
INDUSTRY 4.0 ERA TECHNOLOGY (AI, BIG DATA, BLOCKCHAIN, DAO): WHY THE LAW NEEDS NEW MEMES

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I. INTRODUCTION

The Fourth Industrial Revolution is disrupting the field of law, as evidenced by disputes over data ownership and privacy,¹ legal liability for Artificial Intelligence (AI),² and litigation on the issue of whether a gig economy worker is an independent contractor or an employee.³ In fact, the founder and CEO of the World Economic Forum, Klaus Schwab, has already derided the field of law, proclaiming that it is mired in the era of the Second Industrial Revolution.⁴

This essay extends an invitation to action, encouraging further research and policy-making to at least catch-up to—if not anticipate and be proactively ready for—emerging realities. This essay is part of a wider conversation which is inevitably evolving out of novel legal controversies. For example, who or what should a court hold accountable when a vehicle run by AI programmed by members of a Decentralized Autonomous Organization (DAO) hurts someone, and, if the members as individuals are—for whatever reason—judgment-proof,

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¹ See Bennett Cyphers et al., *Data Privacy Scandals and Public Policy Picking Up Speed: 2018 in Review*, ELECTRONIC FRONTIER FOUND. (Dec. 31, 2018), <https://www.eff.org/deeplinks/2018/12/data-privacy-scandals-and-public-policy-picking-speed-2018-year-review> [<https://perma.cc/S648-7QN5>]; see also Molly Wood, *Goodbye, 2018 — A Year of Data and Privacy Scandals*, MARKETPLACE (Dec. 31, 2018), <https://www.marketplace.org/2018/12/31/tech/goodbye-2018-year-data-privacy-scandals> [<https://perma.cc/6MX2-REG3>].

² See Emerging Technology from the arXiv, *When an AI Finally Kills Someone, Who Will Be Responsible?*, MIT TECH. REV. (Mar. 12, 2018), <https://www.technologyreview.com/s/610459/when-an-ai-finally-kills-someone-who-will-be-responsible> [<https://perma.cc/VSB5-LETQ>].

³ See Mike Kappel, *The End Of An Era? How The ABC Test Could Affect Your Use of Independent Contractors*, FORBES (Aug. 8, 2018, 9:10 AM), <https://www.forbes.com/sites/mikekappel/2018/08/08/the-end-of-an-era-how-the-abc-test-could-affect-your-use-of-independent-contractors/#32bbfc5d1f66> [<https://perma.cc/U7TW-7AEP>].

⁴ See Klaus Schwab, *The Fourth Industrial Revolution: What It Means, How to Respond*, WORLD ECON. FORUM (Jan. 14, 2016), <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond> [<https://perma.cc/CRF5-UWBR>].

can the AI itself be liable?⁵ Or can a court hold the DAO liable, making the organization pay like a human or a conventional business organization?⁶ More broadly, should ethical standards be “hardcoded” into automated processes of organizations, as blockchain-enabled smart contracts allow?⁷

This essay proceeds as follows. Section II clarifies some fundamental terminology. Section III then surveys the issues raised by the current wave of innovations. This Section delves into the legal issues—including prohibitions, what is permissible, and affirmative duties—that are relevant to the gathering, keeping, use, and transfer of data.⁸ Section IV identifies the challenge of defining the relationships and attendant obligations between individuals and entities in an era when technology enables interactions that do not fit neatly into preexisting categories.⁹ Finally, Section V highlights that—in their own way and yet in a related vein—AI, automation, and the advent of the DAO all raise fundamental questions about liability and legal personhood.¹⁰

Currently, Industry 4.0 era innovations impact norms related to information and interrelationships, and they will inevitably raise fundamental questions related to liability and legal personhood.¹¹ Section VI concludes by urging that those in the legal profession—academics, practicing attorneys, judges, and policy-makers—should become uncharacteristically proactive. This Section proposes that our world of legal constructs should not only keep up with the realities enabled by twenty-first century technologies but should also put guardrails on how they are deployed, steering their uses and outcomes to be consistent with sound public policy.¹²

⁵ See Emerging Technology from the arXiv, *AI Can Be Made Legally Accountable for Its Decisions*, MIT TECH. REV. (Nov. 15, 2017), <https://www.technologyreview.com/s/609495/ai-can-be-made-legally-accountable-for-its-decisions/> [<https://perma.cc/M4VJ-RBXL>] [hereinafter Emerging Technology from the arXiv, *AI Can Be Made Legally Accountable*].

⁶ See Stephen D. Palley, *How to Sue a Decentralized Autonomous Organization*, COINDESK (Mar. 20, 2016), <https://www.coindesk.com/how-to-sue-a-decentralized-autonomous-organization> [<https://perma.cc/VVU4-K9RJ>].

⁷ See generally Adam J. Sulkowski, *The Tao of DAO: Hardcoding Business Ethics on Blockchain*, 2 BUS. & FIN. L. REV. (forthcoming 2020) [hereinafter Sulkowski, *The Tao of Dao*].

⁸ See Rahul Telang, *A Privacy and Security Policy Infrastructure for Big Data*, 10 I/S: J.L. & POL'Y FOR INFO. SOC'Y 783, 783 (2015); Shawn M. Boyne, *Data Protection in the United States*, 66 AM. J. COMP. L. 299, 299 (2018).

