kodakone.com/ [https://perma.cc/Y42U-K9HS] ("[P]hotographers can purchase almost everything they need in order to succeed . . . (e.g.: Hardware, Software, Travel, Logistics etc.)"). *But see* Jaclyn Wishnia, *Blockchain Technology: The Blueprint for Rebuilding the Music Industry?*, 37 CARDOZO ARTS & ENT. L.J. 229, 245–58 (2019) (arguing that the purported utility of blockchain technology in the music industry is "over-hyped").

[7] *See* Marr, *supra* note 1 ("Accenture builds blockchain solutions . . . translat[ing] . . . insurance processes into blockchain-ready procedures that embed trust into the system. . . . [RiskBlock] . . . provide[s] proof-of-insurance information."). Axa provides first flight delay insurance using smart contracts. *See What Is Smart Contracts Blockchain And Its Use Cases in Business*, EXISTEK BLOG (May 23, 2018), https://existek.com/blog/what-is-smart-contracts-blockchain-and-smart-contracts-use-cases-in-business/ [https://perma.cc/G4Q7-52S8]. Ascribe uses smart contracts for intellectual property management, allowing direct interaction with entities that want to use the intellectual property and customization of conditions and terms for the use of one's work. *See id.* "A consortium between Walmart, IBM, and Tsinghua University" is developing smart contract blockchain technology for supply chain management that tracks orders from the suppliers to the customers. *Id.* Ethereum provides a "decentralized platform that runs smart contracts," as well as management of its own cryptocurrency called Ether. *A Deeper Look at Different Smart Contract Platforms*, BLOCKGEEKS, https://blockgeeks.com/guides/different-smart-contract-platforms/ [https://perma.cc/W5YT-NDGV]; *see also Welcome!*, ETHEREUM, https://www.ethereum.org/beginners/ [https://perma.cc/KR43-XGEC].

registration systems such as those for land, copyright, trademark, and patents.[8] Additionally, it can be used to register healthcare data, education records, and the commercial transactions and source identifiers related to animals or food.[9] Both the general public and private entities, such as banks, construction companies, supermarkets, distributors, and insurance companies, can use the technology.[10]

[8] *See, e.g.*, Bernard Marr, *35 Amazing Real World Examples of How Blockchain Is Changing Our World*, FORBES (Jan. 22, 2018, 12:28 AM), https://www.forbes.com/sites/bernardmarr/2018/01/22/35-amazing-real-world-examples-of-how-blockchain-is-changing-our-world/ [https://perma.cc/TH49-79NY] (providing examples of how Dubai, Estonia, South Korea, and the United Kingdom are exploring applications of blockchain technology); *infra* Section I.B.

[9] *See* Steve Banker, *Blockchain Gains Traction in the Food Supply Chain*, FORBES (July 25, 2018, 8:15 AM), https://www.forbes.com/sites/stevebanker/2018/07/25/blockchain-gains-traction-in-the-food-supply-chain/#572cb3a41cf9 [https://perma.cc/HV6Y-QL3D] (discussing IBM Food Trust, which uses blockchain technology to improve traceability in the food supply chain); Anna Baydakova, *A Top-5 US Hospital Is Exploring Blockchain for Patient Data*, COINDESK (Dec. 5, 2018), https://www.coindesk.com/a-top-5-us-hospital-is-exploring-blockchain-for-patient-data [https://perma.cc/2WL5-R5XH] (discussing how a hospital is collaborating with third parties to develop a distributed ledger for storing and sharing medical data that allows conversion of existing data to a new standardized format using blockchain technology); Elizabeth Durant & Alison Trachy, *Digital Diploma Debuts at MIT*, MIT NEWS (Oct. 17, 2017), http://news.mit.edu/2017/mit-debuts-secure-digital-diploma-using-bitcoin-blockchain-technology-1017 [https://perma.cc/8V8F-DCLR] ("Blockcerts Wallet . . . enables students to quickly and easily get a verifiable, tamper-proof version of their diploma that they can share with employers, schools, family, and friends. To ensure the security of the diploma, the pilot utilizes the same blockchain technology that powers the digital currency Bitcoin. It also integrates with MIT's identity provider, Touchstone."); Marr, *supra* note 1 (discussing applications of blockchain technology in the medical field, e.g., MedicalChain, MedRec, Nano Vision, Gem, etc.).

[10] *See* Marr, *supra* note 1 (discussing financial service blockchain products, e.g., Bitcoin Atom, Securrency, ABRA, Smart Valor, etc., and supply chain and logistics blockchain products, e.g., IBM Blockchain, Provenance, OriginTrail, etc.); *see also* Peter Fedchenkov, *INS – How Blockchain Technology Will Transform Grocery Retail*, COIN COMMENTS, http://coincomments.com/altcoin/how-blockchain-technology-will-transform-grocery-retail/ [https://perma.cc/WQ34-UK96] (discussing blockchain solutions for "transactions and paperwork; supply chain and logistics; and [the] shopping experience" in the grocery industry that are under development by well-known companies such as IBM and Microsoft).

B.   Blockchain Differs from Other Web Platforms

Blockchain, a revolutionary technology that offers an innovative alternative to traditional tools used to conduct transactions,[11] has ten features that distinguish it from other systems.[12]

1.   "Open-Ledger"

Blockchain maintains a distributed ledger, where recorded transactions are transparent and open to everyone, allowing the arrangement and verification of transactions by people who have no relationship with one another.[13] "Anyone at any time can verify transactions made on the blockchain," as a member with a specific role.[14]

2.   Peer-to-Peer

Blockchain is built on a peer-to-peer network, which is a network of nodes (individual computers) that are interconnected.[15] Because it employs a peer-to-peer network, blockchain allows for "decentralized individual action[s]—specifically, new and important cooperative and coordinate action[s] carried out through radically distributed, nonmarket mechanisms that do not depend on proprietary strategies."[16]

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[11] *See* Alan Cohn et al., *Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids*, 1 GEO. L. TECH. REV. 273, 275, 279–80 (2017); Scott A. McKinney et al., *Smart Contracts, Blockchain, and the Next Frontier of Transactional Law*, 13 WASH. J.L. TECH. & ARTS 313, 315–16, 336-37 (2018); *see also* AARON WRIGHT & PRIMAVERA DE FILIPPI, DECENTRALIZED BLOCKCHAIN TECHNOLOGY AND THE RISE OF LEX CRYPTOGRAPHIA 2 (2015) ("[Scholars] compare the emergence of blockchain to another revolutionary technology, the Internet.").

[12] *See* PRIMAVERA DE FILIPPI & AARON WRIGHT, BLOCKCHAIN AND THE LAW 33 (2018).

[13] *See* WRIGHT & DE FILIPPI, *supra* note 11, at 5 (discussing how before blockchain, it was impossible to coordinate transactions of a group of unrelated individuals); Reggie O'Shields, *Smart Contracts: Legal Agreements for the Blockchain*, 21 N.C. BANKING INST. 177, 180 (2017) (explaining that blockchain, or distributed ledger, is open and transparent for all to see, and that the system is designed to be anonymous).

[14] Michele D'Aliessi, *How Does the Blockchain Work?*, MEDIUM (June 1, 2016), https://medium.com/s/story/how-does-the-blockchain-work-98c8cd01d2ae   [https://perma.cc /UNZ9-W7N2].

[15] *See* Ameer Rosic, *What Is Blockchain Technology? A Step-by-Step Guide for Beginners*, BLOCKGEEKS, https://blockgeeks.com/guides/what-is-blockchain-technology/ [https://perma.cc /B4Z4-AP5R] (last updated Mar. 1, 2019).

[16] WRIGHT & DE FILIPPI, *supra* note 11, at 4 n.14.

