

University of Tennessee Law

Legal Scholarship Repository: A Service of the Joel A. Katz Library

UTK Law Faculty Publications

7-2019

Blockchains, Corporate Governance, and the Lawyer's Role

Joan MacLeod Heminway

Follow this and additional works at: https://ir.law.utk.edu/utklaw_facpubs



Part of the [Law Commons](#)



THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

COLLEGE OF LAW

*Legal Studies
Research Paper Series*

**Research Paper #388
January 2020**

Blockchains, Corporate Governance, and the Lawyer's Role

Joan MacLeod Heminway

&

Adam J. Sulkowski

Wayne Law Review, Vol. 65 (2019)

This paper may be downloaded without charge
from the Social Science Research Network Electronic library at:
<http://ssrn.com/abstract=3473577>

Learn more about the University of Tennessee College of Law:
law.utk.edu

BLOCKCHAINS, CORPORATE GOVERNANCE, AND THE LAWYER'S ROLE

JOAN MACLEOD HEMINWAY[†] & ADAM J. SULKOWSKI[‡]

| | |
|--|----|
| I. BLOCKCHAIN TECHNOLOGY | 18 |
| II. CORPORATE GOVERNANCE ON BLOCKCHAINS | 21 |
| <i>A. Shareholder Recordkeeping and Voting</i> | 24 |
| <i>B. Insider Trading</i> | 30 |
| <i>C. Disclosure-Related Considerations</i> | 34 |
| 1. <i>Monitoring</i> | 35 |
| 2. <i>Materiality</i> | 37 |
| <i>a. Defining Materiality</i> | 38 |
| <i>b. Disclosing Material Facts</i> | 40 |
| <i>c. Implications of Blockchain for Antifraud Disclosures</i> | 41 |
| 3. <i>Mandatory Disclosure</i> | 45 |
| III. IMPLICATIONS FOR LEGAL COUNSEL | 49 |
| IV. CONCLUSION | 54 |

Significant aspects of firm governance can (and likely will) be conducted on blockchains in coming years.¹ This transition has already begun in some respects.² The actions of early adopters illustrate that moving governance to blockchains will require legal adaptations. These adaptations are likely to be legislative, regulatory, and judicial. Firm management, policy-makers, and judges will turn to legal counsel for education and guidance.

This article describes blockchains and their potentially expansive use in several aspects of the governance of publicly traded corporations and outlines ways in which blockchain technology affects what business lawyers should know and do—now and in the future.³ Specifically, this article describes the nature of blockchain technology and ways in which the adoption of that technology may impact shareholder recordkeeping

[†] Rick Rose Distinguished Professor of Law, The University of Tennessee College of Law. A.B., 1982, Brown University; J.D., 1985, New York University School of Law.

[‡] Associate Professor, Babson College. B.A., 1996, College of William & Mary; M.B.A., 1999, Boston College, Carroll School of Management; J.D., 2000, Boston College Law School.

1. David Yermack, *Corporate Governance and Blockchains*, 21 REV. FIN. 7, 13–24 (2017).

2. *See id.*

3. *See infra* Part II, III.

and voting, insider trading, and disclosure-related considerations.⁴ The article then reflects on implications for business lawyers and the practice of law in the context of corporate governance.⁵

I. BLOCKCHAIN TECHNOLOGY

We begin with a brief primer on the basics of blockchain technology. While the concept of digitally time-stamping documents in sequence to authenticate intellectual property surfaced in 1991,⁶ Satoshi Nakamoto—a pseudonym for an unknown person or group of people—is commonly credited with first articulating the functioning and structure of blockchain in 2008.⁷ Blockchain initially was proposed as a method of validating ownership of a virtual currency, bitcoin.⁸

Blockchain is, in essence, an electronic record-keeping technology.⁹ Its key difference from previous forms of computer-based information tracking is that records are distributed and verified across nodes in a network, rather than established and authenticated at a single point of control.¹⁰ It has been hyped as a qualitative leap forward in the advance of information technology, on par with the revolutionary implications of widespread Internet adoption.¹¹ Alternatively, others have characterized it as merely another incremental step forward over earlier innovations (since the late 1970s) in encryption, peer-to-peer applications, consensus mechanisms, and decentralized, distributed data storage.¹² Regardless of

4. See *infra* Part II.

5. See *infra* Part III.

6. See Stuart Haber & W. Scott Stornetta, *How to Time-Stamp a Digital Document*, 3 J. CRYPTOLOGY 99 (1991).

7. Satoshi Nakamoto, *Bitcoin: a peer-to-peer electronic cash system*, BITCOIN (2008), <https://www.bitcoin.org/bitcoin.pdf>.

8. *Id.*

9. See generally Marco Iansiti & Karim R. Lakhani, *The Truth About Blockchain*, 95 HARV. BUS. REV. 118 (2017) (noting, among other things, that “blockchain is an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way.”).

10. *Id.* In layperson’s terms, blockchain-enabled recordkeeping has been analogized to a giant shared spreadsheet in that multiple users can, in real-time, both see a perfect record of changes that have been entered previously and update the document. See MELANIE SWAN, *BLOCKCHAIN: BLUEPRINT FOR A NEW ECONOMY* xi (Tim McGovern et al eds., 1st ed. 2015).

11. Laura Shin, *How the Blockchain Will Transform Everything From Banking to Government to our Identities*, FORBES (May 26, 2016), <https://www.forbes.com/sites/laurashin/2016/05/26/how-the-blockchain-will-transform-everything-from-banking-to-government-to-our-identities/>.

12. Aaron Wright & Primavera De Filippi, *Decentralized Blockchain Technology and the Rise of Lex Cryptographia* 1, 4 (Mar. 12, 2015), <https://ssrn.com/abstract=2580664>.

the extent to which we see blockchain as a major technological advance, and looking past the hype surrounding its application as the foundational technology of cryptocurrencies,¹³ blockchain holds long-term and significant potential to disrupt and improve business processes.¹⁴

These attributes of blockchain technology are founded in the initial vision of blockchain articulated by Satoshi Nakamoto. Records are validated and confirmed as accurate—inherently and constantly—by the very structure and function of the technology. This description of blockchain as an innately accurate data-tracking system is most credible in reference to public blockchains (involving open-source access and nodes independent of the permission or control of a central authority, as we describe below).¹⁵

Benefits of blockchain-enabled information-tracking—especially in the context of corporate governance—include transparency, immutability, reliability, and greater efficiency.¹⁶ Early experiments with the technology have suggested that it might help, for example, authenticate inventory in the timber industry, a context where illegal sales are estimated at a total of \$51–52 billion globally.¹⁷ Other promising applications involve discovering fraud and counterfeiting.¹⁸

A few cautionary notes merit mention. First, while blockchain may create more immediately available and reliable records, it does not assure that a record is free of fraud or error at the point of creation.¹⁹ Second, the technology does not guarantee that records will be scrutinized or acted upon, either by management, customers, or any other stakeholder.²⁰ In other words, the problem of third-person trust has arguably been solved (blockchain is designed to assure that a record has not been

13. Joseph Young, *Blockchain is Overhyped and Not Quite Applicable: VC Andrew Parker*, COINTELEGRAPH (Mar. 23, 2017), <https://cointelegraph.com/news/blockchain-is-overhyped-and-not-quite-applicable-vc-andrew-parker>.

14. See Iansiti & Lakhani, *supra* note 9.

15. See *infra* note 24 and accompanying text.

16. For a comprehensive discussion of the benefits, risks, and implications of blockchain applications in the context of business supply chains and implications for attorneys, see generally Adam J. Sulkowski, *Blockchain, Business Supply Chains, Sustainability, and Law: The Future of Governance, Legal Frameworks, and Lawyers?*, 43 DEL. J. CORP. L. 303 (2019).

17. See Boris Düdler & Omri Ross, *Timber Tracking: Reducing Complexity of Due Diligence by Using Blockchain Technology* 1, 3 (Aug. 8, 2017), <https://ssrn.com/abstract=3015219>.

18. See Phil Taylor, *EY partners with EZLab on Blockchain Wine Security Project*, SECURING INDUS. (Apr. 18, 2017), <https://www.securingindustry.com/food-and-beverage/ey-partners-with-ezlab-on-blockchain-wine-security-project/s104/a4014/#.WvenBogvw2w/>.

19. Sulkowski, *supra* note 16, at 322–23.

20. *Id.*

manipulated after creation), but there remain problems of second-person trust (blockchain does not guarantee error-free or fraud-free record creation) and first-person trust (blockchain does not assure that someone will pay attention to the data and act appropriately based on the improved record-keeping).²¹ Finally, there is the problem of faulty code, which may lead to an application of the technology not functioning as intended, with subsequent controversial fixes that may undermine trust in the platform.²² This was illustrated spectacularly in the so-called Ethereum hack, which was technically not a hack, but rather a theft of cryptocurrency enabled by faulty coding that failed to distinguish between legitimate transactions and thievery.²³

It is also necessary at the outset to differentiate between public and private blockchains. Public blockchains—such as those that serve as the foundation of cryptocurrencies—contain records that are visible to anyone participating in the network; the data has no single central authority that “owns” it.²⁴ According to some, this is a fundamental and definitional key feature of blockchain, and is the basis for blockchain records being more trustworthy than any system where one entity controls either a central database or the majority of nodes of a network.²⁵ Private blockchain records—permissioned ledgers—are accessible only to those granted permission to join the network (most typically persons within an organization).²⁶

Therefore, unsurprisingly, private blockchains are the approach for extant applications for business enterprise transaction tracking.²⁷ Arguably, because a permissioned ledger’s nodes are ultimately under the control of a central entity, private blockchain arrangements do not constitute a great improvement in terms of the credibility of the data. The

21. *Id.* at n.111.

22. *See id.* at 321–22.

23. *Id.* at 319–20.

24. Michèle Finck, *Blockchains: Regulating the Unknown*, 19 GERMAN L. J. 665, 670 (2018).

25. *See Shin, supra* note 11.

26. *See Finck, supra* note 24, at 670; *see also* Alan Cohn et al., *Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids*, 1 GEO. L. TECH. REV. 273, 279 (2017) (describing private blockchains). Permissions to enter data and read data may be differentiated in a private blockchain. *See, e.g.*, Vitalik Buterin, *On Public and Private Blockchains*, ETHEREUM BLOG (Aug. 7, 2015), <https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/>.

27. Todd Benzies, *Tech and Banking Giants Ditch Bitcoin for Their Own Blockchain*, WIRED (Dec. 17, 2015), <https://www.hyperledger.org/news/2015/12/17/wired-tech-and-banking-giants-ditch-bitcoin-for-their-own-blockchain>. Examples of business enterprise applications to date include Hyperledger from Linux Foundation and Corda from the R3 financial services consortium. *Id.*

challenge of balancing the control offered by a permissioned ledger with the transparency and credibility of a public ledger can be addressed in one of several ways.²⁸ One approach is to include a government regulatory agency or ministry as a gatekeeper, so that access to a permissioned ledger is not under the exclusive control of regulated entities.²⁹ Examples include the Securities Exchange in Sydney and the Depository Trust Clearing Corp.³⁰ Other refinements of the permissioned ledger approach include Hyperledger and R3CEV.³¹ Nevertheless, the fundamental distinction between public and permissioned ledgers—at least in the opinion of some observers—should not be under-estimated, and it is vital to understanding parts of the analysis provided in Part II.³²

II. CORPORATE GOVERNANCE ON BLOCKCHAINS

Corporate governance—a commonly used legal and academic term of art—can mean different things to different people in different contexts.³³ On a broad level, corporate governance captures relations between and among the three central internal corporate constituents: directors, officers, and shareholders; sometimes even more broadly including debtholders or others with contractual rights affecting corporate management and control.³⁴ The literature expanding on the use of this term to reference relationships among internal constituents most commonly takes an us-versus-them approach, highlighting tensions

28. See Yermack, *supra* note 1.

29. *Id.* at 10–12.

30. *Id.* at 12.

31. *Id.* at 16.

32. See *infra* Part II.

33. See, e.g., Robert C. Bird & Stephen Kim Park, *Organic Corporate Governance*, 59 B.C. L. REV. 21, 28 (2018) (“Corporate governance has been variously defined as a structure for exerting power inside of a firm, constraints that shape bargaining over firm quasi-rents, or a ‘system of rules . . . and processes’ that direct and control the enterprise.”); Cheryl L. Wade, *Effective Compliance with Antidiscrimination Law: Corporate Personhood, Purpose and Social Responsibility*, 74 WASH. & LEE L. REV. 1187, 1193 (2017) (“Definitions of Corporate Governance are . . . conceptually varied.”).