⁹ See Saranicole A. Duaban, *Workers for On-Demand Businesses—Employees or Independent Contractors?*, FED. LAW., May 2016, at 8, 8; Julia Tomassetti, *Digital Platform Work as Interactive Service Work*, 22 EMP. RTS. & EMP. POL'Y J. 1, 4–5 (2018).

¹⁰ See Emerging Technology from the arXiv, *AI Can Be Made Legally Accountable*, *supra* note 5; Palley, *supra* note 6.

¹¹ See Laila Metjahic, *Deconstructing the DAO: The Need for Legal Recognition and the Application of Securities Laws to Decentralized Organizations*, 39 CARDOZO L. REV. 1533, 1536 (2018).

¹² Adam J. Sulkowski, *Blockchain, Business Supply Chains, Sustainability, and Law: The Future of Governance, Legal Frameworks, and Lawyers?*, 43 DEL. J. CORP. L. 303, 340–45 (2019); see also Joan MacLeod Heminway & Adam J. Sulkowski, *Blockchains, Corporate Governance, and the Lawyer's Role*, 65 WAYNE L. REV. 17, 22–23 (2019).

II. TERMINOLOGY: AI, BLOCKCHAIN, DAO, INDUSTRY 4.0

Before proceeding further, this Section provides a brief primer on the terminology that the remainder of this essay will use.

Artificial Intelligence (AI) is the simulation—or surpassing—of human intelligence processes by computer systems.¹³ It is used almost interchangeably with machine learning, which is defined as an application of AI to provide systems the ability to learn and improve from experience without human guidance.¹⁴ Familiar examples of AI in everyday life include using the voice recognition technology in cell phones and interfacing with digital assistants that speak back to us.¹⁵

Blockchain is a means of distributed record-keeping.¹⁶ This technology enables smart contracts, which are self-executing agreements.¹⁷ Manifesting the legal conceptualization of a corporation as a nexus of contracts, a DAO endeavors to replace the administrative structures of business organizations with—literally—a set of smart contracts that define each party’s relationship, rights, and duties.¹⁸ In other words, the outcome would be an organization of human individuals working together without the traditional administrative overhead, inefficiencies, and potential proclivities for self-dealing and corruption that come with having human managers allocating resources and directing employees.¹⁹

Industry 4.0 is the term coined to describe the changes to the manufacturing sector wrought by a combination of greater availability of data, AI, better human-virtual world interfacing, automation, and 3D printing.²⁰ While Industry 4.0 may have originally been intended to apply to the evolution of factories, the term has, in common parlance, started to serve as shorthand to describe the

¹³ See generally STUART J. RUSSELL & PETER NORVIG, *ARTIFICIAL INTELLIGENCE: A MODERN APPROACH* (3d ed. 2016); see also NILS J. NILSSON, *PRINCIPLES OF ARTIFICIAL INTELLIGENCE 1* (2014).

¹⁴ See generally Carbonell et al., *An Overview of Machine Learning*, in *MACHINE LEARNING: AN ARTIFICIAL INTELLIGENCE APPROACH 3*, 3–4 (Ryszard S. Michalski et al. eds., 2013).

¹⁵ See Will Knight, *Facial Recognition has to be Regulated to Protect the Public, Says AI Report*, MIT TECH. REV. (Dec. 6, 2018), <https://www.technologyreview.com/s/612552/facial-recognition-has-to-be-regulated-to-protect-the-public-says-ai-report/> [<https://perma.cc/Z5XH-P6VJ>]; The Manifest, *16 Examples of Artificial Intelligence (AI) in Your Everyday Life*, MEDIUM (Sep. 26, 2018), https://medium.com/@the_manifest/16-examples-of-artificial-intelligence-ai-in-your-everyday-life-655b2e6a49de [<https://perma.cc/7AXD-G5F5>].

¹⁶ MELANIE SWAN, *BLOCKCHAIN: BLUEPRINT FOR A NEW ECONOMY* x–xi (2015).

¹⁷ VITALIK BUTERIN, *ETHEREUM WHITE PAPER: A NEXT-GENERATION SMART CONTRACT & DECENTRALIZED APPLICATION PLATFORM 1* (2013), <https://pdfs.semanticscholar.org/0dbb/8a54ca5066b82fa086bbf5db4c54b947719a.pdf?ga=2.265248655.1414026395.1569282479-829218213.1569282479> [<https://perma.cc/CQ87-VMBZ>].

¹⁸ See Alex Norta, *Creation of Smart-Contracting Collaborations for Decentralized Autonomous Organizations*, in *PERSPECTIVES IN BUSINESS INFORMATICS RESEARCH 1*, 1–2 (Raimundas Matulevičius & Marlon Dumas eds., 2015).

¹⁹ See Palley, *supra* note 7.