3.   Decentralized

Blockchain does not require a central authority to govern the interactions among peers in order to function and carry out transactions.[17]

4.   Consensus Mechanisms

The transaction data is checked and validated by the peers or members of a blockchain network, following certain protocols set by the network.[18] Transactions are validated to ensure that only legitimate transactions are recorded on the blockchain.[19] Only when peers on the blockchain reach a consensus on the validity of the transaction is a new block representing the transaction accepted and added.[20] A common validation mechanism is the Proof of Work consensus mechanism.[21]

5.   Encrypted

Blockchain provides a tamper-resistant chain of transaction records utilizing cryptographic hash functions.[22] Each block contains a unique hash code, created by the hash functions, as well as the hash of the previous block in the chain.[23] The combined hash values connect the blocks in a specific order, creating a chain that is encrypted in a secure manner.[24]

6.   Irreversible

Each block is connected to the one before and after it via cryptographic hash functions, as noted above.[25] Since, in general, changes cannot be made, the blockchain is secure and tamper-proof.[26]

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[17] *See id.* at 6.

[18] *See* Rosic, *supra* note 15.

[19] *See id.*

[20] *See* WRIGHT & DE FILIPPI, *supra* note 11, at 7; *see also* Mark R. Patterson, *Blockchain: A Conceptual Primer*, LINKEDIN (June 28, 2018), https://www.linkedin.com/pulse/blockchain-conceptual-primer-mark-r-patterson [https://perma.cc/P7B2-RVG2].

[21] WRIGHT & DE FILIPPI, *supra* note 11, at 7.

[22] *See id.* at 7 n.25; Patterson, *supra* note 20; *see also* NAKAMOTO, *supra* note 4, at 2; Bauerle, *supra* note 3.

[23] *See* DE FILIPPI & WRIGHT, *supra* note 12, at 22; Patterson, *supra* note 20.

[24] *See* DE FILIPPI & WRIGHT, *supra* note 12, at 23.

[25] *See id.* at 22–23; *see also* Patterson, *supra* note 20; D'Aliessi, *supra* note 14.

[26] *See* Patterson, *supra* note 20 (analogizing change to a block to pulling a card out of a

This "crypto-proof" aspect of blockchain further protects the stored data from manipulation, making it immutable.

7.   Trustable

Blockchain's secure validation by its peers' verification process keeps fraudulent data off the system and creates a trustable system.[27]   In other words, user trust is achieved through the validation and verification process.[28]

8.   Accessible to All

Anyone can read the chain in a blockchain, make changes, and register a new block on the blockchain, as long as they follow the rules and protocols of the specific blockchain.[29]

9.   Fast

Due to the technology and the absence of the need for a central authority to approve transactions, a faster and more transparent way of recordkeeping is possible.[30]   For example, cryptocurrencies, such as bitcoin, allow global payment systems, whereas traditionally it would take several days for a transaction to clear through banks and regulatory authorities.[31]

10.   Global

Blockchain can be accessed by anyone globally with a simple computing device, a password (a digital key) and an Internet

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[27] *See* WRIGHT & DE FILIPPI, *supra* note 11, at 7.

[28] *See* Michael J. Casey & Paul Vigna, *In Blockchain We Trust*, MIT TECH. REV. (Apr. 9, 2018), https://www.technologyreview.com/s/610781/in-blockchain-we-trust/ [https://perma.cc /V7B6-8MTL] ("[T]he technology itself is all about creating one priceless asset: trust. . . . [M]athematical rules and impregnable cryptography, rather than trust in fallible humans or institutions, are what guarantee the integrity of the ledger. It's a version of what the cryptographer Ian Grigg described as 'triple-entry bookkeeping' . . . .").

[29] Nolan Bauerle, *What Is the Difference Between Public and Permissioned Blockchains?*, COINDESK, https://www.coindesk.com/information/what-is-the-difference-between-open-and-permissioned-blockchains [https://perma.cc/7ZQM-SD8V].

[30] *See* Robert McDonald et al., *How Blockchain Could Radically Alter Global Finance*, KELLOGG INSIGHT (Jan. 3, 2018), https://insight.kellogg.northwestern.edu/article/how-blockchain-could-radically-alter-global-finance [https://perma.cc/E4ES-N7A3].

[31] *See* WRIGHT & DE FILIPPI, *supra* note 11, at 9.

connection.[32] Digital currencies that utilize blockchain technology have a global transactional reach without the need to go through a central authority, as explained above.[33]

To summarize, blockchain technology is unique among web platforms because it creates a trusted, secure ledger through a mix of peer-to-peer technology, cryptographic functions, distributed storage, and decentralized consensus mechanisms.[34]

C.   *Misconceptions About Blockchain Platforms*

One of the main attractions of blockchain technology is the ability to conduct transactions without a central monitoring authority, such as government.[35] Bitcoin quickly became popular because it relied on the decentralized nature of blockchain, which negated the need for a central authority in digital currency transactions.[36] Important information, such as property ledgers and monetary transactions traditionally overseen by government entities, can now be stored without such central authority.[37] Prior to blockchain, centralized authorities played a role in social order through various intermediaries: "banks acted as central referees, who kept ledgers managing the inflow and outflow of wealth," thereby promoting commerce; centralized legislative and judiciary systems permitted the establishment of laws and dispute resolution; and centralized businesses managed the production and distribution of products and services.[38] Blockchain negates the need for such authorities, promoting a peer-driven, transparent, decentralized, and collaborative global system.

Other open-source technology development has followed a similar pattern, enabling technological development on an open, decentralized, and collaborative global manner, allowing "coopetition," or in other words, cooperative competition.[39]

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[32] *Id.*

[33] *See supra* notes 14–17 and accompanying text.

[34] *See* WRIGHT & DE FILIPPI, *supra* note 11, at 4–5.

[35] *Blockchain technology applications* refers to systems that implement the aforementioned blockchain technology.

[36] *See* Satoshi Nakamoto, *Bitcoin Open Source Implementation of P2P Currency*, P2P FOUND. (Feb. 11, 2009, 10:27 PM), http://p2pfoundation.ning.com/forum/topics/bitcoin-open-source [https://perma.cc/M6WU-FND9] ("[Bitcoin is] completely decentralized, with no central server or trusted parties, because everything is based on crypto proof instead of trust.").

[37] WRIGHT & DE FILIPPI, *supra* note 11, at 19.

[38] *See id.* at 18, 19.

[39] *See* MARC KAUFMAN, A BLOCKCHAIN INNOVATOR'S GUIDE TO IP STRATEGY, PROTECTING

Technologies that are developed in an open-source environment are typically given open-source licenses that allow the technology to be freely used, modified, and distributed, with a condition that any improvements to the technology under the same license be made freely available to others as well.[40] Industry players have embraced the open-source benefits of decreased development time, community supported development, community code review, and platform adoption.[41] The decentralized, collaborative approach of the open-source community laid the foundation for the rapid development of innovative and robust programs such as the Linux operating system.[42] Large corporations, ranging from financial services to retailers, now build their businesses around such community-based technology, marking a shift in the industry away from the information-technology-dependent services of the past.[43] Blockchain technology shares the same similar approach of collaboration and decentralization to solve problems.

Following this peer-driven, transparent, decentralized, and collaborative approach, many blockchain applications are being developed under open-source licenses. For example, the Hyperledger project provides a platform for blockchain application development and releases its blockchain software under an open-source license in an effort to advance cross-industry blockchain technologies in a global collaboration effort.[44] LUKSO provides an open-source blockchain development platform specifically for the fashion and lifestyle industry.[45]

INNOVATION & AVOIDING INFRINGEMENT 33 (2018), https://digitalchamber.org/wp-content /uploads/2018/03/Blockchain-Intellectual-Property-Council-White-Paper-Electronic-FINAL .pdf [https://perma.cc/SMD7-BZKW].

[40] *See Licenses & Standards*, OPEN SOURCE INITIATIVE, https://opensource.org/licenses/ [https://perma.cc/RWV4-EFVN] (listing a variety of OSI-approved licenses, each with different policies in the make and use of their licensed technology, e.g., Apache License 2.0, GPL, MIT License, etc.).

[41] *See e.g.*, Gideon Myles, *Balancing Open-Source and Proprietary IP–They Can Co-Exist*, DROPBOX TECH. BLOG (Dec. 13, 2017), https://blogs.dropbox.com/tech/2017/12/balancing-open-source-and-proprietary-ip-they-can-co-exist/ [https://perma.cc/T8WN-LWW2].

