

# PRACTICUM

## Blockchain and Cryptocurrency: An Introduction and Primer

By Mayme Donohue

Blockchain may be new, but the trajectory of disruptive technologies from inception to widespread adoption is a familiar path. Consider how much has changed since the internet was first introduced to mainstream use and e-mail and online shopping were novelties rather than primary tools for communication and commerce. Since the 1990s, people around the world have become increasingly dependent on the Internet and the immediate ability to communicate and engage in commerce. Without thinking much about the technical mechanics of the Internet, society relies on it as a resource for almost everything.<sup>1</sup> Of the billions of people dependent on the internet for commerce and entertainment, only a small fraction of individuals actually understand how or why it works. People just trust it, because the internet has proven itself over time as a tool worth using. There are flaws and cybersecurity issues, but our global society has come to the tacit agreement that the benefits far outweigh the potential risks of conducting business and sharing personal content on the internet.

Born from the internet's connectivity, blockchain technology is charting a similar course in the history of technological advancement. Though development of this disruptive technology began in the early 1990s, the first blockchain was born with the release of the Bitcoin protocol almost 10 years ago by the pseudonymous individual (or individuals), Satoshi Nakamoto.<sup>2</sup> As Bitcoin matured and its market expanded, the blockchain that settled peer-to-peer transactions in virtual currency began to emerge as the playground for technologists and entrepreneurs around the world. At its core, the Bitcoin blockchain allowed for peer-to-peer payments processing without the use of a central intermediary, cutting out the numerous parties currently involved and taking fees in the payments processing lifecycle.<sup>3</sup> Institutions responsible for settling all types of financial transactions are now racing to own the blockchain solutions that stand to replace their role our financial ecosystem.<sup>4</sup> Beyond finance and cryptocurrencies, business enterprise applications for blockchain are exploding onto the scene as the world's largest companies are all investing in the tech-



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nology.<sup>5</sup> In the same way that the internet's beginnings look nothing like the internet we know today, it is impossible to predict the contours of blockchain's eventual mainstream adoption and widespread dependence. Despite that uncertainty, blockchain has had, and will continue to have, a growing impact on the global economy and the fundamental ways businesses operate.

### Blockchain Basics

As is true with most technologies people trust and use daily, it is much more important to understand what blockchain can do as a tool and resource, rather than understand the technical processes behind the technology. The percentage of internet users who know what their IP address is, or how to find it for that matter, is likely very low. Understanding the basic mechanics of how a blockchain operates, however, unlocks the ability to think creatively about how this new technology can be applied across industries. Additionally, the legal profession needs a basic understanding in order to apply blockchain to existing legal and regulatory frameworks around the world.<sup>6</sup>

Blockchain is a decentralized record keeping system that leverages military grade cryptography and complex mathematical algorithms to create a secure, immutable and chronological ledger of transactions. Said another way, blockchain is a distributed ledger that records and organizes transactions in "blocks" of data that are irreversibly "chained" together using cryptography to secure the record and prove the identities of the parties to the transaction. Each participant in a particular blockchain system maintains an identical copy of the ledger of all transactions since the beginning of that blockchain. As each new block is added to the chain, the copy of the ledger maintained by each participant is automatically updated in real-time. Rather than relying on a central intermediary to verify and settle transactions, the network of "nodes" that make up a blockchain does the work of comparing the multiple copies of the ledger to ensure only valid transactions are included in new blocks.

Because the code that runs a blockchain allows each participant in the system to individually store the history of transactions, the network of participants collectively knows whether the parties to a transaction actually own the assets being traded. A blockchain only settles transactions that the network agrees are valid by achieving a consensus among the distributed copies of the ledger. For example, in the Bitcoin context, if Person A originally purchased five bitcoins, the blockchain would record that transaction and update the ledger across participants to show that Person A owns five bitcoins. If Person A buys a service from Person B in exchange for three bitcoins, the blockchain would check that transaction against the distributed ledger and, upon consensus from the network of participants, that transaction would be validated, settled and recorded in a new block to the ledger. With the addition of the new block, each participant's ledger updates to show that Person A owns two bitcoins and Person B owns three bitcoins. Next, if Person A attempts to buy something from Person C in exchange for three bitcoins, the network would reject that transaction because the ledger maintained by each participant would show Person A does not have sufficient bitcoins to settle that transaction.