34. See ROBERT A.G. MONKS & NELL MINOW, *CORPORATE GOVERNANCE* 75 (2d ed. 2001) (defining corporate governance as “the relationship among various participants in determining the direction and performance of corporations” and noting that participants include both primary corporate constituents—shareholders, managers, and directors—as well as “employees, customers, suppliers, creditors, and the community.”); Bird & Park, *supra* note 33, at 28 (“[C]orporate governance is fundamentally concerned with ensuring managers keep their promises through embedded relationships within the organization.”).

between the control rights of management (most particularly the board of directors) and those of shareholders.³⁵

However, corporate governance also refers to the legal structures and processes through which those core constituents interact in managing, controlling, and operating the business of the firm.³⁶ These structures and processes are most typically expressed in state corporate law and federal and state securities regulation.³⁷ They are designed to define roles, establish decision-making authority, and mediate conflict.³⁸

In this article, we employ a capacious definition of corporate governance—one that includes the full breadth of the relationships between and among corporate constituents and the structures and processes through which these constituents interact in the management, control, and functional operation of the corporation. We are especially concerned about the implications of blockchain technology for shareholder recordkeeping and voting, insider trading, and disclosure. These three areas of concern involve corporate governance and implicate related regulatory structures.

In these and other areas of concern, corporate governance and its regulatory framework remain dynamic and continue evolving; the public policy considerations that drive the adoption and interpretation of corporate governance rules are regularly revisited; and legal advisors remain engaged in creative planning and drafting to serve clients for

35. See Lynne L. Dallas, *Is There Hope for Change? The Evolution of Conceptions of "Good" Corporate Governance*, 54 SAN DIEGO L. REV. 491, 494 (2017) (referring to “the use of the term ‘corporate governance’ that arose during the 1980s centering on the relationship between managers and shareholders and focusing on managerial misconduct.”).

36. See generally Frederick H. Alexander, *Whose Portfolio Is It, Anyway?*, 47 STETSON L. REV. 311, 319 (2018) (“[C]orporate governance mechanisms give shareholders the ability, through director elections, to decide who manages the company and to approve certain critical transactions, such as mergers, amendments to governing documents, and dissolution. Thus, when boards fail to act in ways that shareholders consider to be in their best interests, they can be replaced.”); Stephen M. Bainbridge, *Director Primacy: The Means and Ends of Corporate Governance*, 97 NW. U. L. REV. 547, 605 (2003) (averring that corporate governance models identify “which corporate constituency possesses ultimate decisionmaking power” and “whose interests prevail” when decisions pit the interests of corporate constituents against each other); Brian R. Cheffins, *Corporate Governance and Countervailing Power*, 74 BUS. LAW. 1 (2019) (“Corporate governance can be defined as the checks and balances affecting those who run companies.”).

37. See sources cited *supra* note 36.

38. See sources cited *supra* note 36.

whom the rules present challenges and opportunities.³⁹ Legislatures, regulatory bodies, and courts regularly address the tensions between and among various stakeholders and attempt to refine both the rules themselves and their application in practice.⁴⁰ Some commentators take the view, however, that the incremental nature of these changes is insufficient for the task of generating a coherent corporate governance framework and advocate for a more comprehensive reworking of corporate governance: an effective reboot of corporate governance—Corporate Governance 2.0—to address gaps, imbalances, and other deficiencies.⁴¹

At the same time, corporate governance has started to move to blockchains. “Stock exchanges around the world have begun to experiment with blockchains as a method for companies to list, trade, and vote their shares, and stockholders may benefit from lower costs of trading, faster transfers of ownership, more accurate records, and greater transparency of the entire process.”⁴² Corporate governance seems like a logical application for blockchain technology. Corporate information and operations often comprise ordered transactional units that build on each other.⁴³ That type of recordkeeping is what blockchains, by their very nature, promise to do well.⁴⁴ Stockholder lists, stock transfer records,

39. See e.g., Jingchen Zao, *Promoting a More Efficient Corporate Governance Model in Emerging Markets Through Corporate Law*, 15 WASH. UNIV. GLOB. STUD. L. REV. 447 (2016); Dallas, *supra* note 35.

40. Morey W. McDaniel, *Stockholders and Stakeholders*, 21 STETSON L. REV. 121, 126 (1991). Constituency statutes are a classic example of state legislatures and courts engaging in this kind of refinement.

Constituency statutes . . . provide that directors “may consider the interests” of other stakeholders . . . [L]egislatures are instructing the courts to develop the standards and define the scope of a director’s discretion with respect to nonstockholders. Therefore, when courts interpret constituency statutes, they are developing a common law of corporations that encompasses stakeholder interests.

Id. Regulators may directly or indirectly influence stakeholder governance. See, e.g., *id.* at 148 (describing proposals to engage federal agencies in stakeholder analyses in the takeover context); Lynne L. Dallas, *Corporate Ethics in the Health Care Marketplace*, 3 SEATTLE J. FOR SOC. JUST. 213, 224 (2004) (noting that regulators in and outside government may foster “the development of stakeholder theory in corporation law.”).

41. See, e.g., Guhan Subramanian, *Corporate Governance 2.0*, HARV. BUS. REV. (Mar. 2015), <https://hbr.org/2015/03/corporate-governance-2-0> (“I propose Corporate Governance 2.0: not quite a clean-sheet redesign of the current system, but a back-to-basics reconceptualization of what sound corporate governance means.”).

42. Yermack, *supra* note 1, at 28.

43. See David J. Berger et al., *Tenure Voting and the U.S. Public Company*, 72 BUS. LAW. 295, 312 (2017).

44. See *id.* (describing a blockchain as “a shared ledger that records digital transactions made over its peer-to-peer software network” and the recording and

accounts recording transactions in goods and services, and regulatory compliance reports all provide examples of corporate data and processes that can be recorded on blockchains.⁴⁵

We are interested in potential synergies between blockchain technology and corporate governance. While blockchain technology may enhance the efficiency and effectiveness of corporate governance in certain identifiable ways, we question whether the transition from corporate governance to blockchains will have more wide-ranging salutary effects on the corporation and corporate constituents. Accordingly, we explore in this part certain potential benefits and detriments of blockchain-enabled corporate governance using three principal examples: shareholder recordkeeping and voting, insider trading, and disclosure-related considerations.

A. Shareholder Recordkeeping and Voting

Shareholder records are critically important to both corporate finance and corporate governance.⁴⁶ Typically, public companies retain the services of stock transfer agents and registrars to keep track of shareholders and to record transactions in the corporation's stock. "Corporations stand upon the footing of trustees, in relation to their stockholders, for the protection of their interests. Being custodians of the primary evidence of title to the stock, they are held to the exercise of reasonable care and diligence in its preservation."⁴⁷

Investors will not purchase stock unless they know that they can acquire title to it, they will not be able to sell stock they own unless they can prove title to it, and stockholders themselves will not be entitled to the ongoing financial rights of stock ownership—dividends and other distributions—unless they have title to the stock that is recognized by the corporation or by a court order compelling corporate recognition.⁴⁸ The corporation's stock ledger is the definitive source of information on the record ownership of shares of stock in the corporation. Legal title to

chronological ordering of blocks); Yermack, *supra* note 1, at 7 (describing a blockchain as "a sequential database of information that is secured by methods of cryptographic proof" that "offers an alternative to classical financial ledgers.").

45. See generally Yermack, *supra* note 1.

46. See *Peck v. Bank of Am.*, 19 A. 369, 370 (R.I. 1890); see also *Hughes v. Drovers' & Mechs.' Nat. Bank*, 38 A. 936, 937 (Md. 1897) ("Corporations are the custodians of the evidence of title to their stock, and for that reason are held to the exercise of reasonable care and diligence in its preservation.").

47. *Peck*, 19 A. at 370.

48. See, e.g., *Mikart, Inc. v. Marquez*, 438 S.E.2d 633, 636 (Ga. Ct. App. 1993) ("It is axiomatic that only record owners of stock are entitled to dividend payments.").

stock typically is recognized through record ownership evidenced in the stock ledger and stock transfer records of a corporation, although other evidence of title (including the execution of a stock power in blank or in favor of a new owner) also may be recognized.⁴⁹

Corporate governance requires accurate and complete information about shareholders and their holdings. Shareholder emoluments include the right to inspect corporate books and records, the right to bring derivative litigation, and (perhaps most importantly) the right to vote.⁵⁰ Each of these important shareholder entitlements requires a determination of the record ownership of stock at a particular time. As the definitive registry of a corporation's stock ownership, its stock ledger is the core (but not exclusive) evidence used in making this important record ownership determination.⁵¹

Some may remember the days of hardcopy minute books with handwritten or typewritten stockholder lists, stock transfer ledgers, and physical stock certificates. For public companies, and many other corporate firms, these records transitioned to electronic form years ago. Given that stockholder ledgers and stock transfer records document accounts and transactions (respectively), it is only logical that corporate advisors and commentators would consider moving them and related processes to blockchains.

More generally, the public issuance and trading of securities can be documented and verified on blockchains, replacing securities trading and clearance intermediaries with a self-executing stock registration and

49. *See, e.g.*, *Robinson v. Bealle*, 20 Ga. 275, 293 (1856) (“The best evidence of the title to stock, it is said, consists in the stock certificate-book, the stock ledger and the stock transfer book taken together.”); *Willoughby v. Barrett*, 60 Pa. Super. 242, 245 (1915) (“The stock book constitutes the legal evidence of the legal title to stock.”); *Fritsch v. Buckman*, 20 Pa. D. & C. 195, 199 (Com. Pl. 1933) (“The stock book constitutes the legal evidence of the legal title to stock.”).

50. *See, e.g.*, Megan Wischmeier Shaner, *Confronting New Market Realities: Implications for Stockholder Rights to Vote, Sell, and Sue*, 70 OKLA. L. REV. 1, 2-4 (2017) (classifying these rights under three categories: the right to vote, sell, and sue); *see also Know Your Shareholder Rights*, INVESTOPEDIA, (last visited May 30, 2019), <https://www.investopedia.com/investing/know-your-shareholder-rights/>.

51. *See, e.g.*, *W. Air Lines, Inc. v. Kerkorian*, 254 A.2d 240, 241-42 (Del. 1969): [T]he Court of Chancery has the authority to go beyond the record title of stock, and to take evidence upon the status of the person demanding an inspection of the stock list. Under some circumstances, the Chancellor may ignore the stock record title in proceedings attacking the right of a record stockholder to vote his stock.

Id.

transfer system.⁵² More specifically, the beneficial ownership (as well as record ownership) of corporate voting securities can be recorded in blockchains, facilitating both the identification of securityholders ultimately entitled to vote, or to direct a vote, at meetings or by written consent in lieu of meetings and proxy access for shareholders desiring to propose candidates for election to the corporation's board of directors.⁵³ "For a company with shares listed on a public blockchain, all shareholders and other interested parties would be able to view the arrangement of ownership at any time and identify changes instantly as they occurred."⁵⁴ However, the precise identity of each holder may not be easy to discern unless the coding allows identification.⁵⁵ At a U.S. Securities and Exchange Commission (SEC) roundtable convened in November 2018, blockchain proxy voting was mentioned, and a study was suggested.⁵⁶

Benefits of a shareholder tracking and voting system executed on a blockchain may include reduced costs (associated with, among other things, automatic self-verification, increased efficiency, and the potential elimination of intermediaries),⁵⁷ the automatic generation of an accurate

52. See Berger et al., *supra* note 43, at 312–13; see also Jeff John Roberts, *Companies Can Put Shareholders on a Blockchain Starting Today*, FORTUNE (Aug. 1, 2017), <http://fortune.com/2017/08/01/blockchain-shareholders-law/>.

53. See U.S. SEC. & EXCH. COMM'N, ROUNDTABLE ON THE PROXY PROCESS 97 (2018), <https://www.sec.gov/files/proxy-round-table-transcript-111518.pdf> ("Many experts say it's possible, or will be possible soon, to develop a technology-based proxy system that enables proxy materials to be distributed instantaneously to all eligible shareholders, and for votes to be counted quickly, accurately, reliably, fairly, and confidentially."); Berger et al., *supra* note 43, at 315; Peter Feltman, *Blockchain Technology Comes to Annual Meetings*, CQ ROLL CALL, 2017 WL 2060043 (May 15, 2017) ("Blockchain technology . . . provides a secure way to tally votes electronically."); Chris Marquette, *Proxy Voting via Blockchain Floated to Correct Errors*, CQ ROLL CALL, 2018 WL 4356377 (Sept. 13, 2018) ("Experts on U.S. proxy voting say blockchain . . . could ensure votes are properly cast, counted on time and participation is maximized.").