[42] *See* Greg R. Vetter, *The Collaborative Integrity of Open-Source Software*, 2004 UTAH L. REV. 563, 607.

[43] *See* KAUFMAN, *supra* note 39, at 33; *e.g.*, *OSI Affiliate Membership*, OPEN SOURCE INITIATIVE, https://opensource.org/affiliates [https://perma.cc/4P5T-6WJE]; *Members*, LINUX FOUND. MEMBERS, https://www.linuxfoundation.org/membership/members/ [https://perma.cc /HR2P-NQ82].

[44] *See About Hyperledger*, HYPERLEDGER, https://www.hyperledger.org/about [https://perma .cc/P4YF-HCPY].

[45] *See The Digital Ecosystem for New Creative Economies*, LUKSO, https://www.lukso .network/#about [https://perma.cc/9DVF-EFQJ].

But the collaborative premise of blockchain technology and its decentralized, no-central-authority nature creates a misconception that one need not worry about intellectual property (IP) rights when developing or using blockchain technology. To the contrary, there has been a recent uptick in the blockchain patent race.[46]

II.   PATENTING BLOCKCHAIN

A.   *Blockchain Patents*

According to a recent study, the number of blockchain patent applications filed at the United States Patent and Trademark Office (USPTO) the past several years has grown exponentially.[47] The number of patent applications have jumped from 6 in 2011 to 540 in 2016, and the number of patents issued have jumped from 3 in 2011 to 62 in 2016.[48] The basic concepts of blockchain technology were published by Satoshi Nakamoto in 2009,[49] and that publication serves as prior art barring one from being granted a patent on the same basic building blocks of blockchain technology.[50] Fundamentally, blockchain is a technique for storing information. A new corporate blockchain-use law signed into law by California Governor Jerry Brown on September 28, 2018, defines *blockchain* as "a mathematically secured, chronological, and decentralized consensus ledger or database."[51]

Little has been written about the patentability of blockchain technology,[52] beyond the consensus that improvements and/or additions to the core building blocks of blockchain may be patented.[53]

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[46] *See* Nelson Rosario, *An Update on the Blockchain Patent Landscape*, LAW 360 (Mar. 15, 2018, 5:48 PM), https://www.law360.com/articles/1022783.

[47] Jeffrey M. Weinick & Richard A. Cheng, *An Outlook on the Blockchain Patent Arms Race*, N.J.L.J., Sept. 17, 2018, at S-4.

[48] Rosario, *supra* note 46. The study was conducted using blockchain-related search terms, such as *blockchain*, *cryptocurrency*, *smart contracts*, *distributed ledger*, Bitcoin, and Ethereum. *See id.*; *see also* Chuan Tian, *The Rate of Blockchain Patent Applications Has Nearly Doubled in 2017*, COINDESK (July 26, 2017, 11:00 AM), http://www.coindesk.com/rate-blockchain-patent-applications-nearly-doubled-2017 [https://perma.cc/92BD-HQVQ].

[49] *See* NAKAMOTO, *supra* note 4, at 1; *Frequently Asked Questions*, *supra* note 4.

[50] *See* Inayat Chaudhry, *The Patentability of Blockchain Technology and the Future of Innovation*, LANDSLIDE, Mar./Apr. 2018, at 21.

[51] S. 838, 2018 Leg., 2017-2018 Reg. Sess. § 1(a)(12)(iv)(B) (Cal. 2018).

[52] *See, e.g.*, Chaudhry, *supra* note 50 (providing an overview of the Blockchain technology disclosed by Satoshi Nakamoto in 2008, an overview of patentable subject matter in general, and disclosing that important additions and variations to the publicly known core blockchain technology can be patented).

[53] *See* Gurneet Singh, *Are Internet-Implemented Applications of Blockchain Technology*

Thus, patents have already been granted for technologies that are developed as additions to blockchain's basic building blocks.[54]

The actual use of blockchain technology is being explored across many different industries, including telecommunications, financial services, health, and fashion, as well as the government.[55] Any industry that relies on database integrity can apply blockchain to reduce costs and create a more efficient, robust system. For example, fashion blockchain startups focus on supply chain tracking for garments, smart contracts for compensation when a process is completed, and digital labeling.[56] Similarly, "the state of Illinois is investigating the use of blockchain to manage its residents' personal histories, including tax, voting, and driver's license data."[57] Canada and the Netherlands are working on a blockchain for traveler identification, and the National Energy Commission of Chile announced the use of a blockchain platform for authenticating pricing and legal compliance.[58] With blockchain technology becoming mainstream, corporations and entrepreneurs are employing aggressive strategies to secure IP rights of the blockchain technology they are developing. As more use cases are found and improvements to the core blockchain technology are developed, more patent applications will be filed, and more patents will be granted to various entities in a variety of industries.

Patent-Eligible in the United States?, 17 CHI.-KENT J. INTELL. PROP. 356, 357 (2018); *see also* Antonio M. DiNizo Jr., *From Alice to Bob: The Patent Eligibility of Blockchain in A Post-CLS Bank World*, 9 CASE W. RES. J.L. TECH. & INTERNET 1, 28 (2018) (describing patent eligibility for blockchain improvements).

[54] *See* BARRY R. LEWIN, BLOCKCHAIN AND PATENTS 3–4 (2018). The following patents relate to specific uses of the basic blockchain protocol: U.S. Patent No. 9,870,508: "directed to methods and systems for authentication, at least in part, in cryptocurrency applications in blockchain networks." *Id.* at 3. U.S. Patent No. 9,792,742: "provides venue access control based on a blockchain or bitcoin chain of title." *Id.* U.S. Patent No. 9,665,734: "directed to a method for performing record substitution applicable to blockchain technology" for health records. *Id.* at 4. The following examples illustrate improvements to the basic blockchain protocol: U.S. Patent No. 9,635,000: "identity management based on peer-to-peer protocols [on] a public ledger." *Id.* at 3. U.S. Patent No. 9,842,216: "tamper-proof timestamps in a blockchain." *Id.* U.S. Patent No. 9,830,593: "methods for identifying users in pseudonymous transactions." *Id.* U.S. Patent No. 9,807,106: "security-related attributes directed to mitigating a blockchain attack." *Id.*

[55] *See* Marr, *supra* note 1.

[56] *See* Charles Beckwith, *Fashion Blockchain Startups – A Survey of Players in the Field, Q1 2018*, MEDIUM (Mar. 27, 2018), https://medium.com/@fashiontechguru/fashion-blockchain-startups-a-survey-of-players-in-the-field-q1-2018-36727660bb14 [https://perma.cc/X5VW-Q7GZ].

[57] LEWIN, *supra* note 54, at 2.

[58] *See id.* at 2.

B. Patent Infringement

While some scholars have acknowledged that blockchain technology can be patented, few have explored the issues of patent infringement.[59] In a typical patent infringement claim, only a single party's actions are analyzed.[60] Blockchain, however, involves multiple parties working together in a decentralized fashion. That gives rise to divided infringement issues involving multiple parties and making any patent infringement claim and defense much more complicated.

1. Divided Infringement

"Divided infringement law stems from the common law doctrine of contributory infringement."[61] In the past, it was necessary to find a single party responsible for direct infringement under 35 U.S.C. § 271(a) for determining induced infringement under 35 U.S.C. § 271(b).[62] In doing so, different analysis was given to patent claims depending on whether a method/process claim or a system/device claim was at issue.[63] The Federal Circuit noted in *NTP, Inc. v. Research in Motion, Ltd.* that "[u]nder section 271(a), the concept of 'use' of a patented method or process is fundamentally different from the use of a patented system or device."[64]

A few years ago, in *Akamai Technologies, Inc. v. Limelight Networks, Inc.*,[65] the Federal Circuit ruled that "[w]here more than one actor is involved in practicing the steps, a court must determine whether the acts of one are attributable to the other such that a single entity is responsible for the infringement."[66] *Akamai* provided that a party is found responsible where a party "directs or controls others'

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[59] *See, e.g.*, *id.* at 2–3.