²⁰ See Erik Hofmann & Marco Rüsç, *Industry 4.0 and the Current Status as Well as Future Prospects on Logistics*, 89 *COMPUTERS INDUSTRY* 23, 24–25 (2017).

current era of simultaneous and convergent qualitative leaps in the development of various technologies that impact many fields of human endeavors.²¹ For example, beyond manufacturing, blockchain-based cryptocurrencies have attracted the interest of both speculators and monetary experts, including the Managing Director and Chairwoman of the International Monetary Fund, Christine Lagarde.²² Because it is a record-keeping technology, blockchain-based records are clearly relevant in several legal contexts, becoming explicitly recognized as legitimate in a growing numbering of states²³ including, for example, Arizona²⁴ and Delaware.²⁵

Further, as illustrated by Uber, continuous geolocation, monitoring, and interfacing with digital platforms has enabled the gig economy phenomenon.²⁶ In the context of leisure and recreation, human-virtual world interaction has led to massive growth of gaming in terms of global reach and human hours spent in artificial worlds.²⁷ It is difficult to imagine a field of human activity these digital technology trends will not affect.²⁸ Yet, aside from literature focused upon blockchain-based cryptocurrencies, there is a comparative lack of legal scholarship dealing with the full range (and combinations) of the technologies described above (especially considering the scale and variety of disruptive implications for businesses, governments, daily lives, the practice of law, and the profound existential questions at stake).

III. DATA: DUTIES, PROHIBITIONS, AND WHAT IS PERMISSIBLE

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²¹ “It is the fusion of these technologies [AI, big data, Internet of Things, bioinformatics] and their interaction across the physical, digital and biological domains that make the fourth industrial revolution fundamentally different from previous revolutions . . . diffusing much faster and more widely than in previous ones.” KLAUS SCHWAB, *THE FOURTH INDUSTRIAL REVOLUTION* 7–8 (2017).

²² See generally Christine Lagarde, *Central Banking and Fintech: A Brave New World*, INNOVATIONS: TECH., GOVERNANCE, GLOBALIZATION, Summer–Fall 2018, at 4.

²³ For the status of various state-level initiatives to recognize blockchain records, see Heather Morton, *Blockchain 2019 Legislation*, NAT’L CONF. ST. LEGISLATURES (July 23, 2019), <http://www.ncsl.org/research/financial-services-and-commerce/blockchain-2019-legislation.aspx> [https://perma.cc/XM2Z-B6B8].

²⁴ ARIZ. REV. STAT. ANN. § 44-7061 (2017).

²⁵ DEL. CODE ANN. tit. 8, § 224 (West 2017) (amending to allow the use of distributed ledger technology to create and maintain corporate records).

²⁶ Kate Abrosimova, *Building an App Like Uber: What Is the Uber App Made from?*, MEDIUM (May 22, 2014), <https://medium.com/yalantis-mobile/uber-underlying-technologies-and-how-it-actually-works-526f55b37c6f> [https://perma.cc/K7F7-4V3P].

²⁷ See Research & Markets, *Global Virtual Reality Gaming Market 2018-2023: Market Expected to Grow at a CAGR of 26%*, PR NEWswire (Sept. 10, 2018, 9:15 PM), <https://www.prnewswire.com/news-releases/global-virtual-reality-gaming-market-2018-2023-market-expected-to-grow-at-a-cagr-of-26-300709527.html> [https://perma.cc/U3UK-4TXW].

²⁸ Ron Miller, *Technology is Disrupting Everything*, TECHCRUNCH (Mar. 16, 2016, 10:04 AM), <https://techcrunch.com/2016/03/16/technology-is-disrupting-everything/> [https://perma.cc/4FUU-CXAM].

Business School, explains that we are in the era of surveillance capitalism.²⁹ Data gathering is constant and ubiquitous, and data gatherers leverage this information to both predict and influence us.³⁰ In fact, some consider data to be the oil of the 21st-century capitalism.³¹

Whether a data collection and dissemination scandal involves the government,³² the private sector,³³ or both,³⁴ it is hard to escape meta-questions about the optimal setting of boundaries and conditions for data gathering and the consequences for misuse. For example, what data can, must, or must not be gathered on customers, employees, other stakeholders, and impacts on the environment? There are already negative potential legal consequences for *not* performing criminal background checks when hiring for certain positions³⁵ or not keeping records related to workplace health and safety.³⁶ Regulation-by-disclosure³⁷ is an effective tool for bringing about desirable public policy ends,³⁸ alongside being an effective tool of management.³⁹ In another realm, data

²⁹ See generally SHOSHANA ZUBOFF, *THE AGE OF SURVEILLANCE CAPITALISM: THE FIGHT FOR A HUMAN FUTURE AT THE NEW FRONTIER OF POWER* 8 (2019).

³⁰ See *id.*

³¹ See KAI-FU LEE, *AI SUPERPOWERS: CHINA, SILICON VALLEY, AND THE NEW WORLD ORDER* 50 (2018).

³² See, e.g., Barton Gellman & Laura Poitras, *U.S., British Intelligence Mining Data from Nine U.S. Internet Companies in Broad Secret Program*, WASH. POST (June 7, 2013), https://www.washingtonpost.com/investigations/us-intelligence-mining-data-from-nine-us-internet-companies-in-broad-secret-program/2013/06/06/3a0c0da8-cebf-11e2-8845-d970ccb04497_story.html?noredirect=on&utm_term=.91a93298b0db [<https://perma.cc/QA2Z-ZGP5>].