The security built into the code and systems governing blockchains allow parties that do not know each other and have no reason to trust each other to transact business. To begin with, the cryptography and algorithms used to validate the record and participants' identities is extremely secure. In fact, to date there have been no successful hacks of the Bitcoin blockchain; rather, all of the reported hacks related to Bitcoin were security breaches at the individual user or third-party vendor level. Additionally, the fact that the ledger is shared among participants means there is no single copy of the truth and, therefore, no single weak point for a bad actor to target. If any individual's copy of the ledger is tampered with, when a blockchain compares ledgers to create consensus, that single incorrect copy will not be acknowledged and will be overwritten with the addition of a new block of transactions. Furthermore, the requirement that the network agree to a new transaction before settling and recording it eliminates the possibility that a participant can double-spending a bitcoin in two separate transactions. While there are no perfect systems, blockchain offers a superior framework within which transactions have the potential to be settled faster, for less money and with more security than the current systems.

### **Blockchain's Practical Applications**

Contrast the example above to the current payment processing lifecycle, which includes multiple intermediaries each extracting fees, and it becomes clear why the world's largest financial institutions are rushing to develop proprietary blockchain solutions. Billions of

dollars are being invested around the world to develop blockchains for settling a wide variety of financial transactions, including securities offerings and settlement, loan syndication, payment processing and more.<sup>7</sup> Financial institutions have a clear interest in creating blockchain platforms in an order to preserve their relevance in commerce. As these blockchain platforms mature and currency evolves from fiat to a crypto, the entire financial model within which the world operates today could look entirely different in the coming decades.

Blockchain's applications expand far beyond finance, and business enterprise blockchain solutions are some of the most creative and interesting applications of the technology.<sup>8</sup> Supply chain, for example, is one of the most developed landscapes for blockchain innovation. By applying the same mechanics described above related to a transaction in bitcoin to the movement of goods and assets around the globe, supply chains become more efficient, transparent and trusted. Particularly within the context of food safety, blockchain-based supply chains have the potential to save lives in addition to money. Major retailers have found that using a blockchain-based system for tracking food from farm to consumer reduces the time it takes to identify the origin of a contaminated food product from almost seven days to just over two seconds.<sup>9</sup> In addition to supply chain applications, blockchain is being explored to, among other things, manage electronic health records, secure rights to digital media, enhance energy grid management and even improve government administration.<sup>10</sup> As the blockchain develops, new applications reveal themselves and it is impossible to predict the breadth of applications that will achieve widespread adoption in the years to come.

### **The Lawyer's Role in Blockchain's Future**

Given the size of investments and the speed of developments in this new technology, blockchain is often described as a fundamental feature of the Fourth Industrial Revolution.<sup>11</sup> Lawyers need to stay informed and stay involved as blockchain develops. The articles that follow demonstrate the varying legal and regulatory regimes governing cryptoassets around the world, the future of the legal landscape is uncertain at best. As more blockchain applications hit the mainstream, lawyers will be essential in navigating the sometimes frustrating interaction between a new technology and old legal regimes. Innovation within the law and law firms will be necessary as blockchain's impact is felt across industries and around the world. For a profession grounded in precedent and well-established principles, the emergence of blockchain and cryptocurrencies presents lawyers with an exciting opportunity to participate in something new.