[60] Patent claims define the scope of the subject matter of the patented invention. *See* Limelight Networks, Inc. v. Akamai Techs., Inc., 572 U.S. 915, 921, 924 (2014).

[61] Jingyuan Luo, *Patent Law: Shining the Limelight on Divided Infringement: Emerging Technologies and the Liability Loophole*, 30 BERKELEY TECH. L.J. 675, 677 (2015) (providing a good historical overview of the history of the development of divided infringement analysis up to the *Akamai* decision, but not the most updated analysis).

[62] *See Limelight Networks, Inc.*, 572 U.S. at 924.

[63] *See* NTP, Inc. v. Research in Motion, Ltd., 418 F.3d 1282, 1317 (Fed. Cir. 2005) (citing *In re* Kollar, 286 F.3d 1326, 1332 (Fed. Cir. 2002); Joy Techs., Inc. v. Flakt, Inc., 6 F.3d 770, 773 (Fed. Cir. 1993)).

[64] *NTP*, 418 F.3d at 1317 (citing *In re Kollar*, 285 F.3d at 1332; *Joy Techs.*, 6 F.3d at 773).

[65] Akamai Techs., Inc. v. Limelight Networks, Inc., 797 F.3d 1020 (Fed. Cir. 2015) (en banc; per curiam).

[66] *Id.* at 1022.

performance," and where the parties "form a joint enterprise."[67] Liability for infringement can be found "when an alleged infringer conditions participation in an activity or receipt of a benefit upon performance of a step or steps of a patented method and establishes the manner or timing of that performance."[68] Various factors are considered, such as a signed contract, instructions for use, installation guides, technical assistance, a welcome letter, etc.[69] The court further stated that a "joint enterprise" requires four elements:

> (1) an agreement, express or implied, among the members of the group;
> (2) a common purpose to be carried out by the group;
> (3) a community of pecuniary interest in that purpose, among the members; and
> (4) an equal right to a voice in the direction of the enterprise, which gives an equal right of control.[70]

In a blockchain network, these four elements are present. An agreement is made among the peers of a blockchain network by following the blockchain protocol (in carrying out the steps), a common purpose exists to validate and store data on a distributed ledger, the peers have a pecuniary interest among them and the peers have an equal right of control in the decision-making process of a blockchain network (peer consensus).[71] Therefore, a party may be found liable if it performs all the steps or performs a few steps and it controls another party's performance of the other steps of a blockchain patent.

Case law provides further guidance using a two-pronged test established for determining when a party directs or controls others' actions: when a party "(1) 'conditions participation in an activity or receipt of a benefit' upon others' performance of one or more steps of a patented method, and (2) 'establishes the manner or timing of that performance.'"[72] The Federal Circuit further noted in *Travel Sentry,*

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[67] *Id.*

[68] *Id.* at 1023.

[69] *See id.* at 1024–25.

[70] *Id.* at 1023.

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

[72] Eli Lilly & Co. v. Teva Parenteral Meds., Inc., 845 F.3d 1357, 1365 (Fed. Cir. 2017) (emphasis omitted) (quoting *Akamai*, 797 F.3d at 1023); *see also* Travel Sentry, Inc. v. Tropp, 877 F.3d 1370, 1381, 1383 (Fed. Cir. 2017)) (analyzing the two prongs of *Akamai* as they apply to a TSA lock system).

Inc. v. Tropp that "a common thread connects all three cases: evidence that a third party hoping to obtain access to certain benefits can only do so if it performs certain steps identified by the defendant, and does so under the terms prescribed by the defendant."[73] "The decision . . . shows that [the] 'benefit' does not necessarily have to be monetary and may be somewhat intangible, and the 'terms' do not necessarily have to be binding."[74] *Akamai* notably "broaden[ed] the circumstances in which others' acts may be attributed to an accused infringer to support direct-infringement liability for divided infringement, relaxing the tighter constraints on such attribution reflected in our earlier precedents,"[75] and the decisions that followed, such as *Eli Lilly & Co. v. Teva Parenteral Medicines, Inc.* and *Travel Sentry*, further broadened the analysis of *Akamai*.[76] With the broadened analysis, *Travel Sentry* opens the door for more creative arguments for divided infringement cases, which in turn may result in the blockchain technology suffering from divided infringement issues.

In *Raptor, LLC v. Odebrecht Construction, Inc.*,[77] the Federal Circuit distinguished the analysis of system claims from the *Akamai V* divided infringement analysis of method claims stating that "[t]he *Akamai* [*V*] framework does not apply to system claims, which are infringed where a party puts the invention into service."[78] In regards to system claims of blockchain patents, the patentee may assert system claims infringement against those that contain a blockchain component. For system claims infringement analysis, it was noted in *NTP* that "[t]he use of a claimed system under section 271(a) is the place at which the system . . . is exercised and beneficial use of the system obtained."[79] Furthermore, in *Centillion Data Systems, LLC*

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[73] *Travel Sentry*, 877 F.3d at 1380.

[74] Jason N. Mock, *Federal Circuit Breathes More Life into Divided Infringement*, FOLEY (Jan. 16, 2018), https://www.foley.com/en/insights/publications/2018/01/federal-circuit-breathes-more-life-into-divided-in [http://perma.cc/N3U9-AFKG].

[75] Nalco Co. v. Chem-Mod, LLC, 883 F.3d 1337, 1351 (Fed. Cir. 2018) (quoting *Travel Sentry*, 877 F.3d at 1381).

[76] *See Travel Sentry*, 877 F.3d at 1384; *Eli Lilly*, 845 F.3d at 1367–68.

[77] Raptor, LLC v. Odebrecht Constr., Inc., No. 17-21509, 2017 WL 3776914 (S.D. Fla. Aug. 31, 2017).

[78] *Id.* at *3 (quoting Lyda v. CBS Corp., 838 F.3d 1331, 1339 (Fed. Cir. 2016)).

[79] NTP, Inc. v. Research in Motion, Ltd., 418 F.3d 1282, 1317 (Fed. Cir. 2005) (citing Decca, Ltd. v. United States, 544 F.2d 1070, 1083 (Ct. Cl. 1976); *see also* Finjan, Inc. v. Sophos, Inc., 244 F. Supp. 3d 1016, 1047, 1048 (N.D. Cal. 2017) (citing *NTP, Inc.*, 418 F.3d at 1317) (considering whether the benefit and control of a cloud platform is realized in the United States or the United Kingdom).

v. Qwest Communications,[80] the Federal Circuit addressed infringement of a system claim where system components were in the possession of more than one actor,[81] confirming that the *NTP* analysis applies even when different parties include different elements of the system.[82] Moreover, it was noted in *Intellectual Ventures I LLC v. Motorola Mobility LLC*[83] that a party must benefit from each element of the claimed system, not generally from the system as a whole.[84] Additionally, *NTP* established the meaning of *use* as putting the system into use on behalf of a party, and the meaning of *service* to require both the control of the system and the receipt of benefits through the control.[85] Therefore, in circumstances where different parties implement different components, the infringement analysis for system claims depends on whether each party exercises control over the system and whether each party obtains benefits from using the system. For blockchain technology, multiple parties implement different components, and the parties obtain benefits from using the system.[86] The control of the system falls under the power of the parties.[87]   Therefore, blockchain technology may be subject to potential divided infringement issues under system claims as well.

2.   Blockchain Patent Wars

   Historically, innovations in technology were followed by a plague of patent wars, resulting in numerous, high-value patent litigations.[88] Even though the pioneers of the internet opted not to patent the basic building blocks of internet technology, the TCP/IP protocol, subsequent innovations related to technological breakthroughs in various aspects of the internet procured patent

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[80] Centillion Data Sys., LLC v. Qwest Commc'ns Int'l, Inc., 631 F.3d 1279 (Fed. Cir. 2011).

[81] *See id.* 1283.

[82] *See id.* at 1284 (citing *NTP*, 418 F.3d at 1317).

[83] Intellectual Ventures I LLC v. Motorola Mobility LLC, 870 F.3d 1320 (Fed. Cir. 2017).

[84] *Id.* at 1329 (citing *Centillion*, 631 F.3d at 1284).