³³ See Alexis C. Madrigal, *What We Know About Facebook's Latest Data Scandal*, ATLANTIC (June 4, 2018), <https://www.theatlantic.com/technology/archive/2018/06/what-we-know-about-facebooks-latest-data-scandal/561992/> [<https://perma.cc/JBK7-VDYU>]; see also James Sanders & Dan Patterson, *Facebook Data Privacy Scandal: A Cheat Sheet Tech Republic*, TECH REPUBLIC (Dec. 11, 2018, 10:52 AM), <https://www.techrepublic.com/article/facebook-data-privacy-scandal-a-cheat-sheet/> [<https://perma.cc/56AC-ESXQ>].

³⁴ See Lev Grossman, *Inside Apple CEO Tim Cook's Fight with the FBI*, TIME (Mar. 17, 2016), <http://time.com/4262480/tim-cook-apple-fbi-2/> [<https://perma.cc/DTQ8-FX33>].

³⁵ Patricia M. Harris & Kimberly S. Keller, *Ex-Offenders Need Not Apply: The Criminal Background Check in Hiring Decisions*, 21 J. CONTEMP. CRIM. JUS. 6, 8 (2005).

³⁶ See Helen F. Hiser, *Recent Updates in OSHA Reporting Requirements and Maximum Penalties*, 28 S.C. LAW. 16, 16 (2017).

³⁷ The mandatory disclosure of data on employment equity, safety, and environmental risk. See Jodi L. Short & Michael W. Toffel, *Making Self-Regulation More Than Merely Symbolic: The Critical Role of the Legal Environment*, 55 ADMIN. SCI. Q. 361, 362 (2010); see also Kathryn E. Durham-Hammer, *Left to Wonder: Reevaluating, Reforming, and Implementing the Emergency Planning and Community Right-to-Know Act of 1986*, 29 COLUM. J. ENVTL. L. 323, 325 (2004).

³⁸ See Adam J. Sulkowski, *City Sustainability Reporting: An Emerging and Desirable Legal Necessity*, 33 PACE ENVTL. L. REV. 278–79, 296–99 (2016) [hereinafter Sulkowski, *City Sustainability Reporting*].

³⁹ See Mustafa V. Uzumeri, *ISO 9000 and Other Metastandards: Principles for Management Practice?*, ACAD. MGMT. EXECUTIVE, Feb. 1997, at 21, 22–23.

availability is essential for green taxes⁴⁰ and proactive legal strategies.⁴¹ As the adage goes, “we manage what we measure.”⁴² However, what are the limits on gathering, keeping, requesting, and using data? Should data gathering be restricted, in light of existing evidence that the use of data and algorithms can result in unintended discrimination against disadvantaged demographics?⁴³ On the other hand, can governments even attempt to regulate in some arenas without requiring the collection, keeping, and sharing of relevant data?⁴⁴

Another fruitful stream of research involves financial reporting. Publicly traded corporations must disclose to investors information deemed to be material.⁴⁵ U.S. securities law defines the materiality principle by considering the expectations of reasonable investors.⁴⁶ As a result, it seems that what is considered material information could change based on evolving expectations of investors in the context of omnipresent and uninterrupted monitoring of information, including impacts on people and the environment.⁴⁷

IV. NEW RELATIONSHIPS

New technologies have led to new employment platforms, causing worker status to defy easy classification into existing categories. For example, the roles of people employed in the gig economy⁴⁸ may fit certain definitional criteria for being considered employees, yet these individuals arguably also match fundamental criteria to be considered independent contractors.⁴⁹ Which set of principles should a court therefore apply when an Uber driver demands the

⁴⁰ Mystica Alexander et al., *Sustainability & Tax Policy: Fixing a Patchwork of Policies with a Coherent Federal Framework*, 35 VA. ENVTL. L.J. 1, 56 (2016).

⁴¹ Gerlinde Berger-Walliser et al., *Using Proactive Legal Strategies for Corporate Environmental Sustainability*, 6 MICH. J. ENVTL. & ADMIN. L., 1, 28–29 (2017).

⁴² Adam J. Sulkowski & D. Steven White, *A Happiness Kuznets Curve? Using Model-Based Cluster Analysis to Group Countries Based on Happiness, Development, Income, and Carbon Emissions*, 18 ENV'T, DEV. & SUSTAINABILITY 1095, 1097 (2016).

⁴³ See Gideon Mann & Cathy O'Neil, *Hiring Algorithms Are Not Neutral*, HARV. BUS. REV. (Dec. 9, 2016), <https://hbr.org/2016/12/hiring-algorithms-are-not-neutral> [<https://perma.cc/7J64-NN6W>].

⁴⁴ See generally Maureen Giovannini, *What Gets Measured Gets Done: Achieving Results Through Diversity and Inclusion*, J. FOR QUALITY & PARTICIPATION, Winter 2004, at 21, 21; but 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 19 (2007) (articulating the perspective that the risk of potential liability based on existing common law principles ought to be enough to encourage companies to be more circumspect with their data systems).

⁴⁵ See Adam J. 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) [hereinafter Sulkowski & Waddock, *Beyond Sustainability Reporting*].

⁴⁶ *Id.* at 1070.

⁴⁷ See Sulkowski, *City Sustainability Reporting*, *supra* note 38, at 290.