54. Yermack, *supra* note 1, at 17.

55. *Id.* at 18 (noting that "assets on blockchains are typically held in anonymous 'digital wallets' identified only by complex labels akin to serial numbers.").

56. See U.S. SEC. & EXCH. COMM'N, *supra* note 53, at 22–23, 62, 92, 97–106, 109–10; see also FED. SEC. L. REP. ¶ 6433804 ("Several roundtable participants expressed support for using blockchain or other distributed ledger technology to reform the proxy voting system.").

57. See Berger et al., *supra* note 43, at 314 (quoting from the Overstock.com, Inc. prospectus); *id.* at 315 ("[T]he blockchain treats all shares alike and bears virtually all costs."); Donald Pierce, *Protecting the Voice of Retail Investors: Implementation of a Blockchain Proxy Voting Platform*, 14 RUTGERS BUS. L. REV. 1, 21–22 (2019) ("Some see blockchain technology as an immensely disruptive force that will eliminate the middleman in our current proxy system . . . In the alternative, [b]lockchain may be gradually integrated within the structure of the current financial service industry as intermediaries apply blockchain to enhance their current platforms."); Wright & De

and complete list of shareholders entitled to vote,⁵⁸ the ability to ensure that each of those shareholders receives proxy materials relevant to the meeting,⁵⁹ and the accurate counting and recording of votes in a timely manner.⁶⁰ These benefits address aspects of voting processes that have been criticized in the past.⁶¹ At the outset of the SEC's 2018 roundtable on the proxy process, SEC Commissioner Kara Stein described the current proxy system as "arcane at best."⁶² Among other things, improvements to the process may encourage greater participation by shareholders in corporate voting.⁶³

The execution of public company shareholder voting on a blockchain brings challenges as well as benefits. Drawbacks of a blockchain proxy voting system may include a loss of privacy for shareholders, given that voter identities would not be strictly confidential in a public blockchain.⁶⁴ For issuers, the open-source nature of a public blockchain

Filippi, *supra* note 12, at 8 ("By combining digital currencies, smart contracts, and distributed data storage, the blockchain further is ushering in entirely new decentralized organizations (including decentralized autonomous organizations) that use source code to define an organization's governance structure.").

58. See Pierce, *supra* note 57, at 29 ("By publishing ownership records to the blockchain, this step would enable the timely and accurate determination of vote entitlement."); Wright & De Filippi, *supra* note 12, at 8 (noting that blockchain technology is being used to create "fraud-resistant digital voting platforms").

59. See J. Travis Laster & Marcel T. Rosner, *Distributed Stock Ledgers and Delaware Law*, 73 BUS. LAW. 319, 332 (2018) ("[B]lockchain-based distributions might replace the physical mailing of a proxy statement, saving issuers and stockholders money in the process.").

60. See Pierce, *supra* note 57, at 29 ("Once voting begins, blockchain's transparent nature would facilitate instantaneous and redundant vote tabulations. This accuracy will provide vote finality."); Wright & De Filippi, *supra* note 12, at 13–14 ("Voters could verify that their own votes were counted, and—due to encryption—any blockchain-based voting system would be resistant to hacking."); Yermack, *supra* note 1, at 23 ("The benefits of blockchain elections would include faster, more precise vote tabulation, and equal real-time transparency of the likely voting outcome for both management and dissident shareholders.").

61. See, e.g., Yermack, *supra* note 1, at 23 ("Many studies . . . have documented the current problems with corporate elections, which include inexact voter lists, incomplete distribution of ballots, and sometimes chaotic vote tabulation.").

62. Kara M. Stein, Commissioner, U.S. Sec. & Exch. Comm'n, Opening Remarks at the 2018 SEC Staff Roundtable on the Proxy Process (Nov. 15, 2018) (transcript available at <http://www.sec.gov>).

63. See Yermack, *supra* note 1, at 23 ("[T]he greater speed, transparency, and accuracy of blockchain voting could motivate shareholders to participate more directly in corporate governance and demand votes on more topics and with greater frequency." (footnote omitted)).

64. See *id.* at 23 ("Due to the transparency of blockchains, ensuring the anonymity of voters would be an obvious problem").

for shareholder voting may present related concerns—such as the capacity of shareholders to exercise greater management control.⁶⁵

Through the deployment of new and innovative blockchain-based applications, shareholders may take a greater role in the management of their organizations, with innovations such as nearly instantaneous voting mechanisms In a world of decentralized autonomous consensus, collective decision-making could take on more prominence, resulting in the rapid reformulation of corporate structures and the more efficient allocation of corporate resources.⁶⁶

The broad-based implementation of a transparent, distributed shareholder voting system using blockchain technology could be a corporate governance game-changer.⁶⁷ Shareholders may be more engaged and share enhanced decision-making trust.⁶⁸ The integrity of shareholder voting—including in director elections—should be greater.⁶⁹

Unsurprisingly (given its status as the organizational home of most publicly traded firms in the United States), Delaware has been an early mover in facilitating the use of blockchain technology in maintaining shareholder records.⁷⁰ Legislators in Delaware paved the way.⁷¹

65. *See id.*

66. Wright & De Filippi, *supra* note 12, at 36.

The ease of shareholder voting could make corporations more dynamic. Restrictions on shareholder proposals could be lessened, as shareholders could submit any proposal they want and only proposals that have garnered a sufficient number of votes from other shareholder (on a percentage basis) would be presented to a board of directors. By lessening the noise, shareholders' voices could be actually heard and legitimate shareholder concerns addressed.

Id. at 37; Yermack, *supra* note 1, at 23 (“[T]he greater speed, transparency, and accuracy of blockchain voting could motivate shareholders to participate more directly in corporate governance and demand votes on more topics and with greater frequency.” (footnote omitted)).

67. *See* Wright & De Filippi, *supra* note 12, at 37 (“By lessening the noise, shareholders' voices could be actually heard and legitimate shareholder concerns addressed.”).

68. *See id.* at 16 (“By facilitating coordination and trust, a blockchain enables new forms of collective action that have the potential to bypass existing governance failures. . . . Trust does not rest with the organization, but rather within the security and auditability of the underlying code, whose operations can be scrutinized by millions of eyes.”).

69. *See* Pierce, *supra* note 57, at 10 (“[B]lockchain has the potential to bring integrity to the proxy process” and “if blockchain can solidify the integrity of the shareholder voting process it will also solidify the legitimacy of director control.”).

70. *See* Lucas Mearian, *Delaware to Test Blockchain-Based Business Filing System*, COMPUTERWORLD (July 12, 2018),

Specifically, in 2017, the Delaware General Assembly enacted legislation expressly permitting the use of blockchains for the maintenance of shareholder lists.⁷² In relevant part, under the General Corporation Law of the State of Delaware (DGCL):

“stock ledger” means 1 or more records administered by or on behalf of the corporation in which the names of all of the corporation’s stockholders of record, the address and number of shares registered in the name of each such stockholder, and all issuances and transfers of stock of the corporation are recorded in accordance with § 224 of this title.⁷³

DGCL Section 224 then provides (in relevant part) that:

Any records administered by or on behalf of the corporation in the regular course of its business, including its stock ledger, books of account, and minute books, may be kept on, or by means of, or be in the form of, any information storage device, method, or 1 or more electronic networks or databases (including 1 or more distributed electronic networks or databases), provided that the records so kept can be converted into clearly legible paper form within a reasonable time, and, with respect to the stock ledger, that the records so kept (i) can be used to prepare the list of stockholders specified in §§ 219 and 220 of this title, (ii) record the information specified in §§ 156, 159, 217(a) and 218 of this title, and (iii) record transfers of stock as governed by Article 8 of subtitle I of Title 6.⁷⁴

It bears mention that “Delaware is also in the process of creating a system intended to let companies do everything from file incorporation documents to register shares via a blockchain.”⁷⁵ While Delaware initially pursued these initiatives on a fast track, it has assumed a more

<https://www.computerworld.com/article/3289484/blockchain/delaware-to-test-blockchain-based-business-filing-system.html> (noting that “Delaware will . . . test a new distributed stock ledger, which will . . . update in real time.”).

71. See, e.g., Jeff John Roberts, *Why Delaware Made it Easier for Businesses to Use Blockchain*, FORTUNE (Aug. 22, 2017), <http://fortune.com/2017/08/22/fortune-500-blockchain-ledger-delaware/> (“As of Aug. 1, a new law permits companies in Delaware—where more than two-thirds of *Fortune* 500 companies are incorporated—to keep their list of shareholders on a blockchain.”).

72. See *id.*

73. DEL. CODE ANN. tit. 8, § 219(c) (West 2019).

74. DEL. CODE ANN. tit. 8, § 224.

75. Roberts, *supra* note 71.

considered pace in facilitating blockchain corporate records and processes in the past eighteen months or so.⁷⁶

Blockchain stock transfers and voting technology currently exist and are likely to become more popular.⁷⁷ As has been widely reported, Overstock.com, Inc. (Overstock) has issued digital shares on a blockchain.⁷⁸

Overstock's blockchain system gives the issuer and its transfer agent near real-time data as to the record holders of its digital securities, enabling the issuer or its transfer agent to mail proxies, pay distributions, and take other actions with respect to its record holders as required by the applicable securities and corporate laws.⁷⁹

It seems that it is only a matter of time before other firms adopt blockchain to enable stock offerings, transfers, and other aspects of shareholder governance. Business lawyers are well-advised to become familiar with the attributes of public and private blockchains as they relate to the maintenance of shareholder records and shareholder voting mechanics.

B. Insider Trading

Although some may not think of insider trading as a corporate governance concern, market participants and observers are attentive to sales and purchases made by corporate insiders—especially directors and officers—because of the effects those trades may have on existing shareholders and others involved in securities trading markets.⁸⁰ The

76. See Kari Baker, *Delaware Eases off Early Blockchain Zeal After Concerns Over Disruption to Business*, DEL. ONLINE (Feb. 1, 2018), <https://www.delawareonline.com/story/news/2018/02/02/delaware-eases-off-early-blockchain-zeal-after-concerns-over-disruption-business/1082536001/>.

77. See Berger et al., *supra* note 43, at 313.

78. *Id.*

79. Reade Ryan & Mayme Donohue, *Securities on Blockchain*, 73 BUS. LAW. 85, 98 (2018).

80. An academic commentator recently summarized these effects as a matter of economic theory.

The economic analysis of insider trading to date has revolved around two principle [sic] theoretical frameworks: market effects, and agency. The market effects critique considers primarily the effect of insider trading on market efficiency and liquidity. The inside trader is treated as a sort of informed-trader-on-steroids, whose information is cheaper, more timely, more accurate, and perhaps less subject to competition than outside information traders. The agency critique focuses on the manager's

strain on management-shareholder relations can be as troublesome here as it is in shareholder voting and other corporate governance matters.⁸¹ U.S. federal securities law, therefore, has been interpreted to regulate the use of material nonpublic information by corporate insiders for their personal benefit.⁸²

Classic insider trading doctrine, in fact, focuses attention directly on management-shareholder relations.⁸³ Federal securities law primarily governs insider trading as a matter of securities fraud.⁸⁴ The primary statutory and regulatory provisions are few. They include Section 10(b) of the Securities Exchange Act of 1934, as amended (1934 Act),⁸⁵ and Rules 10b-5,⁸⁶ 10b5-1,⁸⁷ and 10b5-2⁸⁸ as adopted by the SEC under Section 10(b) of the 1934 Act. The applicable legal doctrine relies on interpretations of Section 10(b) and these rules as reflected in decades of judicial decisions. Liability under the classical theory of this fraud-based regime requires the breach of a duty of trust and confidence—in the case

flawed relationship with the firm, asking the question: what might a disloyal manager do in order to maximize her insider trading profits?

James C. Spindler, *The Coasian Firm and Insider Trading, Revisited*, 71 SMU L. REV. 967, 968–69 (2018) (footnotes omitted).

81. See, e.g., Marleen A. O'Connor, *Toward A More Efficient Deterrence of Insider Trading: The Repeal of Section 16(b)*, 58 FORDHAM L. REV. 309, 315–16 (1989) (footnotes omitted) (“[I]nsider trading harms corporations by impairing the agency relationship between management insiders and their corporations.”).

82. See e.g., *S.E.C. v. Texas Gulf Sulphur, Co.*, 401 F.2d 833 (2d Cir. 1968), cert. denied, 404 U.S. 1005 (1971); *Cady, Roberts & Co.*, 40 S.E.C. 907, Exchange Act Release No. 34-6668, 1961 WL 60638 (Nov. 8, 1961).