[85] *Intellectual Ventures*, 870 F.3d at 1328–29 (quoting *Centillion*, 631 F.3d at 1284).

[86] *See* Bauerle, *supra* note 29; *supra* Section I.B.

[87] *See* Rosic, *supra* note 15; *supra* text accompanying notes 15–17.

[88] *See generally* Charles Duhigg & Steve Lohr, *The Patent, Used as a Sword*, N.Y. TIMES, Oct. 8, 2012, at A1 ("Almost every major technology company is involved in ongoing patent battles.").

protection.[89]   Then a plethora of lawsuits followed.[90]   The semiconductor industry followed the same pattern.[91] Recently, the smartphone industry triggered an epic patent war across the world with industry players spending billions of dollars in disputes over their intellectual property assets.[92] The most well-known of them is the infamous *Apple vs. Samsung* case that spanned more than a decade.[93]   With blockchain technology having the potential to transform all types of industries, industry players are anticipating a similar blockchain patent war and have started taking proactive measures to mitigate future litigation.

III.   CURRENT LANDSCAPE

A.   *Private-Ordering Mechanisms*

Companies fearing a potential patent war over blockchain technology are exploring a variety of avenues to avert new legal minefields. Some are taking part in measures that are already in place, and some are exploring new solutions.

In the past, to protect against threats from patent trolls,[94] industry players formed a mutual defense alliance called the LOT Network.[95] The network began in 2014 as a Google initiative and currently has over a dozen members including tech giants Microsoft, Tencent, Facebook, Oracle, Tesla, Amazon, and General Motors.[96] The LOT Network creates a type of legal immunity for its members by requiring the members to put conditions on their patents so that those patents cannot be used against another member in the

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[89] KAUFMAN, *supra* note 39, at vi (discussing how the pioneers of the internet, Robert E. Kahn and Vint Cerf, and the pioneer of blockchain, Satoshi Nakamoto, followed similar footsteps in opting out from seeking patent protection of the basic building blocks of their breakthrough technologies).

[90] *See e.g.*, Duhigg & Lohr, *supra* note 88.

[91] *See* Dorsey & Whitney LLP, *The Top Ten Patent Wars – Semiconductors (#7)*, JDSUPRA (Sept. 5, 2018), https://www.jdsupra.com/legalnews/the-top-ten-patent-wars-semiconductors-7-27555/ [https://perma.cc/4668-494F].

[92] *See* Duhigg & Lohr, *supra* note 88; Jeff John Roberts, *As Blockchain Grows, Companies Look to Avert a Patent War*, FORTUNE (June 19, 2018), http://fortune.com/2018/06/19/blockchain-patent/ [https://perma.cc/5ANN-ZHRJ].

[93] *See* Roberts, *supra* note 92.

[94] Sometimes also referred to as non-practicing entities (NPEs) or patent assertion entities (PAEs), who obtain rights to patents to bring infringement threats and licensing demands against companies for profit or to stifle competition.

[95] *See* Roberts, *supra* note 92.

[96] *See id.*; *Our Community*, LOT NETWORK, https://lotnet.com/our-community/#member-list [https://perma.cc/X2SQ-2NTK].

network, especially when the patents are sold to patent trolls.[97] Some industry players also recommend development of patent pools, such as the Open Invention Network (OIN),[98] where the members of the patent pools are protected against patent suits by acquiring patents and licensing them freely to members who agree to contribute their patents to the pool.[99] Many scholars have written about potential defenses against patent trolls[100] and have also proposed legislative reforms to mitigate the havoc that can be caused by a patent legal minefield.[101]

Recently, the Chamber of Digital Commerce created the Blockchain Intellectual Property Council (BIPC) to promote innovation in the field of blockchain by grappling with IP issues implicated by the technology.[102] The BIPC was formed to combat patent trolls from hindering innovation by providing blockchain-specific patent information and exploring various intellectual property protection measures, such as "nonaggression agreements" in which one party agrees not to assert patent rights against another.[103] As blockchain technology generates more interest, private industry is taking proactive measures by creating blockchain-specific patent defenses to promote innovation in the field, such as the formation of the BIPC, and development of blockchain-specific standards.[104]

Private-ordering mechanisms such as those provided by standard setting organizations (SSOs)[105] have had a role in establishing

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[97] *See* Roberts, *supra* note 92.

[98] *See About OIN*, OPEN INVENTION NETWORK, https://www.openinventionnetwork.com /about-us/ [https://perma.cc/CG6C-DEAM] (seeking to protect its members against suits for using Linux, which is an open-source operating system, by acquiring patents and licensing them freely to its members who agree to contribute their patents to the pool).

[99] Leslie Spencer & Marta Belcher, *Defensive Patenting Strategies for Blockchain Innovators*, LAW 360 (Oct. 10, 2017, 2:03 PM), https://www.law360.com/articles/968628.

[100] *See, e.g.*, Caroline Coker Coursey, *Battling the Patent Troll: Tips for Defending Patent Infringement Claims by Non-Manufacturing Patentees*, 33 AM. J. TRIAL ADVOC. 237, 243 (2009).

[101] *See, e.g.*, John M. Golden, *"Patent Trolls" and Patent Remedies*, 85 TEX. L. REV. 2111, 2113–14 (2007).

[102] *See* KAUFMAN, *supra* note 39, at ii.

[103] *See Chamber of Digital Commerce Forms the Blockchain Intellectual Property Council,* CHAMBER DIGITAL COM. (Mar. 16, 2016), https://digitalchamber.org/chamber-digital-commerce-forms-blockchain-intellectual-property-council/ [https://perma.cc/CLF9-J5YN]; *see also* KAUFMAN, *supra* note 39, at 33.

[104] *See* Catherine Saez, *Blockchain-Related Patents on Exponential Rise, Lawyer Says. Targets? China, US, UK*, INTELL. PROP. WATCH (Jan. 12, 2018), https://www.ip-watch.org/2018 /01/12/blockchain-related-patents-exponential-rise-lawyer-says-targets-china-us-uk/ [https:// perma.cc/4SCU-MMJA].

[105] Examples of SSOs include the Institute of Electrical and Electronics Engineers (IEEE), the European Telecommunications Standards Institute (ETSI), the World Wide Web

market confidence in rolling out advanced technologies, alongside regulation.[106]   SSOs are "industry group[s] that set common standards for its particular industry to ensure compatibility and interoperability of devices manufactured by different companies."[107] A group of companies who are members of an SSO agree to abide by the SSO's policies while collaborating on developing a standardized technical specification of a technology.[108] These standards help set a baseline platform for innovation of new technology, at the same time offering the baseline platform as prior art, prohibiting future patents being granted on technology that merely describes the same baseline technology.[109] Some well-known standards are the XML standard, the 802.11n standard, the 4G standard, the USB standard, and the Bluetooth standard.[110] The members convene and choose relevant technologies that eventually get adopted and published for the industry to produce the standard-compliant technology.[111]

Some SSOs implement a fair, reasonable, and nondiscriminatory terms (FRAND) licensing structure[112] and require members who are involved in the development to declare their intellectual property assets, such as patents, that are related to the standard.[113] Often this is an optional declaration, not a requirement.   For example, telecommunication standard-setting bodies, such as ETSI, provide declaration databases, however, the declaration is optional.[114] Moreover, the Internet Engineering Task Force (IETF) convenes open standards related to web services known as Request for

Consortium (W3C), and the Internet Engineering Task Force (IETF).   NAT'L RESEARCH COUNCIL, PATENT CHALLENGES FOR STANDARD-SETTING IN THE GLOBAL ECONOMY: LESSONS FROM INFORMATION AND COMMUNICATIONS TECHNOLOGY 31 (2013).

[106] *See* VARANT MEGUERDITCHIAN, STANDARDS AUSTL., ROADMAP FOR BLOCKCHAIN STANDARDS 5 (2017).

[107] *See* KAUFMAN, *supra* note 39, at 35.

[108] *See* Theresa R. Stadheim, *Rambus, N-Data, and the FTC: Creating Efficient Incentives in Patent Holders and Optimizing Consumer Welfare in Standards-Setting Organizations*, 19 ALB. L.J. SCI. & TECH. 483, 487 (2009).