⁴⁸ This is also described as the sharing, platform, or taking economy. See Ryan Calo & Alex Rosenblat, *The Taking Economy: Uber, Information, and Power*, 117 COLUM. L. REV. 1623, 1625 (2017).

⁴⁹ Miriam A. Cherry, *Beyond Misclassification: The Digital Transformation of Work*, 37 COMP. LAB. L. & POL'Y J. 577, 578 (2016).

health or disability benefits of an employee or negligently wounds or kills a pedestrian or even assaults a passenger?⁵⁰ Further, would entrepreneurs, workers, and society benefit from the creation of new employment categories?⁵¹ Do all of these stakeholders benefit from a *laissez-faire* approach to regulation, since some claim that it boosts the chances of discriminated-against groups finding opportunities to legally trade their labor for value,⁵² or should new employment platforms be regulated or banned, based on equally compelling evidence and arguments that they can function as tools of exploitation?⁵³

V. THE POWER OF ARTIFICES, SUCH AS CORPORATE PERSONHOOD

Any sustained coordinated action among people requires shared fictions.⁵⁴ Our imagined notions are given precise definition, enforceable authority, and impact physical reality through the use of law.⁵⁵ For example, we collectively imagine that corporations, such as Google, exist as legal persons⁵⁶ with the only quibble being that some jurists have preferred to describe corporate legal personhood using variations on the word “artifice” as opposed to “fiction.”⁵⁷ These fictions extend to imaginary handcuffs—for example, fiduciary duties—that require actions and loyalties of those in contractual relations with Google. Our shared mental models for understanding reality and legal artifices for maintaining or creating new realities are an example of memes.⁵⁸

To further illustrate and appreciate the power of legal fictions, it is valuable to briefly contemplate the aptness of the metaphors used above. In the United

⁵⁰ See Duaban, *supra* note 9.

⁵¹ See Miriam A. Cherry & Antonio Aloisi, “*Dependent Contractors*” in *the Gig Economy: A Comparative Approach*, 66 AM. U. L. REV. 635, 637 (2017).

⁵² The employment terms that result from a gig economy platform have been shown to be fairer than those arising in conventional contexts. Annabel Denham, *The Gig Economy Is the Future and Women Can Lead the Charge*, TELEGRAPH (Apr. 11, 2018, 7:00 AM), <https://www.telegraph.co.uk/women/business/everyone-benefiting-gig-economy-apart-women/> [https://perma.cc/4LEM-U8SM].

⁵³ See Niels van Doorn, *Platform Labor: On the Gendered and Racialized Exploitation of Low-Income Service Work in the ‘On-Demand’ Economy*, 20 INFO., COMM. & SOC’Y 898, 904–05 (2017).

⁵⁴ See YUVAL N. HARARI, *HOMO DEUS: A BRIEF HISTORY OF TOMORROW* 150–52 (2017).

⁵⁵ Examples include the rights and duties of public and private sector entities and the notions of property and jurisdiction. As will be explained shortly, shared fictions can have enormous significance over lives in physical reality.

⁵⁶ See John Dewey, *The Historic Background of Corporate Legal Personality*, 35 YALE L.J. 655, 669 (1926).

⁵⁷ See Arthur W. Machen, Jr., *Corporate Personality*, 24 HARV. L. REV. 253, 256 (1911).

⁵⁸ The author is among those who have previously noted the power of memes in management and in solving civilizational existential problems. See Adam J. Sulkowski & Sandra Waddock, *Midas, Cassandra & the Buddha: Curing Delusional Growth Myopia by Focusing on Thriving*, J. OF CORP. CITIZENSHIP, Mar. 2016, at 15, 15 [hereinafter Sulkowski & Waddock, *Midas, Cassandra & the Buddha*]. The term *meme* was introduced by Richard Dawkins in 1976 to denote a replicated unit of cultural transmission. RICHARD DAWKINS, *THE SELFISH GENE* 192 (2d ed. 1989).

States, the country with the largest incarcerated population,⁵⁹ the handcuffs are not entirely metaphorical in the context of our private prison industry, inasmuch as the imagined legal duty of an executive to maximize shareholder value lead to the very real sale of an inmate's labor, which is exempted from minimum wages standards.⁶⁰ The law allows the inmate to be profitably caged because a court may have concluded, for example, that the individual sold a cannabis plant, an act that people (depending on the state) may have imagined to be criminal.⁶¹ At present, political donations are imagined to be constitutionally protected free speech. So, a lucrative prison corporation is currently empowered to influence lawmakers to continually criminalize the possession of certain vegetation as part of its effort to increase its revenue by forcibly warehousing more people.⁶²

The observations above concern classic legal questions and quandaries related to our imaginary friends and sometimes masters: business organizations.⁶³ First, assuming conventional structures using existing tools, is it possible to guide these imaginary beasts to behave better, despite the incentive of their nominal leaders to harm people and the environment as a side effect of profit-seeking?⁶⁴ Is it a means to "take the blinders off" these imaginary beings and help decision-makers take into account real risks and opportunities connected to people and ecosystems through enhanced gathering and publication of data on societal and environmental impacts?⁶⁵ Would deeper and more comprehensive data monitoring by business organizations that explicitly co-prioritize societal and environment stewardship,⁶⁶ enabled by more inclusive

⁵⁹ This includes by percentage and in absolute numbers. Drew Kann, *5 Facts Behind America's High Incarceration Rate*, CNN (Apr. 21, 2019, 2:50 PM), <https://www.cnn.com/2018/06/28/us/mass-incarceration-five-key-facts/index.html> [<https://perma.cc/Z8FZ-9ED8>].