83. The classic (or classical) theory of insider trading relates to cases in which a “corporate insider trades in his own corporation’s stock on the basis of material, nonpublic information belonging to his corporation.” Zachary J. Gubler, *A Unified Theory of Insider Trading Law*, 105 GEO. L.J. 1225, 1227 (2017); see also Geraldine Szott Moohr, *An Enron Lesson: The Modest Role of Criminal Law in Preventing Corporate Crime*, 55 FLA. L. REV. 937, 947 (2003) (“Classic insider trading occurs when an insider, such as an executive of the company, uses information that is not available to the public to buy or sell a security of that company.”).

84. See, e.g., Richard A. Booth, *The Missing Link Between Insider Trading and Securities Fraud*, 2 J. BUS. & TECH. L. 185, 187 (2007) (“[I]nsider trading is a form of securities fraud”); Donna M. Nagy, *Beyond Dirks: Gratuitous Tipping and Insider Trading*, 42 J. CORP. L. 1, 8 (2016) (referring to insider trading as “a species of securities fraud”); J. Kelly Strader, *(Re)conceptualizing Insider Trading: United States v. Newman and the Intent to Defraud*, 80 BROOK. L. REV. 1419, 1422 (2015) (citing *U.S. v. Newman*, 773 F.3d 438 (2d Cir. 2014), reh’g en banc denied, 2015 WL 1954058 (2d Cir. Apr. 3, 2015)) (“[I]nsider trading is a form of securities fraud that is primarily judicially-defined . . .”).

85. 15 U.S.C. § 78j(b) (2018).

86. 17 C.F.R. § 240.10b-5 (2018).

87. 17 C.F.R. § 240.10b5-1.

88. 17 C.F.R. § 240.10b5-2.

of corporate management, the fiduciary duty of directors and officers to the corporation they serve, a fiduciary duty that often (but not always) inures to the primary benefit of the corporation's shareholders.⁸⁹ The net effect under federal securities law is that corporate directors and officers in possession of material, nonpublic information must disclose that information or abstain from trading.⁹⁰

Stock transfers recorded on a public blockchain, like votes recorded on a public blockchain, may be harder to conceal than transfers recorded on current electronic ledgers, if trades can be traced to individual insiders.⁹¹ "For a company with shares listed on such a blockchain, all

89. See, e.g., *eBay Domestic Holdings, Inc. v. Newmark*, 16 A.3d 1, 34 (Del. Ch. 2010) (stating that "acting to promote the value of the corporation for the benefit of its stockholders" is a standard applicable to directors under Delaware corporate law); Kelli A. Alces, *Debunking the Corporate Fiduciary Myth*, 35 J. CORP. L. 239, 246 (2009) ("[S]cholars and courts alike have moved toward an understanding of corporate fiduciary duties which dictates that fiduciary duties are owed to the corporation as a whole and that the interests or preferences of one constituency should not be honored above others."); Stephen M. Bainbridge, *Director Primacy: The Means and Ends of Corporate Governance*, 97 NW. U. L. REV. 547, 592 (2003) ("[T]he fiduciary duties of corporate directors should extend only to shareholders."); Leo E. Strine, Jr., *Our Continuing Struggle with the Idea that For-Profit Corporations Seek Profit*, 47 WAKE FOREST L. REV. 135, 147 n.34 (2012) ("[S]tockholders' best interest must always, within legal limits, be the end. Other constituencies may be considered only instrumentally to advance that end."); see generally *S.E.C. v. Texas Gulf Sulphur, Co.*, 401 F.2d 833, 848 (2d Cir. 1968), cert. denied, 404 U.S. 1005 (1971) ("[A]nyone who, trading for his own account in the securities of a corporation has 'access, directly or indirectly, to information intended to be available only for a corporate purpose and not for the personal benefit of anyone' may not take 'advantage of such information knowing it is unavailable to those with whom he is dealing,' i.e., the investing public." (quoting *Cady, Roberts & Co.*, 40 S.E.C. 907, 912 (1961))).

90. See *Chiarella v. United States*, 445 U.S. 222, 226–30 (1980).

[A]dministrative and judicial interpretations have established that silence in connection with the purchase or sale of securities may operate as a fraud actionable under 10(b) despite the absence of statutory language or legislative history specifically addressing the legality of nondisclosure. But such liability is premised upon a duty to disclose arising from a relationship of trust and confidence between parties to a transaction. Application of a duty to disclose prior to trading guarantees that corporate insiders, who have an obligation to place the shareholder's welfare before their own, will not benefit personally through fraudulent use of material, nonpublic information."). Based on the same legal principles, insiders also are prohibited from sharing material nonpublic information with others who may use it to trade. See *Dirks v. SEC*, 463 U.S. 646, 659 (1983) ("Not only are insiders forbidden by their fiduciary relationship from personally using undisclosed corporate information to their advantage, but they may not give such information to an outsider for the same improper purpose of exploiting the information for their personal gain."

Id.

91. See Yermack, *supra* note 1, at 17.

shareholders and other interested parties would be able to view the arrangement of ownership at any time and identify changes instantly as they occurred.”⁹² As a result, blockchain-based stock transfer records may deter trading by knowing or reckless wrongdoers.⁹³ Concealment would be easier if stock transfers were instead recorded on a private blockchain. “Even under the private or permissioned blockchain models, the real-time archive of transactions would create much more current and complete information about each firm’s ownership than is available in stock markets today, and it would be visible to at least some observers.”⁹⁴

Government access to a blockchain on which trades are recorded may deter unlawful or questionable trading by management, or may better enable enforcement of insider trading prohibitions against insiders who trade or tip while in possession of material nonpublic information.⁹⁵ To the extent that abnormal financial returns accruing to corporate directors or officers may have been considered part of management’s compensation, a deterrence of stock trading engendered by the transfer of stock ledgers to a blockchain may result in decreased compensation to insiders.⁹⁶

Moreover, when it comes to enforcement, the U.S. government has shown a willingness to use a variety of techniques to monitor questionable activity relating to possible insider trading violations.⁹⁷ Attempts to hide the identity of traders in government investigations of blockchain activity have, to date, been somewhat successful.⁹⁸ The government’s enforcement activity in the insider trading case brought against Raj P. Rajaratnam established, among other things, that it could be motivated to go to significant lengths to obtain evidence in pursuing

92. *Id.*

93. *See id.* (“[M]anagers might wish to conceal their trades for exactly the same reasons that small shareholders or fund managers might wish to observe them.”).

94. *Id.*

95. *See id.* at 17 (“If the ledger of transactions were visible only to the blockchain sponsor and to the government, the impact on investors’ trading strategies and insiders’ incentives could still be profound.”).

96. *See id.* at 21 (“The net effect would likely cut into managers’ profits from legal insider trading, and firms might have to pay them more to offset this loss.”).

97. *See, e.g.,* Kenneth Herzinger & Mark Mermelstein, *On Tap The Government’s Use of Wiretaps in Insider Trading Prosecutions Shows a Willingness to Use Nontraditional Methods of Investigation*, 35-APR LA LAW. 30 (Apr. 2012) (describing modern tactics employed by the Federal Bureau of Investigation, the SEC, and the U.S. Department of Justice in insider trading and other white-collar crime enforcement).

98. *See* Yermack, *supra* note 1, at 18 (“On the Bitcoin blockchain, maintaining anonymity has at times proven difficult. Law enforcement officials have successfully identified and prosecuted money launderers, drug dealers, operators of virtual casinos and Ponzi schemes, and other miscreants.”).

possible unlawful insider trading.⁹⁹ The prospect of blockchain stock trading makes it desirable for legal counsel advising both issuers and corporate management to become familiar with the nature and extent to which trading transactions can be identified and traced on various types of blockchains.

Existing securities transactional reporting mechanisms applicable to insiders—including those compelled by Rule 144 under the Securities Act of 1933, as amended (1933 Act),¹⁰⁰ Section 16(a) of the 1934 Act,¹⁰¹ and Rule 13d-1 under the 1934 Act¹⁰²—would likely be reconsidered. These transactional reports help identify suspicious management stock trades.¹⁰³ “Such notices to the market . . . might become superfluous if these investors’ positions could be observed in real time.”¹⁰⁴ Lawyers advising clients in this area will be challenged to keep up with legal developments in reporting responsibilities applicable to corporate management, as well as with the nuances of insider trading regulation if blockchain technology becomes a widelyaccepted means for recording management stock trades or attendant information.

C. Disclosure-Related Considerations

The legal framework applicable to publicly traded corporations engages both state corporate law establishing (among other things) fiduciary duties and federal securities law requiring (among other things) the disclosure of information.¹⁰⁵ This section proceeds by first briefly

99. John C. Hueston, *New Developments in Insider Trading Investigations and How to Respond*, MANAGING WHITE COLLAR LEGAL ISSUES, 2012 WL 167211, *2 (2012); see also Peter J. Henning, *Rajaratnam's Uphill Fight to Suppress Wiretaps*, N.Y. TIMES DEALBOOK (May 10, 2010), <https://dealbook.nytimes.com/2010/05/10/an-uphill-fight-to-suppress-the-galleon-wiretaps/>.

100. 17 C.F.R. § 230.144(h) (2018).

101. 15 U.S.C. § 78p(a) (2018).

102. 17 C.F.R. §§ 240.13d-101–102 (2018).

103. See, e.g., Allan Horwich, *The Origin, Application, Validity, and Potential Misuse of Rule 10b5-1*, 62 BUS. LAW. 913, 954 (2007) (noting the connection between insider trading and executive and director stock reporting under Rule 144 and Section 16(a)); Ellen Taylor, *Teaching an Old Law New Tricks: Rethinking Section 16*, 39 ARIZ. L. REV. 1315, 1334–35 (1997) (identifying Schedule 13D as a form on which insiders may be required to publicly report trades, but noting that “section 13(d) does not require officers and directors who are not 5% holders to file reports of their trades, so it does not provide the publicity with respect to those trades that section 16 does.”).

104. See Yermack, *supra* note 1, at 18.

105. See, e.g., Robert T. Esposito, *Charitable Solicitation Acts: Maslow's Hammer for Regulating Social Enterprise*, 11 N.Y.U. J.L. & BUS. 463, 483 (2015) (explaining that for-profit corporations are regulated under state corporate law and federal securities law and that the “regulatory regime revolves around the fiduciary duties

examining how blockchain-based recordkeeping could facilitate the board's fulfillment of fiduciary duties under state corporate law by enabling more efficient and reliable monitoring of the organization. Next, this section examines how blockchain could enable more rapid and credible disclosures, which may impact materiality analyses under federal securities law and rules. Finally, this section concludes by considering the saliency of blockchain to broader issues in the context of mandatory and voluntary disclosures under the federal securities laws.

1. Monitoring

Boards of directors have duties of care and loyalty.¹⁰⁶ In a series of judicial opinions, Delaware courts have articulated how a component of the duty of loyalty—the obligation to act in good faith—applies in the compliance context.¹⁰⁷ The relevant opinions explain that, in accordance with this duty of good faith, directors are obligated to monitor operations to assure compliance.¹⁰⁸ Boards have an evolving duty to, for example,

and disclosure requirements regarding the financial aspects of the business”); Christopher Gulinello, *The Mandatory Disclosure of State Corporate Law*, 86 NEB. L. REV. 795, 796 (2008) (“In the United States, the relationship between investors and the managers of public companies is governed by a combination of state and federal law.”).

106. See, e.g., *Stone ex rel. AmSouth Bancorporation v. Ritter*, 911 A.2d 362, 370 (Del. 2006) (clarifying that the only two fiduciary duties under Delaware corporate law are the duties of care and loyalty and describing the duty of loyalty in a corporate compliance context); *Smith v. Van Gorkom*, 488 A.2d 858, 872–73 (Del. 1985) (“[A] director’s duty to exercise an informed business judgment is in the nature of a duty of care, as distinguished from a duty of loyalty.”), *overruled on different grounds by Gantler v. Stephens*, 965 A.2d 695 (Del. 2009).

107. See, e.g., *Stone*, 911 A.2d at 369–70 (“The failure to act in good faith may result in liability because the requirement to act in good faith ‘is a subsidiary element[,]’ i.e., a condition, ‘of the fundamental duty of loyalty.’ It follows that because a showing of bad faith conduct . . . is essential to establish director oversight liability, the fiduciary duty violated by that conduct is the duty of loyalty.”); see also *In re Caremark International Inc. Derivative Litigation*, 698 A.2d 959 (Del. Ch. 1996); *Graham v. Allis-Chalmers Manufacturing Co.*, 188 A.2d 125 (Del. 1963).