[109] *See id.* at 486.

[110] *See* RICHARD RAYSMAN, EMERGING TECHNOLOGIES AND THE LAW: FORMS AND ANALYSIS, §1.04 (2002).

[111] *See, e.g.*, KAUFMAN, *supra* note 39, at ii; MEGUERDITCHIAN, *supra* note 106, at 4, 5.

[112] *See* KAUFMAN, *supra* note 39, at 35.

[113] *See* Justus Baron & Tim Pohlman, *Mapping Standards to Patents Using Declarations of Standard-Essential Patents*, 27 J. ECON. & MGMT. STRATEGY 504 (2018).

[114] *See* ETSI, A GUIDE TO WRITING WORLD CLASS STANDARDS 3 (2013); *ETSI IPR Online Database*, ETSI, https://ipr.etsi.org/ [https://perma.cc/R792-C79V]; *see also About Us*, ETSI, https://www.etsi.org/about [https://perma.cc/ZY96-CGTV] ("ETSI is a European Standards Organization (ESO).   [ETSI is] the recognized regional standards body dealing with telecommunications, broadcasting and other electronics communications networks and services.").

Comments (RFC),[115] however, the IETF relies on the public to submit IP rights disclosures. The IETF provides the public with ways to notify the IETF of one's own patents or others' patents that cover the subject matter covered by the open standards the IETF sets.[116] The commonly known Standard-Essential Patents (SEPs) are a subset of declared patents that are essential to a standard, where the standard cannot be implemented without the patented technology.[117] The parties that are involved in the standard-setting practice are often penalized when they intentionally hide the fact that they own an SEP.[118] The penalties serve as a check on a party's abuse of the inner-workings of SSOs that set the standards. A few SSOs have already started working on a blockchain standard with the hopes of promoting innovation by making interoperability possible among blockchain innovations,[119] and mitigating future intellectual property rights issues. For example, the International Organization for Standardization (ISO) created a technical committee (TC307) to develop standards for blockchain technologies.[120]

B.   Public-Ordering Mechanisms

In the past, legislative reforms have been passed to alleviate headaches caused by the plethora of patent wars.[121] One example is the Leahy-Smith America Invents Act (AIA), which was the most significant legislative change to the U.S. patent system when it went into effect on September 16, 2012.[122] As part of the AIA, the USPTO introduced a new trial proceeding procedure called the inter partes review (IPR) that allows a party to challenge the validity of a patent in front of the Patent Trial and Appeal Board (PTAB) at the USPTO.[123] This was a modification of a previous review procedure called the inter partes reexamination.[124] The IPR allows one to

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[115] *See Internet Standards: RFCs*, IETF, https://www.ietf.org/standards/rfcs/ [https://perma.cc/7UBT-DN52].

[116] *See Mission and Principles*, IETF, https://www.ietf.org/about/ [https://perma.cc/9EHM-AENE].

[117] *See* Baron & Pohlman, *supra* note 113.

[118] *See id.*

[119] MEGUERDITCHIAN, *supra* note 106, at 5, 19.

[120] *See id.* at 5.

[121] *See, e.g.*, Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011).

[122] *See id.*

[123] *See Inter Partes Review*, U.S. PAT. & TRADEMARK OFF., https://www.uspto.gov/patents-application-process/appealing-patent-decisions/trials/inter-partes-review [https://perma.cc/6SFE-F3CX].

[124] *See* HUNTON & WILLIAM, CLIENT ALERT: FIVE THINGS YOU SHOULD KNOW ABOUT THE

petition the validity of a patent by showing that "there is a reasonable likelihood that the petitioner would prevail with respect to at least one claim challenged."[125] The issue of the validity of the patent can only be raised under the 35 U.S.C. § 102 (anticipation) or § 103 (obviousness), and the validity will be determined by the PTAB within one year.[126] The new IPR procedure paved a new way to defend against patent assertions in a faster and more efficient manner—the time taken for a decision to be made was reduced to one year and is significantly cheaper than going through litigation at other courts.

IV. LEGAL CHALLENGES

Although the private sector is taking proactive steps to mitigate a potential patent minefield in the field of blockchain and measures are in place in the public sector, this may not be enough to alleviate future patent wars. In the past, we have seen that "the convergence of products and services in the Internet and cellular communication sector has transformed [our] daily lives . . . and spawned industries in every part of the world with aggregate economic activity approaching $2 trillion per year." The Internet of Things (IoT) is another hot topic in the technology field that refers to a network of devices, vehicles, home appliances, and infrastructure that contain electronics, software, and connectivity, allowing communication between unrelated devices.[127] The industry is currently exploring the convergence of IoT and blockchain, as well as artificial intelligence (AI), resulting in explosive economic and research and development activity.[128] This will further increase the likelihood of a patent

REPLACEMENT OF INTER PARTES REEXAMINATION WITH INTER PARTES REVIEW ON SEPTEMBER 16, 2012, at 1 (2012).

[125] *Inter Partes Review*, *supra* note 123.

[126] *See id.*; *see also* Michelle D. Evans, *Litigation of Inter Partes Review Proceedings in Patent Law*, 152 AM. JUR. TRIALS 349 (2017) (discussing details of IPR proceedings). *But see* Daniel C. Tucker & Jency J. Mathew, *Indefiniteness in Inter Partes Review: The Existing Quagmire and a Path Forward*, FINNEGAN (2019), https://www.finnegan.com/en/insights/indefiniteness-in-inter-partes-review-the-existing-quagmire-and-a-path-forward.html [https://perma.cc/567L-WES9] (noting that nothing in the statute expressly cabins the grounds for inter partes review to § 102 and § 103, but the PTAB has never entertained challenges on other grounds).

[127] *See* Jayshree Pandya, *A Changing Internet: The Convergence of Blockchain, Internet of Things, and Artificial Intelligence*, FORBES (July 5, 2019, 2:40 PM), https://www.forbes.com/sites/cognitiveworld/2019/07/05/a-changing-internet-the-convergence-of-blockchain-internet-of-things-and-artificial-intelligence/ [https://perma.cc/L2SM-UHJR].

[128] *See id.*

minefield with industry players trying to procure their interests in intellectual property.

Although some SSOs track and provide a database of patents that are declared to be covering a published standard, the data is nowhere complete, and even inaccurate, because it relies on self-reporting by entities and no validation process is in place.[129] For example, the IEFT's Best Current Practice guidelines on declaration of intellectual property assets explicitly state, "The IETF will make no determination about the validity of any particular IPR claim."[130]

Engineers and entrepreneurs are often taught to conduct market research—what competition is already in the market, what related technology exists, what related technology has been explored, what are the key points of market entry, what can be improved with the current market, etc.[131] In the IP field, this is also known as prior art search, to get a sense of what is known and has already been patented.[132] The quality of the research heavily relies on access to information, especially when one is dealing with intellectual property.[133] Government and nongovernment entities offer patent search tools to the public: the USPTO offers a patent database search tool,[134] the European Patent Office (EPO) offers Espacenet,[135] and the World Intellectual Property Organization (WIPO) offers PatentScope.[136] The private sector also offers free patent search tools, such as Google Patents,[137] as well as subscription services, such

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[129] *See* SCOTT BRADNER & JORGE CONTRERAS, INTELLECTUAL PROPERTY RIGHTS IN IETF TECHNOLOGY 8 (2017), https://www.rfc-editor.org/rfc/pdfrfc/rfc8179.txt.pdf [https://perma.cc/3RPN-S29N].

[130] *Id*. at 7.

[131] *See, e.g.*, *The Best Ways to Do Market Research for Your Business Plan*, ENTREPRENEUR (Jan. 20, 2015), https://www.entrepreneur.com/article/241080 [https://perma.cc/P8JC-LLA9]; Francois Botha, *Winning Companies Do Their Research; Four Tips to Get You Started*, FORBES (Nov. 26, 2018, 3:30 PM), https://www.forbes.com/sites/francoisbotha/2018/11/26/winning-companies-do-their-research-four-tips-to-get-you-started [https://perma.cc/73Y5-KWNS].