⁶⁰ Jaron Browne, *Rooted in Slavery: Prison Labor Exploitation*, RACE, POVERTY & ENV'T, Spring 2010, at 78, 80.

⁶¹ Depending on the place and context, the law still imagines marijuana as forbidden; DISA Global Solution provides a regularly updated map and tables of states where marijuana is fully legal, partially legalized, or fully illegal. See *Map of Marijuana Legality by State*, DISA GLOBAL SOLUTIONS, <https://disa.com/map-of-marijuana-legality-by-state> (last updated Oct. 2019) [<https://perma.cc/6WJ4-73VZ>].

⁶² R. W. Anderson, *Marijuana Prohibition and Rent Seeking*, 34 HOMO OECONOMICUS 33, 44 (2017).

⁶³ William M. Geldart, *Legal Personality*, 27 L.Q. REV. 90, 93–94 (1911). It bears pointing out that legal personhood is not limited to organizations established for the purpose of making profit.

⁶⁴ See generally Adam J. Sulkowski, *Ultra Vires Statutes: Alive, Kicking, and a Means of Circumventing the Scalia Standing Gauntlet in Environmental Litigation*, 24 J. ENVTL. L. & LITIG. 75 (2009); Adam J. Sulkowski & Kent Greenfield, *A Bridle, a Prod, and a Big Stick: An Evaluation of Class Actions, Shareholder Proposals, and the Ultra Vires Doctrine as Methods for Controlling Corporate Behavior*, 79 ST. JOHN'S L. REV. 929, 930 (2005).

⁶⁵ See Sulkowski & Waddock, *Beyond Sustainability Reporting*, *supra* note 45, at 1079–80.

⁶⁶ For example, benefit corporations. See Frank Tantone, *Keeping the "Benefit" in Benefit Corporations: How and Why New York State Should Continue to Foster and Develop Benefit Corporation Legislation*, 30 J. CIV. RTS. & ECON. DEV. 215, 219 (2017); see also *What Is a Benefit Corporation?*, BENEFIT CORP., <https://benefitcorp.net/what-is-a-benefit-corporation> [<https://perma.cc/D7Z9-2KLW>].

managerial practices⁶⁷ and new certifications,⁶⁸ help create artificial beings that create more value and less harm?⁶⁹ Especially, if “first, do no harm” or “do not be evil” or “create net zero harm to the environment” were literally encoded into the rules of a DAO, would we at last have an artificial legal person with the DNA of a harmless and good neighbor,⁷⁰ rather than that of what has been characterized as a psychopath?⁷¹

However, ultimately, the following is perhaps one of the most profound legal and public policy questions related to the creation of DAOs: in replacing human administration by encoding values, duties, and consequences electronically, could we create an organization that is “hard-coded” to not break the law and/or not to harm?⁷² If a nexus of self-executing smart contracts replaced conventional corporate hierarchies and overhead,⁷³ it may have the effect of eliminating attendant inefficiencies, limitations, susceptibilities to corruption, self-dealing, and costs. The more that values and rules are entrusted to code, the more that algorithms are entrusted to bring our mental models of

⁶⁷ Such as the German legal expectation of labor representation on boards. *See generally* Justin Fox, *Why German Corporate Boards Include Workers*, BLOOMBERG OPINION (Aug. 24, 2018, 9:00 AM), <https://www.bloomberg.com/opinion/articles/2018-08-24/why-german-corporate-boards-include-workers-for-co-determination> [<https://perma.cc/8AYF-QN57>]. Another example of an inclusive approach to management is holocracy. Ethan Bernstein et al., *Beyond the Holacracy Hype*, HARV. BUS. REV., July–Aug. 2016, at 40, <https://hbr.org/2016/07/beyond-the-holacracy-hype> [<https://perma.cc/PV5G-Q73L>].

⁶⁸ The B Corp movement is one example of a relatively new certification. *See About B Corps*, CERTIFIED B CORP., <https://bcorporation.net/about-b-corps> [<https://perma.cc/4NAV-XHPF>]. Alternatively, the Principles of Responsible Management Education (PRME) can provide a source of guidance in running a business ethically. *See* Adam J. Sulkowski, *Rodolfo's Casa Caribe in Cuba: Business, Law, and Ethics of Investing in a Start-up in Havana*, 34 J. LEGAL STUDIES EDUC. 127, 152–54 (2017).