108. See, e.g., *id.* at 370 (articulating “the necessary conditions predicate for director oversight liability,” including the conscious failure to monitor or oversee corporate operations); *In re Caremark Int’l Inc. Derivative Litig.*, 698 A.2d 959, 968–70 (Del. Ch. 1996) (describing director liability for a failure to monitor); *Graham v. Allis-Chalmers Mfg. Co.*, 188 A.2d 125, 130 (Se. Ch. 1963) (“[T]he question of whether a corporate director has become liable for losses to the corporation through neglect of duty is determined by the circumstances. If he . . . has refused or neglected cavalierly to perform his duty as a director, or has ignored either willfully or through inattention obvious danger signs of employee wrongdoing, the law will cast the burden of liability upon him.”). For an articulation of the critique that private shareholder litigation is inadequate as a means of assuring adequate board oversight, and a proposal for a public sector

monitor operations so as to detect and address illegal schemes carried out by company employees.¹⁰⁹

Especially for large organizations, therefore, blockchain applications offer a tremendous potential benefit to directors because of the capacity of blockchains to assist the directors in fulfilling their duty to monitor and detect fraud, theft, or any other malfeasance by officers, employees, or anyone else in the supply chain.¹¹⁰ Specifically, capturing compliance-related information and transactions on blockchains may make it harder for bad actors to hide their activities.¹¹¹ Both public and private blockchains have this potential.

There are, however, two cautionary notes that bear emphasizing in this and other contexts in which blockchain is relied upon for disclosure. First, as noted in Part I, blockchain-enabled recordkeeping is only as reliable as the initial creation or entry of data.¹¹² This places a premium on audits or independent verification to assure that record creation and certifications are accurate and complete—in other words, that all information written onto the blockchain is free of misrepresentations and that all information needed to prevent disclosed information from being misleading has been disclosed.¹¹³ In short, the adoption of blockchain-based information storage shifts the attention in fraud identification away from recordkeeping to record-creation. Legal counsel needs to be aware of this shift, including, for example, when proffering advice in the context of compliance processes. Second, as also noted in Part I, blockchain-enabled recordkeeping is only as meaningful as the attentiveness of officers and directors to the data and anomalies and the ability and the will of these managers to take investigative and corrective action if needed and as warranted.¹¹⁴ As summarized further below, this second cautionary note heightens the value of attorney awareness and astuteness with regard to the operations of their organizational clients.

Assuming that a corporation controls access to all the nodes of a private blockchain, it is worth noting that, in this context as in the others previously discussed, a permissioned distributed ledger (i.e., a private blockchain) does not add to the credibility of information to the same

mechanism, see Renee M. Jones & Michelle Welsh, *Toward a Public Enforcement Model for Directors' Duty of Oversight*, 45 VAND. J. TRANSNAT'L L. 343 (2012).

109. See sources cited *supra* note 108; see also Jennifer Arlen, *The Story of Allis-Chalmers, Caremark, and Stone: Directors' Evolving Duty to Monitor*, CORP. L. STORIES 323, 324–25, 329–31 (J. Mark Ramseyer ed., 2009).

110. See *supra* Part I.

111. See *supra* Part I.

112. See *supra* note 16 and accompanying text.

113. See *supra* Part I.

114. See *supra* note 16 and accompanying text.

degree as a public blockchain, at least to skeptical outside observers or others who do not have trust in the controlling corporation.¹¹⁵ If all nodes are under the control of a firm's management, then they have the ability to control those records—and theoretically could alter them. The system could be made more credible if independent accountants, or other trustworthy third parties, controlled any of the nodes; or if a regulatory agency controlled at least one node, as has been employed in at least one context so far.¹¹⁶

2. Materiality

Beyond the potential of blockchain to fundamentally alter the availability of actionable information to corporate leadership, it also could have profound implications for what and when publicly traded corporations are obligated to disclose to investors and others. Public companies have disclosure obligations under both antifraud and mandatory disclosure provisions of federal securities laws.¹¹⁷ This subsection focuses on antifraud compliance in connection with offers, sales, and purchases of securities, which typically relies more centrally on materiality determinations when there is an underlying duty to disclose information. Subsection C.3 raises a broader set of blockchain-

115. *See supra* Part I.

116. *R3 Unlocks Regulatory Reporting on Corda with Financial Conduct Authority and Two Global Banks*, R3 (Sept. 12, 2017), <https://www.r3.com/news/r3-unlocks-regulatory-reporting-on-corda-with-financial-conduct-authority-and-two-global-banks/>.

117. As one of us offered in a prior work,

The 1933 Act and the 1934 Act principally exist to protect investors in, and to promote and sustain the integrity of, the U.S. securities markets. The chief means used by and under these laws to achieve their core policy objectives is the public disclosure of investor-relevant information. This public disclosure is compelled by mandatory disclosure provisions and antifraud rules contained in the statutes, in regulations of the Securities and Exchange Commission (SEC), and in federal judicial decisions.

Joan MacLeod Heminway, *Personal Facts About Executive Officers: A Proposal for Tailored Disclosures to Encourage Reasonable Investor Behavior*, 42 WAKE FOREST L. REV. 749, 752 (2007) (footnotes omitted).

Miriam R. Albert explains,

[J]udicial decisions take into account, to varying degrees, the underlying legislative purposes of the federal securities laws to provide investor protection through mandatory disclosure of the information investors need to make informed investment decisions and, through antifraud liability, to put some teeth into the mandatory disclosure requirements by imposing significant penalties for violations thereof. (footnotes omitted).

Miriam R. Albert, *The Howey Test Turns 64: Are the Courts Grading This Test on A Curve?*, 2 WM. & MARY BUS. L. REV. 1, 6–7 (2011).

related considerations relevant to a public company's mandatory disclosure compliance and the practice of voluntary disclosures.

a. Defining Materiality

Several federal statutes govern securities transactions,¹¹⁸ with the 1933 Act and 1934 Act providing the foundation for the federal regime of required disclosures by entities that desire to offer or sell securities to the public or that issue publicly tradable securities.¹¹⁹ Key contextual definitions of securities fraud and information that must be made public are found in judicial opinions under Section 17(a) of the 1933 Act¹²⁰ and Section 10(b) of and Rule 10b-5 under the 1934 Act.¹²¹ Case law addressing the application of Section 32(a) of the 1934 Act¹²² provides additional context with respect to criminal securities fraud actions. In both the civil and criminal securities fraud liability contexts, materiality can be a significant enforcement and liability touchstone.¹²³

118. For a comprehensive overview of the federal framework of securities regulation, see Brian Lewis et al., *Thirtieth Annual Survey of White Collar Crime*, 52 AM. CRIM. L. REV. 1567 (2015) (discussing regulation and registration of those in the business of advising others on securities investments); Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, 124 Stat. 1376 (2010) (codified in U.S.C. §§ 7, 12, 15, 18, 22, 31, 42). Previously, an additional federal statute, the Public Utility Holding Company Act of 1935, 15 U.S.C. §§ 79-79z-6, governed securities transactions. The Act was repealed by the Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (2005).

119. See 15 U.S.C. § 78b (2018) (explaining that the purpose of mandatory reporting of information is to “insure the maintenance of fair and honest markets”).

120. 15 U.S.C. § 77q(a) (2018).

121. 15 U.S.C. § 78j(b); 17 C.F.R. § 240.10b-5 (2019).

122. 15 U.S.C. § 78ff(a).

123. See, e.g., *Basic Inc. v. Levinson*, 485 U.S. 224, 231-32 (1988) (applying, under Rule 10b-5, the materiality formulations recognized by the Court in *TSC Indus., Inc. v. Northway, Inc.*, 426 U.S. 438, 449 (1976)); *Chiarella v. United States*, 445 U.S. 222, 230 (1980) (noting, in the insider trading context, that the “[a]pplication of a duty to disclose prior to trading guarantees that corporate insiders, who have an obligation to place the shareholder’s welfare before their own, will not benefit personally through fraudulent use of material, nonpublic information.”). As one of us has noted in an earlier work, materiality may be especially significant in insider trading actions brought under Section 10(b) and Rule 10b-5 of the 1934 Act. See Joan MacLeod Heminway, *Just Do It! Specific Rulemaking on Materiality Guidance in Insider Trading*, 72 LA. L. REV. 999, 1010 (2012) (“The open-textured disclosure environment of insider trading in which materiality operates is of particular concern when it mixes with enforcement discretion.”); Joan MacLeod Heminway, *Materiality Guidance in the Context of Insider Trading: A Call for Action*, 52 AM. U. L. REV. 1131, 1156 (2003) (“The concept of materiality is critically important to insider trading analysis because undisclosed information always exists and securities trading by an issuer or one of its insiders triggers a duty to disclose.”).

Materiality has been described as having “an unrivaled position in the center of all of securities law.”¹²⁴ Deciding what information must be disclosed to comply with antifraud principles when there is a duty to disclose¹²⁵ hinges on a determination of whether the data, information, or event qualifies as material¹²⁶—which depends on the precise definition of materiality, as it has evolved over time.¹²⁷ In common securities trading parlance, materiality is understood as the “importance of an event or information in influencing a company’s stock price.”¹²⁸ As the U.S. Supreme Court explained, false statements or omissions alone do not constitute securities fraud if they are insignificant.¹²⁹

In *TSC Industries, Inc. v. Northway, Inc.*, the Supreme Court elaborated that the decision of whether a misstatement or omission is material depends upon “delicate assessments of the inferences a ‘reasonable shareholder’ would draw from a given set of facts and the significance of those inferences to him.”¹³⁰ While *TSC* was a proxy fraud case,¹³¹ the standard articulated there was adopted for use in Section 10(b) and Rule 10b-5 analyses in 1988 in *Basic v. Levinson*.¹³² There is no bright-line rule to make these assessments.¹³³ Instead, on a case-by-case basis, the determination of whether a misstatement or omission is material hinges upon the question of whether there is a substantial likelihood that a reasonable investor would have viewed the information (or lack thereof) as important, or as having significantly altered the total

124. Dale A. Oesterle, *The Overused and Under-Defined Notion of “Material” in Securities Law*, 14 U. PA. J. BUS. L. 167, 167 (2011).

125. For a concise summary of the elements of securities fraud, see *Dura Pharm., Inc. v. Broudo*, 544 U.S. 336, 341–42 (2005) (setting forth the basic elements of a cause of action for securities fraud brought under Section 10(b) and Rule 10b-5 of the 1934 Act).

126. 15 U.S.C. § 77q(a)(2) (2018) (making it unlawful for a person to “obtain money or property by means of any untrue statement of a material fact or any omission to state a material fact necessary in order to make the statements made, in light of the circumstances under which they were made, not misleading . . .”); 17 C.F.R. § 240.10b-5 (2018) (barring entities from making “any untrue statement of a material fact” or omission of a “material fact necessary in order to make the statements made . . . not misleading”).

127. See Richard C. Sauer, *The Erosion of the Materiality Standard in the Enforcement of the Federal Securities Laws*, 62 BUS. LAW. 317, 318 (2007).

128. *Materiality*, NASDAQ, <https://www.nasdaq.com/investing/glossary/m/materiality> (last visited May 6, 2019).

129. *Basic Inc. v. Levinson*, 485 U.S. 224, 238 (1988).

130. *TSC Indus., Inc. v. Northway, Inc.*, 426 U.S. 438, 450 (1976).

131. *Id.* at 440.

132. See *Basic*, 485 U.S. at 232 (“We now expressly adopt the *TSC Industries* standard of materiality for the § 10(b) and Rule 10b-5 context.”).

133. *Matrixx Initiatives, Inc. v. Siracusano*, 563 U.S. 27, 30 (2011).

mix of available information.¹³⁴ This same definition of materiality is applied to statements that are speculative or contingent in nature and to statements of opinion (although in each case there are refined judicial tools available to guide application of the definition in context).¹³⁵ Analyses of the relative importance of information, and the total mix of information in specific cases, may be impacted by blockchain-enabled data storage and verification.

b. Disclosing Material Facts

In addition to this background on materiality, it is worth briefly reviewing the means by which material information is typically communicated to prevent investor fraud. Unlike the disclosures provided by firms in compliance with mandatory disclosure rules addressed in subsection C.3 of this Part, disclosures prompted by the federal securities laws' antifraud rules applicable to offers, sales, and purchases of securities are not required to be made on a specific form or in a specific manner.¹³⁶ Rather, the focus in making these disclosures is on effective dissemination of the material information to offerees, purchasers, or sellers of securities.

In general, firms publicly release material information to the public through press releases and other routine public announcements.¹³⁷ It has become customary to file a Current Report on Form 8-K¹³⁸ to formalize these disclosures. These general Form 8-K filings reporting material information are commonly made under Item 8.01 of Form 8-K, the optional filing category for information about other events.¹³⁹

As any securities lawyer with experience in counseling U.S. public companies knows, issuers are, in reality, confronted with the need to

134. *TSC Indus.*, 426 U.S. at 449.