## Endnotes

1. Use of the Internet as a percentage of the world's population has grown from 0.049% in 1990 to 45.78 percent in 2016. See *Individuals Using the Internet*, THE WORLD BANK, <https://data.worldbank.org/indicator/IT.NET.USER.ZS> (last visited Jul. 17, 2018).
2. Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (October 31, 2008), <https://bitcoin.org/en/bitcoin-paper>.
3. DAVID MILLS ET AL., *DISTRIBUTED LEDGER TECHNOLOGY IN PAYMENTS, CLEARING, AND SETTLEMENT 2-4* (2016), <https://doi.org/10.17016/FEDS.2016.095>.
4. For example, Goldman Sachs has been granted a patent for a settling securities trades using its own cryptocurrency, SETLcoin. See Chuan Tian, *Goldman Sachs Granted 'SETLcoin' Cryptocurrency Patent*, COINDESK (Jul 13, 2017), <https://www.coindesk.com/goldman-sachs-granted-setlcoin-cryptocurrency-patent/>.
5. Michael del Castillo, *The 10 Largest Companies in the World Are Now Exploring Blockchain*, FORBES (Jun. 6, 2018), <https://www.forbes.com/sites/michaeldelcastillo/2018/06/06/the-10-largest-companies-exploring-blockchain/#390acc2d1343>.
6. The explanation of blockchain that follows is intended to be simple and is not a comprehensive description of the technology. For a more detailed explanation of blockchain, see *What Is Blockchain Technology?*, COINDESK, [HTTPS://WWW.COINDESK.COM/INFORMATION/WHAT-IS-BLOCKCHAIN-TECHNOLOGY/](https://www.coindesk.com/information/what-is-blockchain-technology/) (last visited Jul. 17, 2018).
7. For a more in-depth analysis of how securities can be offered and traded using blockchain, see Reade Ryan & Mayme Donohue, *Securities on Blockchain*, 73 BUS. LAW 85 (Winter 2017–2018).
8. See, e.g., Mayme Donohue & Bob King, *Major Companies Are Quietly Amassing Blockchain Patents Across Industries*, BLOCKCHAIN LEGAL RESOURCE (June 28, 2018), <https://www.blockchainlegalresource.com/2018/06/major-companies-quietly-amassing-blockchain-patents-across-industries/>.
9. Lead by Walmart and IBM, 10 of the world's biggest companies are working together on the "Food Trust" project, which is building a food safety supply chain. In tests conducted in 2017, Walmart reduced the time it took to track the source of a package of sliced mangos from almost seven days to 2.2 seconds by using the blockchain-based system. See Kim S. Nash, *Walmart-Led Blockchain Effort Seeks Farm-to-Grocery-Aisle View of Food Supply Chain*, WALL ST. J. (June 25, 2018), <https://blogs.wsj.com/cio/2018/06/25/walmart-led-blockchain-effort-seeks-farm-to-grocery-aisle-view-of-food-supply-chain/>.
10. See, e.g., John D. Halamka, MD, Andrew Lippman & Ariel Akblaw, *The Potential for Blockchain to Transform Electronic Health Records*, HARV. BUS. REV. (Mar. 3, 2017), <https://hbr.org/2017/03/the-potential-for-blockchain-to-transform-electronic-health-records>; Leigh Cuen, *Intel Thinks Blockchain Could Power a Next-Gen Media Rights Manager*, COINDESK (May 19, 2018), <https://www.coindesk.com/intel-thinks-blockchain-power-next-generation-media-manager/>; Sam Hartnett & Peter Bronski, *How Blockchain Can Manage the Future Electricity Grid*, WORLD ECONOMIC FORUM (May 30, 2018), <https://www.weforum.org/agenda/2018/05/how-blockchain-can-manage-the-electricity-grid/>; Lucas Mearin, *Delaware to Test Blockchain-Based Business Filing System*, COMPUTERWORLD (Jul. 12, 2018), <https://www.computerworld.com/article/3289484/blockchain/delaware-to-test-blockchain-based-business-filing-system.html>.
11. See, e.g., *Blockchain, 4th Industrial Revolution*, WORLD ECONOMIC FORUM, <https://www.weforum.org/agenda/archive/blockchain/> (last visited Jul. 17, 2018).

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