⁶⁹ For examples of research on the practice and impacts of data publication on the functioning of businesses, *see generally* Christopher J. Hughey & Adam J. Sulkowski, *More Disclosure = Better CSR Reputation? An Examination of CSR Reputation Leaders and Laggards in the Global Oil & Gas Industry*, 12 J. ACAD. BUS. & ECON. 24 (2012); Jia Wu et al., *Environmental Disclosure, Firm Performance, and Firm Characteristics: An Analysis of S&P 100 Firms*, 10 J. ACAD. BUS. & ECON. 73 (2010); Lu Wei et al., *The Relationships between Environmental Management, Firm Value and Other Firm Attributes: Evidence from Chinese Manufacturing Industry*, 10 INT'L J. ENV'T & SUSTAINABLE DEV. 78 (2011); Cassandra Walsh & Adam J. Sulkowski, *A Greener Company Makes for Happier Employees More So Than Does a More Valuable One: A Regression Analysis of Employee Satisfaction, Perceived Environmental Performance and Firm Financial Value*, 11 INTERDISC. ENVTL. REV. 274 (2010); Adam J. Sulkowski, *The Growing Trend of Voluntary Corporate Responsibility Disclosure and Its Implications for Real Estate Attorneys*, 38 REAL EST. L.J. 4, 475 (2010); Adam J. Sulkowski & D. Steven White, *Financial Performance, Pollution Measures, and the Propensity to Use Corporate Responsibility Reporting: Implications for Business and Legal Scholarship*, 21 COLO. J. INT'L ENVTL. L. & POL'Y 491 (2010); Adam J. Sulkowski et al., *Corporate Responsibility Reporting in China, India, Japan, and the West: One Mantra Does Not Fit All*, 42 NEW ENG. L. REV. 787 (2008).

⁷⁰ *See* Sulkowski, *The Tao of DAO*, *supra* note 8 (manuscript at 4).

⁷¹ *See* JOEL BAKAN, *THE CORPORATION: THE PATHOLOGICAL PURSUIT OF PROFIT AND POWER* 135 (2004).

⁷² *See* Sulkowski, *The Tao of DAO*, *supra* note 8 (manuscript at 4).

⁷³ *See id.*

what “ought to be” into reality.⁷⁴ Technologies for gathering and processing data are giving algorithms near omniscience of our daily lives, and, with the advent of the Internet of Things, could be given omnipotence in some contexts, such as controlling networked autonomous vehicles in the context of transportation.⁷⁵ Relating back to laws concerning data, making policy necessitates the prioritization of interests and impacts, including the rights and duties of people and entities. This in turn will require deciding what data can—or must or must not be—tracked, acted upon, or disclosed.

Regardless of forms and structures of business—even with humans in C-suites still nominally in control of decisions—could plans and actions be made in a way that considers input and impact data related to people and ecosystems, such as to enable better management of organizations, and better public policy outcomes?⁷⁶ Arabesque, CSRHub, and Datamaran hope to do so by aggregating and digesting societal and environmental data so that stakeholders and business leaders can consume, understand, and act upon it.⁷⁷

The academic community has also noted the potential of Industry 4.0 to improve environmental efficiency.⁷⁸ There is no doubt, practically by definition, that enhanced measurement and use of data is a *sine qua non*, if organizations and, collectively, civilization are to achieve net zero harm to natural life systems,⁷⁹ much less restorative impacts on society and ecosystems.⁸⁰

Yet, so far, our technological tools alone have not encouraged us to solve problems, even as solutions seem to abound.⁸¹ Rather, the deliberate and shared imagination of what ought to be must be realized using the tools of our discipline.⁸² A shared vision of what ought to be is in turn predicated upon our shared models, memes, and artifices for understanding and creating reality.⁸³ Yet our models and memes—our simplified and shared abstractions of reality—can

⁷⁴ Put another way, this phenomenon has been described as translating the “wet code” of human norms into the “dry code” of computer language. Nick Szabo, *Wet Code and Dry*, UNENUMERATED (Aug. 24, 2008, 2:51 PM), <http://unenumerated.blogspot.com/2006/11/wet-code-and-dry.html>[<https://perma.cc/B8QB-YRMC>].

⁷⁵ See HARARI, *supra* note 54, at 314–15 (2017).

⁷⁶ See Adam J. Sulkowski et al., *Shake Your Stakeholder: Firms Leading Engagement to Cocreate Sustainable Value*, 31 ORG. & ENV'T 223, 223–24 (2018); see also Raquel Antolín-López et al., *Deconstructing Corporate Sustainability: A Comparison of Stakeholder Metrics*, J. CLEANER PRODUCTION, Nov. 2016, at 5, 13.

⁷⁷ Adam J. Sulkowski, *20 Years Ago He Gave Cannibals Forks. Now John Asks: Where's the Disruption?*, HUFFPOST (July 10, 2017, 9:30 AM), https://www.huffpost.com/entry/20-years-ago-he-gave-cannibals-forks-now-john-asks_b_59637fabe4b085e766b51450 [<https://perma.cc/ASM6-6QRJ>].

⁷⁸ E.g., Tim Stock & Guenther Seliger, *Opportunities of Sustainable Manufacturing in Industry 4.0*, 40 PROCEDIA CIRP 536, 540 (2016).

⁷⁹ See JOHN ELKINGTON, *THE ZERONAUTS: BREAKING THE SUSTAINABILITY BARRIER* 26 (2012).

⁸⁰ See GUNTER PAULI, *THE BLUE ECONOMY 3.0: THE MARRIAGE OF SCIENCE, INNOVATION AND ENTREPRENEURSHIP CREATES A NEW BUSINESS MODEL THAT TRANSFORMS SOCIETY* 2–3 (2017).

⁸¹ See *id.*

⁸² See Sulkowski & Waddock, *Midas, Cassandra & the Buddha*, *supra* note 58, at 34.