135. See *Omnicare, Inc. v. Laborers Dist. Council Const. Indus. Pension Fund*, 135 S. Ct. 1318, 1320 (2015) (addressing statements of opinion); *Basic Inc.*, 485 U.S. at 232–41 (addressing contingent or speculative information).

136. See Ted Kamman & Rory T. Hood, *With the Spotlight on the Financial Crisis, Regulatory Loopholes, and Hedge Funds Comply with the Insider Trading Laws?*, 2009 COLUM. BUS. L. REV. 357, 447 (2009).

137. See *id.*

138. *Form 8-K*, U.S. SEC. & EXCH. COMM'N, <https://www.sec.gov/files/form8-k.pdf> (last visited May 28, 2019).

139. See David M. Stuart & David A. Wilson, *Disclosure Obligations Under the Federal Securities Laws in Government Investigations*, 64 BUS. LAW. 973, 991 (2009) (noting that Item 8.01 of Form 8-K “provides a catch-all disclosure option under which the company may disclose any events, with respect to which information is not otherwise called for, that the company deems of importance to security holders.”).

distinguish (i) highly important information that should be promptly disclosed in a press release and Form 8-K; and (ii) potentially material information that need merely be disclosed somewhere in the next periodic report, such as a regular earnings release, Annual Report on Form 10-K or Quarterly Report on Form 10-Q.¹⁴⁰

Prompted by, among other factors, a U.S. Supreme Court decision in an insider trading case that credited selective disclosures to market professionals in circumstances that would give them an advantage over the ordinary investor,¹⁴¹ the SEC promulgated Regulation FD,¹⁴² providing an express requirement to convey material information to the public if it is being conveyed to certain market-engaged individuals or entities (including analysts and other securities market professionals).¹⁴³ To satisfy the requirements of Regulation FD, a disclosure may be made using a Current Report on Form 8-K or by disseminating information through any means “reasonably designed to provide broad, non-exclusionary distribution of the information to the public.”¹⁴⁴ The SEC has clarified that this rule is flexible and—of significance to this article—was intended to allow for the use of the Internet to share information.¹⁴⁵ Although the SEC has not made any explicit statements endorsing blockchain for public disclosure purposes, it seems reasonable to conclude that blockchain platforms could be deemed adequate to comply with the public disclosure requirements of Regulation FD.

c. Implications of Blockchain for Antifraud Disclosures

The adoption of blockchain-enabled recordkeeping will have several implications for public company disclosure practices designed to comply with antifraud protections under federal securities law. The precise implications of using blockchain-enabled information disclosure depend upon whether blockchain information-tracking occurs on a public

140. Kamman & Hood, *supra* note 136, at 451.

141. *Dirks v. SEC*, 463 U.S. 646, 657 n.16, 663 (1983).

142. For the proposition that the holding in the *Dirks* case was a factor in the promulgation of Regulation FD, see Madelyn La France et al., *Securities Fraud*, 55 AM. CRIM. L. REV. 1677, 1721 (2018).

143. 17 C.F.R. § 243.100(b)(1) (2019).

144. 17 C.F.R. § 243.101(e).

145. According to the SEC, Rule 101(e) provides considerable flexibility and was designed to permit issuers to make use of current technologies such as the Internet. *See* Selective Disclosure and Insider Trading, Release Nos. 33-7881, 34-43154, 65 FR 51716-01 (Aug. 24, 2000). The SEC provided specific guidance on the use of firm websites for Regulation FD disclosures in 2008. *See* Comm’n Guidance on the Use of Co. Web Sites, Release No. 34-58288 (Aug. 1, 2008), <https://www.sec.gov/rules/interp/2008/34-58288.pdf>.

blockchain (with the disclosed data therefore laid bare to public scrutiny) or a private blockchain (on which access to data is controlled and most likely limited to individuals within the organization).¹⁴⁶ As explained above, the choice is significant because a public blockchain makes information (at least in theory) immediately and continuously available to anyone, while deploying a private blockchain—or permissioned ledger—keeps information private.¹⁴⁷

By making records more credible, transparent, and immediately available, the use of a public blockchain for the storage and updating of corporate financial and non-financial operating information may actually lower expectations for additional disclosure because the market already would have access to materially accurate and complete information.¹⁴⁸ As mentioned above, Regulation FD allows corporations to satisfy disclosure requirements through Internet-enabled technologies.¹⁴⁹ Therefore, given current standards, use of a public blockchain in the context of corporate recordkeeping and supply chain management would logically obviate or lessen the need to make a public filing on Form 8-K or to publish the information in a future periodic report.¹⁵⁰ It simply would be less likely that additional information would exist, and of it did, that it would be important or significant to the total mix of information already available in the market.¹⁵¹ It would be more likely, in other words, that accurate and complete information already would be available to the market through disclosure on a public blockchain.

Based on the foregoing, public blockchain-enabled information-tracking would have at least three potential benefits to public companies. First, it may allow corporations to more efficiently and effectively put investors on at least constructive notice of information disclosed through

146. See *supra* Part I (describing the difference between public and private blockchains).

147. See *supra* Part II.

148. See *Wielgos v. Commonwealth Edison Co.*, 892 F.2d 509, 518 (7th Cir. 1989) (finding no violation of Section 11 of the 1933 Act because “[e]verything we can see demonstrates that the market had in its possession all significant information.”).

149. See *supra* notes 145 & 146 and accompanying text.

150. This logical leap is informed by Professor Dale Oesterle’s earlier work on continuous disclosure under the federal securities laws and Professor Hillary Sale’s scholarship on evolving notions of publicness. See generally Dale Arthur Oesterle, *The Inexorable March Toward Continuous Disclosure Requirement for Publicly Traded Corporations: “Are We There Yet?”*, 20 CARDOZO L. REV. 135 (1998); Hillary A. Sale, *J.P. Morgan: An Anatomy of Corporate Publicness*, 79 BROOK. L. REV. 1629 (2014); Hillary A. Sale, *Public Governance*, 81 GEO. WASH. L. REV. 1012 (2013); Hillary A. Sale, *The New “Public” Corporation*, 74 L. & CONTEMP. PROB. 137 (2011).

151. See *Wielgos*, 892 F.2d at 516 (“Knowledge abroad in the market moderated, likely eliminated, the potential of a dated projection to mislead. It therefore cannot be the basis of liability.”).

blockchain-enabled information-tracking that is or could conceivably be deemed material—or, more accurately, it would proactively assure that investors are *kept* on continual constructive notice. Second, by eliminating the need for specific, event-based Form 8-K filings or other statements or notifications, public blockchain-enabled information-tracking may (somewhat ironically) actually draw *less* attention to unforeseen developments, effectively keeping otherwise noteworthy events more discrete. Third, public blockchain disclosures may conceivably streamline discovery in litigation or lead to the early dismissal of securities class action lawsuits, by providing quick and easy proof that investors were effectively kept informed of material information, even if they later express surprise and indignation that they were not specially and specifically notified of unforeseen developments within the organization (at least with regard to the information tracked on public blockchain applications).¹⁵²

Conversely, especially in the early years of adoption and usage, there could be drawbacks and risks related to information-tracking on public blockchains. For example, until the SEC specifically issues guidance or courts resolve a case on point, it is conceivable—even predictable—that investors would argue that blockchain-enabled information-tracking is inadequate or inappropriate as a means of informing them of material information.

First, blockchain disclosure may be argued to be inadequate, in that not all reasonable investors (at least in the immediate future) are savvy enough to understand, access, and adequately comprehend information conveyed via blockchain-enabled platforms. We see an implication for lawyers here, in that they must evaluate this risk proactively when advising clients, and also for policy-makers and judges, in that they may need to resolve this question. Second, it may be argued that information-tracking and information-sharing on public blockchains is inappropriate (even if it is assumed that it is an adequate means of communication) because it *over-*informs investors, effectively burying them in data, such that material information is effectively concealed.¹⁵³ This is analogous to the phenomenon of litigators technically complying with a discovery request, but effectively overwhelming their counterparts by providing so

152. *But see, e.g., In re Atossa Genetics Inc Sec. Litig.*, 868 F.3d 784, 795–96 (9th Cir. 2017) (asserting that, in a direct reliance action, misstated or omitted facts that are corrected or supplied through public disclosure do not necessarily render those facts immaterial).

153. *See* Vice-Chancellor Jacobs, *Sonet v. Plum Creek Timber Co., L.P.*, 24 DEL. J. CORP. L. 1254, 1268 (1999) (“[I]f material information facts are buried in a lengthy disclosure document so that the true import of that information is lost, such ‘buried fact’ disclosure may be deemed misleading.”).

many related records as to conceal the “needle in the haystack.”¹⁵⁴ Again, this raises a question for attorneys to consider and highlights a potential dispute that policy-makers and judges eventually may be called upon to resolve.

Private intra-corporate blockchains raise a different set of implications for antifraud disclosures. If an information-tracking application relies on a private blockchain, then investors do not have better and faster access to more credible data—only the company (together with its permitted representatives and agents) does.¹⁵⁵ Therefore, if a private blockchain is used, because the company and its permitted representatives and agents have faster access to more credible data (but external observers do not), the use of information-tracking on the blockchain may alter disclosure expectations in the opposite way. Namely, management would be expected to disclose more than in the past or at present to the extent that the private blockchain makes management more aware of potentially material information that has not been publicly disclosed.

Gone would be any conceivable defenses that certain information was not immediately knowable by the board of directors or officers of the corporation,¹⁵⁶ at least regarding the information kept on the private blockchain-enabled platform. Attorneys would be well advised to gain and maintain technological and operational astuteness and proactively raise concerns and offer solutions, and officers and directors would be well advised to actually (rather than constructively) know and then disclose information that could qualify as material. It is, further, conceivable that spreading popular awareness of enhanced record-keeping could alter regulators’ and courts’ conceptions of what a reasonable investor would find important or would want to know as part of the total mix of information that an investor considers when making investment decisions.¹⁵⁷

154. See *Hagemeyer N. Am., Inc. v. Gateway Data Scis. Corp.*, 222 F.R.D. 594, 598 (E.D. Wis. 2004) (indicating that a responding party to a discovery request “cannot attempt to hide a needle in a haystack by mingling responsive documents with large numbers of non-responsive documents....[But there is] no duty to organize and label the documents if [the responding party] has produced them as they are kept in the usual course of business.”).

155. See *supra* Part I.

156. Cf. *Ernst & Ernst v. Hochfelder*, 425 U.S. 185, 193 (1976) (noting the failure of an accounting firm to discover and comment on material nonpublic information).

157. Cf. Joan MacLeod Heminway, *Female Investors and Securities Fraud: Is the Reasonable Investor A Woman?*, 15 WM. & MARY J. WOMEN & L. 291, 296 (2009) (“[T]he nature and source of conceptions of the reasonable investor raise a number of important unanswered questions. These questions include . . . whether—and if so how—

To summarize, the implications of blockchain for controversies and decisions about materiality depend on the kind of blockchain application that is deployed: public or private. However, materiality is not the only disclosure standard applicable to the external communication of information. In the next section, we turn our attention to related, but distinct, contexts relating to public company mandatory disclosure obligations.

3. *Mandatory Disclosure*

As mentioned in Part II.C.2,¹⁵⁸ the legal framework concerning securities fraud, which requires the reporting of material information when there is a duty to disclose, is not the only body of law that compels the disclosure of information by firms with publicly offered or traded stock. Issuers that are required to comply with Section 13(a) or Section 15(d) of the 1934 Act¹⁵⁹ must file various periodic and transactional reports and statements, including (as applicable) quarterly and annual reports, proxy statements, tender offer statements, and going-private statements. These reporting obligations have been standard-bearers of federal securities regulation in the United States from the start.

However, this mandatory disclosure regime has been enhanced over the years through legislation and regulation, including by the enactment (starting in 2002) of various federal legislative responses to significant episodes of corporate fraud evidencing failures in corporate governance.¹⁶⁰ These legislative initiatives include expectations for both internal information-tracking and public-facing communication. For example, the Sarbanes-Oxley Act of 2002 (SOX) requires public attestations, by a firm's Chief Executive Officers and Chief Financial Officers in the firm's annual and quarterly reports, that adequate audit mechanisms are in place to detect fraud or other financial misdeeds within their organizations.¹⁶¹ These officers require factual support for their attestations.¹⁶²

While it is far from certain, the deployment of a blockchain-enabled financial data-tracking mechanism—without an additional audit system—may technically satisfy key provisions of SOX that require each

decisional law context (including the interaction of materiality and other elements of a fraud claim, e.g., scienter or reliance) affects our view of the reasonable investor.”).