[132] *See* Elizabeth Peters, *Are We Living in a Material World?: An Analysis of the Federal Circuit's Materiality Standard Under the Patent Doctrine of Inequitable Conduct*, 93 IOWA L. REV. 1519, 1550 (2008).

[133] *See, e.g.*, *id.* at 1551.

[134] *See Patent Tools & Links*, U.S. PAT. & TRADEMARK OFF. (Mar. 27, 2014, 11:18 AM), https://www.uspto.gov/patent [https://perma.cc/Q3SD-FBGR].

[135] *See Espacenet: Patent Search*, EUR. PAT. OFF., https://worldwide.espacenet.com [https://perma.cc/TD5U-TENX] (last updated Apr. 26, 2017).

[136] *See PatentScope*, WIPO (Aug. 22, 2019), https://patentscope.wipo.int/search/en/search.jsf [https://perma.cc/QE5C-BNF9].

[137] *See* GOOGLE PATENTS, https://patents.google.com/ [https://perma.cc/KTV2-UJ9T]; *see also* GOOGLE SCHOLAR, https://scholar.google.com/ [https://perma.cc/HB3G-E9VJ] (offering the inclusion of patents in search filtering).

as InnovationQ Plus.[138] Although these tools may work for a general overview of what types of patents are already procured by industry players, it is hard for the average Joe to utilize these search tools in conducting a quality search. This is in part due to the technical and legal patent lingo that covers them. Although the USPTO provides additional resources to make patents more accessible, it is difficult for the unschooled to navigate the patent database without some knowledge of IP terms or technical terms.[139]

There are many ways to describe a given technology. Blockchain technology can be described in various ways: distributed ledger, bitcoin, cryptocurrency, smart contracts, peer validation system, etc.[140] Cloud computing systems are also known as distributed storage, distributed computing, shared pool of computing systems, etc.[141] Furthermore, patent applicants are allowed to be their own

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[138] *See InnovationQ Plus*, IEEE (2018), https://innovationqplus.ieee.org/ [https://perma.cc/4AUV-8U5S] (offering a patent search and analytics platform).

[139] USPTO recognizes that accessing patent information can be challenging for the public, and offers Patent and Trademark Resource Centers (PTRC) by partnering with third party entities, such as libraries, under certain guidelines. Pub. Info. Servs. Grp., *Patent and Trademark Resource Centers*, U.S. PAT. & TRADEMARK OFF. (Jul. 21, 2009 9:36 AM), https://www.uspto.gov/learning-and-resources/support-centers/patent-and-trademark-resource-centers-ptrcs [https://perma.cc/LG2U-DR65]. The types of resources available at the Patent and Trademark Resource Center include specialized search tools, such as a public version of the Examiner's Automated Search Tool that patent examiners use for reviewing patent applications. *See* Pub. Info. Servs. Grp., *PTRC Basic Resources*, U.S. PAT. & TRADEMARK OFF. (Dec. 9, 2013 2:38 PM), https:/ www.uspto.gov/learning-and-resources/support-centers/patent-and-trademark-resource-centers-ptrc/ptrc-basic [https://perma.cc/2H73-XWD7]. USPTO provides tutorials on navigating the patent database. Pub. Info. Servs. Grp., *Seven Step Strategy*, U.S. PAT. & TRADEMARK OFF. (Jul. 4, 2009 7:13 PM), https://www.uspto.gov/learning-and-resources/support-centers/patent-and-trademark-resource-centers-ptrc/resources/seven [https://perma.cc/4H9S-Z8TE]. The patent publication numbering system may seem complicated. For example, utility patents consist of six, seven or eight digits, whereas design patents start with *D* followed by seven digits, and plant patents start with *PP* followed by six digits. *See Patent Number*, U.S. PAT. & TRADEMARK OFF. (Jan. 10, 2018 1:18 PM), https://www.uspto.gov/patents-application-process/applying-online/patent-number [https://perma.cc/L6ZG-L3G4]; *see also* U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE ch. 201 (9th ed., Jan. 2018 rev., Mar. 2014), https://mpep.uspto.gov/RDMS/MPEP/e8r9#/e8r9/d0e4514.html (explaining the types of applications, e.g., continuation, continuation-in-part, divisional, parent, etc.); *infra* Part VI (discussing the Cooperative Patent Classification system).

[140] *See* WRIGHT & FILIPPI, *supra* note 11, at 18–19; Rosario, *supra* note 46.

[141] *See* Anwar Mohd. Mansuri & Prithviraj Singh Rathore, *Cloud Computing: A New Era in the Field of Information Technology Applications and its Services*, 2 AM. J. INFO. SYS. 1, 3 (2014) (stating that cloud computing utilizes distributed storage to save data); *Cloud Computing vs. Distributed Computing*, DEZYRE (Apr. 11, 2015), https://www.dezyre.com/article/cloud-computing-vs-distributed-computing/94 [https://perma.cc/2U8J-GPQU] (discussing that cloud computing systems provide access to a pool of computing resources). *But see id.* (discussing how cloud computing and distributed computing systems reference slightly different objects, but the underlying concept between the two systems are the same).

lexicographer and often use their own terms with specific meanings to describe different technologies.[142] Some create their own terms to further differentiate their inventions from what is already known, making it difficult for even intellectual property experts to determine the scope of a patent.

Public-ordering mechanisms, such as legislative reforms, take years and even after years spent in developing the reforms, many do not see the light of day. Private-ordering mechanisms can be implemented much faster; however, the industry players may promote their own interests first, and the mechanisms rely heavily on self-regulation by the industry.[143]

V.   PROPOSED SOLUTION

A.   A Hybrid Model: Patent Tagging System

To prevent the kind of patent minefields that have plagued other disruptive technologies, tying them up in years of litigation, we propose a hybrid model for blockchain that involves collaboration between the private sector (industry, general public) and the public sector (government). This system would allow hashtags or keyword tagging of patent documents.[144] Such a system could be offered by a public or private service that would allow industry players, inventors, and academics[145] the ability to tag patent documents with keywords describing the technology field that the invention falls under. The public sector entities, such as the USPTO, could provide their own tags for the same patent documents. The tags then could be processed through a consensus protocol that filters unnecessary tags and determines the most prominent tags. The system could be implemented in a variety of ways, involving, for instance, a voting structure or a validation structure that would leverage private and public actors or be limited to public sector entities. The tags of the patent documents will not have legal implications on the intellectual property rights of the patents, but serve as metadata providing additional educational information. The tags would be dynamic—

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[142] *See* U.S. PATENT & TRADEMARK OFFICE, *supra* note 139, ch. 2111.01.

[143] *See generally* Jorge L. Contreras, *From Private Ordering to Public Law: The Legal Frameworks Governing Standards-Essential Patents*, 30 HARV. J.L. & TECH. 211 (2017) [https://perma.cc/RR6Q-7SE2].

[144] *Patent documents* refers to patent-related documents, such as published patent applications and published patent grants.

[145] This is not an exhaustive list of general public and private sector positions.

they could be modified according to further developments in the technology field covered by the patent documents. The patent documents themselves would be searchable by tags. For example, a search of *blockchain* would produce a list of patent documents validated for that tag, even though such documents may not appear on their face to be related to the technology.

B. *Theoretical Justifications*

The proposed hybrid model would create a more efficient, approachable solution with many benefits for the public. The patent system was built on the notion of transparency and to provide access to technology for promoting innovation.[146] In return for disclosing one's invention to the public with enough details for one of ordinary skill to make use of the invention, intellectual property laws provided the patent owner with exclusive rights for a limited time.[147] Patents prohibit others from making, using, selling, or importing an invention without the patent owner's consent.[148] The proposed hybrid model creates more transparent access to blockchain technology by providing a way to categorize the patent documents in layperson terms. It clears confusion created by obscure and technical patent lingo and allows a more searchable database for one to access technological advancements.