158. *See supra* Section II.C.2.

159. 15 U.S.C. § 78m(a) (2018); 15 U.S.C. § 78o(d).

160. *See id.*

161. Pub. L. No. 107-204, 116 Stat. 745 (codified as amended at 15 U.S.C. §§ 7201–7266 (2002) and in scattered sections of 18 U.S.C., 28 U.S.C. & 29 U.S.C.), at § 302(a)).

162. *See id.*

publicly traded firm both (a) to have effective internal controls and processes designed to generate accurate and complete public disclosures¹⁶³ and (b) to include a report on financial internal controls (including an “assessment, as of the end of the most recent fiscal year of the issuer, of the effectiveness of the internal control structure and procedures of the issuer for financial reporting”) in its annual report filing.¹⁶⁴ The continuous and constant verification of previous records by independent nodes would likely allow officers of the company to meet the attendant requirement that they personally evaluate the effectiveness of the corporation’s internal controls as of a date within 90 days prior to each quarterly and annual report.¹⁶⁵

Reasonable minds could disagree on any of these assertions about the effects of blockchain data-tracking on these regulatory requirements—only a proactive decision of policy-makers, or the retroactive determination of a judge in a dispute, will resolve these questions. Until then, it is up to scholars to make arguments and up to practitioners to highlight risks and recommend liability-limiting protections for corporations and their officers and directors.

Blockchain technology can also aid in maintaining and releasing non-financial disclosures. These non-financial disclosures include, for example, those mandated by the Dodd-Frank Wall Street Reform and Consumer Protection Act¹⁶⁶ (regarding, among other things, the publication of information about minerals sourced in conflict zones¹⁶⁷), those compelled by statutes and regulations requiring public disclosures of environmental data¹⁶⁸ (including the Toxic Release Inventory Act¹⁶⁹), those compelling the disclosure of impacts on people (for instance, the workplace health and safety data publication requirements set by and

163. 15 U.S.C. § 7241(a) (2019).

164. 15 U.S.C. § 7262 (2019). For a more in-depth discussion of duties created by the Sarbanes-Oxley Act, see Larry Catá Backer, *The Duty to Monitor: Emerging Obligations of Outside Lawyers and Auditors to Detect and Report Corporate Wrongdoing Beyond the Federal Securities Laws*, 77 ST. JOHN’S L. REV. 919 (2003).

165. 15 U.S.C. § 7241(a)(4)(C).

166. Pub. L. No. 111–203, 124 Stat. 1376 (2010). For an overview and discussion of the law, see David M. Lynn, *The Dodd-Frank Act’s Specialized Corporate Disclosure: Using the Securities Laws to Address Public Policy Issues*, 6 J. BUS. & TECH. L. 327 (2011); see also Emily Veale, Note, *Is There Blood On Your Hands-Free Device?: Examining Legislative Approaches to the Conflict Minerals Problem in the Democratic Republic of Congo*, 21 CARDOZO J. INT’L & COMP. L. 503, 544 (2013).

167. The Dodd-Frank Act, § 1502, 124 Stat. at 2213–18. See generally Veale, *supra* note 166 (arguing “that an effective solution to the conflict minerals crisis requires more than Dodd-Frank’s mandated SEC disclosures.”).

168. See, e.g., Emergency Planning and Community Right-to-Know Act (EPCRA), 42 U.S.C. §§ 11001–50 (2000).

169. 42 U.S.C. §§ 11003, 11022–23.

under the Occupational Safety and Health Act¹⁷⁰), and voluntary sustainability disclosure practices adopted by over 90% of the largest 250 companies in the world.¹⁷¹

The enhanced tracking of information, certifications and inspections, or data on the provenance of materials in the supply chain enabled by a blockchain present a now familiar double-edged sword. On the one hand, a public blockchain-enabled solution would arguably satisfy reporting requirements in a more efficient and reliable manner.¹⁷² On the other hand, no blockchain platform can assure the reliability of data measurement and data entry.¹⁷³ And no blockchain platform—in and of itself—assures that company leadership will take note and act upon the recorded information.

Furthermore, the use of a platform enabled by a public blockchain for mandatory or voluntary public disclosures of information holds the added risk that management has little capacity to control the narrative or withhold data based on the determination that information is immaterial.¹⁷⁴ There is a risk that data becomes misunderstood because management loses the opportunity to package the disclosed information for digestion by shareholders and investors.

The use of a private blockchain would result in fewer differences from present practices. Although private blockchain-enabled platforms would offer several benefits similar to those offered by a public blockchain (e.g., more quickly delivering more reliable data to management), private blockchains offer the additional benefit of preserving some discretion over what, when, and how information is divulged to the greater public.¹⁷⁵ In other words, a private blockchain solution would preserve the more selective information-curating common to periodic and transactional reporting by public companies as

170. Pub. L. No. 91-596, 84 Stat. 1590 (1970).

171. For a more thorough discussion of sustainability reporting, integrated reporting, their relationship to statutes and the materiality principle, and reasoning in support of clearer requirements for such reporting, see Adam Sulkowski & Sandra Waddock, *Beyond Sustainability Reporting: Integrated Reporting is Practiced, Required and More Would be Better*, 10 U. ST. THOMAS L. J. 1060, 1061 (2013).

172. See *supra* Section II.C.2.b.

173. See *supra* Part I.

174. To see the importance of controlling the narrative, see Walter Pavlo, *The Shkreli Trial Is About Controlling Narrative, And That Is Not Good For Justice*, FORBES (Jun. 30, 2017), <https://www.forbes.com/sites/walterpavlo/2017/06/30/the-shkreli-trial-is-about-controlling-narrative-and-that-is-not-good-for-justice/#64cd020a4b3b> (showing that in the Martin Shkreli securities fraud trial, “controlling the narrative is more important than mounting a prosecution or defense strategy. If you control the public narrative, you control the jury.”).

175. See *supra* Part I.

we currently know and understand it. However, as addressed in more detail below, the consideration of a private blockchain-based application should include a conversation about the specifics of the terminology used in related public announcements.¹⁷⁶

An additional option to raise, for purposes of disclosures (both those that are mandated, and those that companies may voluntarily undertake), is for a party outside the corporation—either a governmental agency or an organization outside the control of any corporation or consortium of corporations—to establish a public blockchain. An example would be a government, UN agency, or NGO establishing a public blockchain for the registration and tracking of minerals mined in conflict zones.¹⁷⁷ This would at least remove the potential perception that corporations have somehow set up the tracking mechanism to allow for editing of records, even though it would still not solve the problems of first-person and second-person trust described above.¹⁷⁸

A final cautionary note must be raised with regard to statutes and regulations that mandate *nondisclosure*—in other words, laws such as the Health Insurance Portability and Accountability Act of 1996 (HIPAA)¹⁷⁹ and the Financial Modernization Act of 1999, commonly known as the Gramm-Leach-Bliley Act (GLB)¹⁸⁰—which were passed to protect the privacy of data in the context of, respectively, the health care industry and the banking sector.¹⁸¹ If the legacy of SOX is any indication of what to expect, savvy (if somewhat unscrupulous) entrepreneurs will soon offer blockchain-enabled data-tracking systems that claim to be HIPAA- or GLB-compliant, even if the statutes do not actually define what qualifies as a compliant blockchain application.¹⁸² Attorneys should be attentive to these developments and become adequately familiar with the

176. See *infra* Part III.

177. See e.g., Yogita Khatri, *Rwanda Starts Tracking Conflict Metal Tantalum with Blockchain*, COINDESK (Oct. 17, 2018), <https://www.coindesk.com/rwanda-starts-tracking-conflict-metal-tantalum-with-blockchain> (indicating that Rwanda's government will use blockchain technology to track tantalum).

178. See *supra* Part I.

179. 42 U.S.C. § 1320d-6 (2018).

180. 15 U.S.C. §§ 6801-6809 (2018).

181. For a review of major federal statutes dealing with data privacy, see Adam J. Sulkowski, *Cyber-Extortion: Duties and Liabilities Related to the Elephant in the Server Room*, 2007 U. ILL. J.L. TECH. & POL'Y 21, 33-44 (2007).

182. See *id.* at 36 (stating SOX “has led to a burgeoning market in IT systems claiming to be ‘Sarbanes compliant[.]’”); see also Mark Rasch, *Sarbanes Oxley for IT Security?*, REGISTER (May 3, 2005), https://www.theregister.co.uk/2005/05/03/sarbanes_oxley_for_it_security/ (noting the widespread claim by computer security vendors that their products and services are “100% Sarbanes Oxley Compliant” and examining how SOX is relevant to IT security and how proper IT security can prevent some types of fraud).

privacy safeguards in the relevant body of law, as well as in the technology, to better advise firm management as to the prudence of adopting blockchain technology in these contexts. It may fall upon attorneys to help firm leadership imagine worst-case scenarios, such as all-to-common data breaches, and lead contingency planning.¹⁸³ Especially when strict data privacy rules are involved, data breaches may trigger reporting requirements.¹⁸⁴

III. IMPLICATIONS FOR LEGAL COUNSEL

The foregoing analysis leads to a number of implications for attorneys, several of which were mentioned in the context of the specific corporate governance applications of blockchain technology described in Part II.¹⁸⁵ Enterprise solutions based on blockchain already exist and are poised for widespread adoption.¹⁸⁶ It is more likely to be a question of when—not if—legal counsel is confronted with issues related to blockchain (assuming no confrontation has taken place yet).¹⁸⁷

In this milieu, business lawyers must not only keep abreast of developments in technology, but also actively query clients so as to be aware sooner (rather than after the fact) if they are adopting blockchain-enabled corporate governance platforms or modalities. Under the Model

183. See generally Emily Johnson, *A Cyber Breach Contingency Plan is Not Just the CIO's Responsibility*, INFORMATIONWEEK (Apr. 2, 2018), <https://www.informationweek.com/strategic-cio/security-and-risk-strategy/a-cyber-breach-contingency-plan-is-not-just-the-cios-responsibility/d/d-id/1331416> (indicating lawyers' role in data breaches and contingency planning).

184. See e.g., Josephine Wolff, *How Is the GDPR Doing?*, SLATE (Mar. 20, 2019), <https://slate.com/technology/2019/03/gdpr-one-year-anniversary-breach-notification-fines.html> (stating that the European Union's General Data Protection Regulation "requires organizations to report data breaches to both the affected individuals and the appropriate regulatory authorities within 72 hours of being discovered.").

185. For a discussion of the implications for attorneys of blockchain adoption in business supply chains with similar conclusions, see Sulkowski, note 16, at 326–344.

186. Capital markets are projected to spend \$400 million on blockchain technology in 2019, according to the Aite Group. Reina G. Wiatt, *From the Mainframe to the Blockchain*, STRATEGIC FIN. (Jan. 1, 2019), <https://sfmagazine.com/post-entry/january-2019-from-the-mainframe-to-the-blockchain/>. Accenture estimates that blockchain may save investment banks \$8-12 billion annually by 2025. *Id.* Market Reports Hub predicts that the growth rate of blockchain technology may be over 60% by 2021. *Id.* According to the World Economic Forum, 10% of the world's GDP will involve a distributed ledger by 2027. *Id.*

187. Erik P.M. Vermeulen, *Corporate Governance in A Networked Age*, 50 WAKE FOREST L. REV. 711, 713 (2015) ("In today's business environment, every company has basically become a technology company. This explains why smart companies increasingly attempt to become more agile, innovative, and responsive by restructuring the way they are organized.").

Rules of Professional Conduct, a lawyer is urged to keep abreast of technological developments necessary to service the lawyer's clients.¹⁸⁸ Business law practitioners therefore would be wise to adopt a disciplined and regular practice of reviewing blockchain developments as they relate to corporate governance matters.¹⁸⁹

The second discernible implication of blockchain-based corporate governance is that attorneys have a role in educating their clients on the legal implications of the adoption of new technologies relating to or in the course of representation.¹⁹⁰ This, too, is a matter of professional responsibility as well as a best practice.¹⁹¹ This second implication builds on the first. To render timely, valuable, and actionable advice, attorneys must develop both technological and operational astuteness. While legal counsel may not need a course or certification in coding, proffering sound legal advice behooves familiarity with the benefits and risks of specific blockchain applications and how they are being deployed and used.¹⁹²

Notably, the terminology used by a company could raise the risk of liability. Legal actions brought by investors or customers may be founded, for example, on the allegation that the firm's use of the word "blockchain" to refer to a permissioned ledger was fraudulent or misleading.¹⁹³ To be clear, we do not have a strong opinion about the merits of such a claim, but the disagreement over this issue must be acknowledged; and it would be a potentially costly mistake to avoid raising the issue proactively with one's client or to avoid discussing options for minimizing risks of this kind. Along similar lines, legal counsel should query and point out the extent to which a given distributed ledger technology truly keeps an immutable record.¹⁹⁴

A third implication, related to the first two, is that practitioners, policy-makers, scholars, and judges would be better off being proactive in discussing the implications of blockchain in the context of corporate

188. See MODEL RULES OF PROF'L CONDUCT r. 1.1 cmt. 8 (AM. BAR ASS'N 2016).

189. See Mark Popielarski, *Blockchain Research: Bitcoins, Cryptocurrency, and Distributed Ledgers*, COLO. LAW. 10 (June 2018), <http://www.coallnet.org/wp-content/uploads/2018/06/Irc0618.pdf> (compiling issues, resources, and practices recommended for lawyers).

190. See Sulkowski, *supra* note 16 at 333–35.

191. See MODEL RULES OF PROF'L CONDUCT r. 1.4(b) (AM. BAR ASS'N 2018) ("A lawyer shall explain a matter to the extent reasonably necessary to permit the client to make informed decisions regarding the representation.").

192. See *id.*

193. See *supra* Part I.

194. For a synopsis of reasons to question the characterization of records kept on distributed ledgers as immutable, with support references, see Nathan Fulmer, *Exploring the Legal Issues of Blockchain Applications*, 52 AKRON L. REV. 161, 170 (2018).

governance (and possibly corporate policies more generally), rather than figuring things out retroactively.¹⁹⁵ Legal counsel may need to be uncharacteristically proactive, relative to norms of the legal profession—actively seeking knowledge, offering observations, and testing ideas well outside a lawyer’s typical comfort zones.¹⁹⁶

To take one example, it would be advantageous for enterprises, the investment community, and other stakeholders, if the SEC were to issue clarification on whether the tracking of information on a public blockchain satisfies the disclosure requirements of Regulation FD.¹⁹⁷ Specifically, this clarification would create more regulatory certainty and predictability, encouraging entrepreneurs to develop related blockchain disclosure applications, confident that there would be a potential market for their products. In the absence of SEC action clarifying the role of public blockchain in Regulation FD compliance, legal counsel will be required to make nuanced judgments based on accumulated knowledge. Proactive education is consistent with a lawyer’s general obligation to “cultivate knowledge of the law beyond its use for clients, employ that knowledge in reform of the law and work to strengthen legal education.”¹⁹⁸ As those most familiar with corporate governance laws and norms, business law practitioners advising firms on corporate governance may well find themselves having to explain the interface between corporate governance and blockchains.¹⁹⁹

This exhortation to legal counsel and others (including policy-makers) to be proactive is predicated upon two implied assumptions that deserve to be stated more explicitly. First, techno-utopian assertions notwithstanding, we believe that blockchain, like other technologies, will

195. For a discussion of the relevance of proactive legal scholarship to the practice of law in the blockchain era, see Sulkowski, *supra* note 16, at 340–45. For a broader review of proactive legal strategies, see Gerlinde Berger-Walliser et al., *Using Proactive Legal Strategies for Corporate Environmental Sustainability*, 6 MICH. J. ENVTL. & ADMIN. L. 1 (2016).

196. One commentator put it well:

[C]onsider the role of corporate governance intermediaries, such as corporate lawyers, accountants, auditors, and other advisors and consultants. These intermediaries are generally considered to be conservative, risk averse, and reluctant to think “out of the box.” They tend to recommend boilerplate standardized arrangements and compliance with one-size-fits-all “best practices” rather than offering their clients customized and more optimal organizational solutions.

Vermeulen, *supra* note 187, at 720.

197. See *supra* Section II.C.2.b.

198. See MODEL RULES OF PROF’L CONDUCT PMBL. ¶ 6 (AM. BAR ASS’N 2018).

199. See *id.*, r. 1.4 cmt. 5 (“[T]he lawyer should fulfill reasonable client expectations for information consistent with the duty to act in the client’s best interests, and the client’s overall requirements as to the character of representation.”).

not, on its own, predetermine outcomes that are necessarily more desirable—whether to specific stakeholders or for the better functioning of markets or society as a whole. For example, depending on the nature of the blockchain used for a specific application (including, e.g., whether it is public or private and, if private, how the permissions are constructed and managed), blockchain’s transparency may have both benefits and detriments in the context of shareholder record-keeping and voting. Moreover, it may seem that information-tracking on a public blockchain would increase efficiency and transparency and, therefore, serve the interests of investors.

However, as we have pointed out, the desirability of the actual outcomes also may depend on specifics of how this idea is implemented in practice. For example, material information may be effectively concealed in a flood of data, as alluded to previously.²⁰⁰ There may be a role for policy guidance to assure that the interests of investors and the functioning of markets are actually served, rather than hindered. A related question is whether the traditional current periodic reporting requirements and Form 8-K disclosure regime would be rendered obsolete by a wholesale move of financial and operating disclosures to blockchain applications. This is a more radical change and thus would require significant study and thought.

Second, our encouragement of taking a proactive approach assumes that the technology and its adoption and use is fundamentally governable. Again, this is notwithstanding the prognostications of techno-enthusiasts and blockchain application evangelists, some of whom see an eroding role for large central authorities (especially in contexts in which they create inefficiencies and charge for their role as verifiers of records).²⁰¹ No doubt this might be a welcomed development to anyone who has experienced the delay and paid the fees necessary to transfer money internationally or to engage in other activities that require significant intermediation.

200. *See supra* Section II.C.2.b.

201. As the co-founder and CEO of VALR, a cryptocurrency platform, stated:

We’ve been told that blockchain technology will get rid of the need for trust in the world. We won’t have to trust corrupt governments, greedy corporations or rigged electoral systems. Everything from deeds offices to supply chains to voting systems to identity will be revolutionized, ensuring we never have to trust another untrustworthy human being, institution or government ever again.

This is a pipe dream that is unsubstantiated and misleading.

Farzam Ehsani, *The False Promise Blockchains will Revolutionize Real-World Assets*, COINDESK (Jan. 5, 2019), <https://www.coindesk.com/the-false-promise-blockchains-will-revolutionize-real-world-assets>.

However, we believe it is instructive to remember that some similarly predicted a sovereign-free Internet in the 1990s that would empower individuals.²⁰² Instead, the Internet became commercialized (resulting in several of the world's largest private fortunes) and, especially when coupled with smartphones, a pervasive tool of government and corporate surveillance and manipulation.²⁰³ Similarly, it would be naïve to believe that blockchain-enabled applications will inevitably lead to the downfall of centralized public and private sector power.²⁰⁴ To borrow Kai-Fu Lee's conclusions after many years on the frontlines of advancing artificial intelligence, human norms can and must be applied through public policy to the regulation of the deployment and use of technology.²⁰⁵

This leads us to a final reflection on conceptualizing the role of attorneys in the blockchain era as including a vital mediating function.²⁰⁶ While we do not all need to become programmers, and while some legal professionals' roles could be automated,²⁰⁷ there is a key higher-order function that attorneys should appreciate and embrace. That role is to better understand the human values and interests of clients and other stakeholders and, in the words of Nick Szabo, to help translate the “wet code” of human norms into the “dry code” of software.²⁰⁸ This also entails helping clients understand what encoded rules are irrevocable, what consequences might be self-executing, and various contingencies—preferably before adoption decisions are made.

Rather than obviating the need for attorneys, blockchain adoption in the context of corporate governance raises the stakes for and potential

202. See Timothy B. Lee, *Is Bitcoin a Joke? People Thought that About the Internet Too*, VOX (June 30, 2014), <https://www.vox.com/2014/6/30/5839436/marc-andreessen-on-bitcoin> (noting an early criticism of the internet as being decentralized and that businesses would not trust it).

203. See *id.*; see generally Jo Jung, *What the Internet Used to Look Like—And What it Says About Society*, INDEPENDENT (Sept. 12, 2018), <https://www.independent.co.uk/life-style/gadgets-and-tech/features/internet-society-meaning-past-wed-design-fashion-belief-a8531706.html> (noting the history of website design).

204. See Ehsani, *supra* note 201.

205. See generally KAI-FU LEE, *MY JOURNEY INTO AI: THE STORY BEHIND THE MAN WHO HELPED LAUNCH 5 AI COMPANIES WORTH \$25 BILLION* (2018) (autobiographically making this and other related points).

206. See Sulkowski, *supra* note 16, at 341–44.

207. See Jeffrey Unger, *How Technology and Automation Enable Lawyers to Deliver Personalized Services*, FORBES (Nov. 16, 2016), <https://www.forbes.com/sites/forbeslegalcouncil/2016/11/16/how-technology-and-automation-enable-lawyers-to-deliver-personalized-service/#4d8ce97f5a6a> (detailing how lawyers can automate processes to spend more time with clients).

208. See Nick Szabo, *Wet Code and Dry*, UNENUMERATED (Aug. 24, 2008, 2:51 PM), <http://unenumerated.blogspot.com/2006/11/wet-code-and-dry.html>.

value of technologically and operationally astute legal professionals and policy-makers.²⁰⁹ “Lawyers will play a key role other than coding.”²¹⁰ For scholars, it also creates an opportunity to explore and explain the issues and preferable approaches to attorneys, legislators, regulators, and judges who eventually will need to plan for implementation and resolve disputes.

IV. CONCLUSION

Blockchain, as a record-keeping technology, has the potential to fundamentally alter significant aspects of corporate governance—in particular, those involving data-tracking or communication.²¹¹ In the view of many, blockchain-based information-tracking is more immediate, transparent, and credible than alternatives involving a centralized point of control. If a firm utilizes a public blockchain, it can be more transparent to those outside the firm as well.

For purposes of this article, we defined corporate governance broadly and then examined certain practices specifically.²¹² We discussed blockchain’s foreseeable impacts on shareholder recordkeeping and voting, insider trading, and disclosure, as well as related legal questions.²¹³ In some cases, existing rules and principles can be applied to these new contexts, and we can divine issues and arrive at reasonable guesses as to legal conclusions. In other cases, our application of existing rules and principles to foreseeable scenarios leads to questions rather than answers and the realization that there may be legal lacunae that policymakers may want to address proactively (and, absent clarifications, that judges may need to prepare to address retroactively in the context of disputes).

Based on this analysis of specific scenarios, we identified generalizable observations and meta-themes for attorneys and the practice of law in the nascent context of blockchain-enabled corporate governance.²¹⁴ We arrived at several items of guidance.

209. See generally Olga V. Mack, *From the Bar to Blockchain: Why Lawyers Should Consider Joining the Blockchain Industry*, ABOVE THE L. (Jul. 30, 2018), <https://abovethelaw.com/2018/07/from-the-bar-to-blockchain-why-lawyers-should-consider-joining-the-blockchain-industry/> (summarizing the entry of and benefits for lawyers practicing in the blockchain arena).

210. Dennis Kennedy, *Thinking Smartly About Smart Contracts: Lawyers Should Get A Jump-Start on Contributing to This Emerging Technology*, 44 LAW PRAC. 56, 59 (Jan./Feb. 2018).

211. See *supra* Part I.

212. See *supra* Part II.

213. See *supra* Parts I, II.

214. See *supra* Part III.

First, it behooves attorneys not only to stay updated about the state of applicable law and relevant interpretations, but also to expand their scope of awareness to include technological and operational astuteness.

Second, in both the context of advising firm management and public policy-making, it is prudent to be proactive.

In representing business clients, counsel have a critical role in thinking through all the implications of moving any governance function or process to a blockchain-based platform. It is especially important to help clients see, consider, and appreciate certain irrevocable consequences and legal risks, as well as potential opportunities. In the realm of policy-making and rule interpretation, anyone engaged in the practice, administration, scholarship, or making of law has a role to play in researching, pondering, discussing, and proposing policy solutions in the context of ambiguities. This will create more certainty for markets, market participants, and society as a whole.

Finally, we arrived at a conceptual reframing that has been gaining ground for several years: far from obsolescence, the role of lawyers is going to evolve to include a type of translation function—consulting with clients and others to better comprehend interests, goals, and principles and to assist in transforming these human norms and values into software code, such that its deployment and use serve our ends, rather than vice versa. This also impacts the job of legal educators and law schools. “While blockchain-centered legal jobs of the future will be the centerpiece of any law school reform agenda, the future of non-blockchain-centered legal employment is equally important.”²¹⁵ Based on the observations we make here, there undoubtedly will be a growing need for lawyers who can address blockchain issues relating to corporate governance.

215. Mark Fenwick et. al., *Legal Education in the Blockchain Revolution*, 20 *VAND. J. ENT. & TECH. L.* 351, 382–83 (2017).