The hybrid model also serves an educational purpose. As previously explained, many synonyms are used to describe the same technology. These are typically technical terms, but sometimes are legal terms carrying enforceable significance. An additional layer of tags of synonyms can educate a person of the terms describing the technology and provide further details of a patent document. Furthermore, one can research related technology using the knowledge gained from such tags and find other pertinent information. This makes the hybrid model an efficient tool to educate the public, including students who are studying the technology,

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[146] *See The Benefits of Transparency Across the Intellectual Property System*, U.S. PAT. & TRADEMARK OFF. (Apr. 24, 2014), https://uspto.gov/about-us/news-updates/benefits-transparency-across-intellectual-property-system [https://perma.cc/9VXD-CRTV].

[147] *Id.*

[148] *See General Information Concerning Patents,* U.S. PAT. & TRADEMARK OFF. (Oct. 2015), https://www.uspto.gov/patents-getting-started/general-information-concerning-patents [https://perma.cc/W4NN-L3K4].

industry players conducting market research, intellectual property professionals interested in further research, etc.[149]

The patent system also seeks to minimize the waste of resources. Tangible resources, such as money, and intangible resources, such as human knowledge, are spent to develop new technologies. Incentivizing inventors to share their knowledge through the patent system allows another inventor to spend their resources on further technological advancements rather than wasting them on the same technology. The hybrid model reduces waste by creating a more approachable categorization of patent documents. The hybrid model provides access to a trove of information that may have been otherwise difficult to access.[150]

More accessible patent knowledge can further promote innovation, providing innovators and entrepreneurs with a better sense of disclosed and protected technology. This in turn promotes exploration of other creative technological solutions by the innovators and entrepreneurs.

The proposed hybrid model also has global reach. The system will not be restricted to the U.S., allowing collaboration among industry experts around the world. The system may help incentivize globally standardized terms for use in the field of technology as well as bring attention to terms that are less well known due to their nation-specific terminology.

Patent professionals may improve the quality of search conducted with the additional knowledge provided by the system. With improved search using the layer of tags, fewer patents may be found to be invalid in the long run, because search will ultimately allow quality patents to survive through patent prosecution at national patent offices. As more quality patents are issued, less frivolous patent litigation will result, saving both time and money.

VI.   POTENTIAL DRAWBACKS

One may argue that this is a redundant effort that is already covered by the classification system implemented by patent offices around the world. The USPTO and other national patent offices have standardized classification systems for patents that provide "a hierarchical system of language independent symbols for" classifying

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[149] *See supra* Part IV.
[150] *See supra* Part IV.

patents[151] according to the field of technology it covers, such as the International Patent Classification (IPC), which was established by the Strasbourg Agreement 1971.[152] The most recent push for a global standard is the Cooperative Patent Classification (CPC) system, which was jointly developed by the EPO and the USPTO around 2012 and provides a more detailed version of the IPC.[153] However, these patent classification systems involve a steep learning curve that requires understanding the symbols and a complex, hierarchical classification structure. The CPC provides a very detailed categorization of patent documents; however, a layperson may find it overwhelming.[154] The tags and keywords offered by the proposed system will be implemented in simple terms that any layperson can easily approach.

The system may also run into tagging abuse problems. Users of the system may tag patents with profanity, unrelated tags, and incomprehensible tags, making the system unusable. It may also be subject to bot attacks, where computer programs (not human users) tag the patent documents with malicious intent. This can be prevented with technical solutions, such as the use of CAPTCHA and secure login techniques that are widely implemented on online services. The system may also provide incentives to users that help validate and/or provide quality tags.[155] Incentives provided by the USPTO are not unprecedented. For example, Patents for Humanity is an awards competition honoring "innovators who use game-changing technology to meet global humanitarian challenges."[156] Applicants submit their candidacy for the award and qualified judges external to the USPTO review and score the applications according

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[151] *See International Patent Classification (IPC)*, WORLD INTELL. PROP. ORG., https://www .wipo.int/classifications/ipc/en/ [https://perma.cc/5TVM-HV9R].

[152] *Id.*

[153] *See Objectives*, COOPERATIVE PAT. CLASSIFICATION, http://www.cooperativepatent classification.org/obj.html [https://perma.cc/8C7P-LN5S].

[154] For example, H04L 63/308, a classification noted in one of the patents described in note 54, *supra*, U.S. Patent No. 9,842,216 (system and methods for tamper proof interaction recording and timestamping) is defined in the paragraphs of information. *See H04L63/308*, *Cooperative Patent Classification*, U.S. PAT. & TRADEMARK OFF., https://www.uspto.gov/web /patents/classification/cpc/html/cpc-H04L.html#H04L63/308 [https://perma.cc/HD8K-MZTU].

[155] Quality tags are similar to blockchain technology. *See, e.g.*, Nicky Morris, *Honeywell Uses Blockchain and Startup Approach to Digitize Aircraft Parts*, LEDGER INSIGHTS, https://www.ledgerinsights.com/honeywell-blockchain-aircraft-parts/ [https://perma.cc/Q3RB-VZX].

[156] *Patents for Humanity*, U.S. PAT. AND TRADEMARK OFF., https://www.uspto.gov/patent /initiatives/patents-humanity/learn-more [https://perma.cc/NV2J-DRKU].

to selection criteria, which can be found in their website.[157]   This showcases a collaborative effort between the public sector (USPTO) and the private sector (judges external to the USPTO). The award winners are recognized in a formal ceremony and awarded with a coupon that can be redeemed for an accelerated patent application process.   Similar incentives can be placed to incentivize quality taggers. Quality taggers can be recognized through a formal process and provided with similar coupon incentives.

   To develop a more robust, high-quality tagging system, the proposed solution may require collaboration with SSOs and other technology-specific organizations, such as the BIPC discussed above. SSOs already have a database of patent documents that are self-reported by the industry players, noting the relevancy of the patent documents to a specific technology standard developed by the SSO.[158] Similarly, BIPC is working on gathering patent information related to blockchain technology.[159]   The information gathered by these organizations and the industry experts will be valuable in realizing a robust tagging system. The tags may be vetted by the private sector, organizations, and industry experts and/or by the public sector, such as the USPTO personnel.

VII.   CONCLUSION

   Blockchain is a major technology breakthrough with huge potential across a variety of industries. Its potential may be further multiplied when combined with other technological advancements such as IoT and AI.[160] With industry focused on grabbing intellectual property rights, a pressing need has arisen for a system that will reduce and avoid the kind of patent litigation that has plagued other emerging new technologies.   The hybrid model proposed in this Article recommends a simple approach in the hopes of avoiding and mitigating such litigation. For the proposed model to be fully useful, it may require guidance and coordination from both the private and

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[157] *See id.*

[158] *See* Baron & Pohlmann, *supra* note 113, at 3.

[159] *See* KAUFMAN, *supra* note 39, at vi, vii.

[160] *See* Francesco Corea, *The Convergence of AI and Blockchain: What's the Deal?*, MEDIUM (Dec. 1, 2017), https://medium.com/@Francesco_AI/the-convergence-of-ai-and-blockchain-whats-the-deal-60c618e3accc [https://perma.cc/E897-8RGB]; *see also* Oscar W, *AI on Blockchain—What's the Catch?*, HACKERNOON (Oct. 12, 2018), https://hackernoon.com/how-cortex-brings-ai-on-the-blockchain-86d08922bb2a [https://perma.cc/6WCS-N2R2] (discussing the convergence of AI and blockchain, for example, smart contracts on blockchain powered by AI, blockchain powered with AI for reducing power consumption, etc.).

public sectors. But the drawbacks to our approach are minimal compared with the benefits to society at large.

Legislative reforms and even minor changes in the patent process take years, as seen with the development of the AIA.[161] An industry that is dynamic and fast-paced needs to implement a system that can quickly adapt to changes. The proposed hybrid model offers such approach by utilizing techniques already widely used (tagging) in a scalable structure that can be overlaid on the existing patent documents structure.

The model provides educational value to both experts and nonexperts in intellectual property law and has the potential to help grant more high-quality patents in the long run. Industry players and academics will have more tools at their disposal to make informed decisions in developing blockchain technology. The result will be faster and more intelligent application and introduction of blockchain technology to the benefit of both industry and the public.

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[161] *See supra* Section III.B.