⁸³ See *id.* at 38–39.

vary depending on experiences. It is in the crucible of political debates that we arrive at an adequately popular shared understanding to then construct the binding rules and artifices specified in our laws. This means lawyers and legal scholars need to be proactive in the public conversations about reality-changing technologies.

VI. CONCLUSION

As previously discussed, Industry 4.0 is the term coined to describe current changes in manufacturing, begging at least three questions: (1) is the term broad enough to encompass all the technological changes we are experiencing, (2) are we truly in the era of the Fourth Industrial Revolution, and (3) what is the role of law and policy—and scholars and practitioners of governance and regulation—in this era?

Perhaps it is more accurate to say that humanity might be on the cusp of the beginning of Society Version 2.0.⁸⁴ However, we have not broken past some key physical realities and societal norms—what we might call Society 1.0—begat by the First Industrial Revolution, as explained below.

First, current impacts of technological changes are not limited to the manufacturing sector. Technological disruptions and resulting disputes extend to services, finance, daily life, non-manufacturing employment, entertainment, and public sectors.

Second, regarding physical realities and societal norms tying us to the First Industrial Revolution, our economy is still primarily (a) fossil-powered,⁸⁵ (b) based on a wasteful, linear supply chain—a take-make-waste model that cannot last,⁸⁶ (c) consumerism-based,⁸⁷ and (d) defined by man-made, sometimes deadly, and unsustainable inequalities.⁸⁸ Together, these four attributes are arguably the defining design principles of Society 1.0 and a consequence of the First Industrial Revolution.

⁸⁴ Society 2.0 will be further defined below. The term has been used before in different contexts, including business, academia, and a U.S. State Department initiative. *See, e.g.,* Zack Brisson, *Society 2.0*, REBOOT (Jan. 24, 2011), <https://reboot.org/2011/01/24/society-2-0/> [<https://perma.cc/ALC7-FRSW>].

⁸⁵ *Global Energy Demand Grew by 2.1% in 2017, and Carbon Emissions Rose for the First Time Since 2014*, INT'L ENERGY AGENCY (Mar. 22, 2018), <https://www.iea.org/newsroom/news/2018/march/global-energy-demand-grew-by-21-in-2017-and-carbon-emissions-rose-for-the-firs.html> [<https://perma.cc/MJ9P-8APN>].

⁸⁶ Rather than primarily based on cradle-to-cradle design and a circular flow of reused materials. *See Only 9% of the World's Plastic is Recycled*, ECONOMIST (Mar. 6, 2018), <https://www.economist.com/graphic-detail/2018/03/06/only-9-of-the-worlds-plastic-is-recycled> [<https://perma.cc/9RZJ-3LHZ>].

⁸⁷ For example, spending on consumer goods account for about 68 percent of U.S. economic activity. *See* Federal Reserve Economic Data (FRED), *Personal Consumption Expenditures/Gross Domestic Product*, FED. RES. BANK ST. LOUIS, <https://fred.stlouisfed.org/graph/?g=hh3> [<https://perma.cc/L3DH-LJYX>].

⁸⁸ *See* THOMAS PIKETTY, *CAPITAL IN THE TWENTY-FIRST CENTURY* 443–47 (Arthur Goldhammer trans., 2014) (2013).

Third, while the mix of current technological revolutions, including AI, big data, and blockchain, could help us get to Society 2.0,⁸⁹ it is not a 100 percent guarantee that it will break us free of 18th-, 19th-, and 20th- century errors and fundamental societal design flaws that cannot last, and which we as a society have grown to accept as normal. This will rather depend on shared understandings and collective human will, as made enforceable through law and governance. Without breaking our reliance on the four design features listed above⁹⁰ as (a)-(d), it is premature to say we have truly graduated past Dickensian elements of the First Industrial Revolution—not just in our manufacturing sector but as a society.

The “so what?” implication is that law, policy, and governance are arenas where we can—as individuals and working together with others in organizations and societies—decide on guardrails to help steer and nudge technology and markets to serve desired ends.⁹¹ New technologies on their own, like the Internet, can otherwise fail to bring the changes that idealists hope(d), and instead become dystopian tools of surveillance and influence, reinforcing problematic patterns and structures rather than advancing norms. Nor will any imaginable combination of new technologies guarantee how one deploys them, and to what end. The collectively imagined artifices expressed in law are vital for fostering opportunities, limiting risks, coordinating actions, setting boundaries, and determining consequences when one breaches limitations or inflicts harm. The deployment of technologies and outcomes will depend on humanity’s values, mindset, memes, and models of seeing the world⁹² and can be steered by the norms and rules that these support, as ultimately formalized in private and public law.⁹³

It is therefore imperative that legal scholars, practitioners, and policymakers proactively wrestle with “what if” questions related to current technological changes, especially as these scenarios continue to rapidly move from the domain of imaginative hypotheticals and into the realm of daily reality.

⁸⁹ The essay defines it here as a set of norms for human activity that are different than (a)-(d) listed above.

⁹⁰ See *supra* notes 85–88 and accompanying text.

⁹¹ See Lital Marom, *How Regulations Could Determine the Future of Innovation and the Gig Economy*, FORBES (Nov. 1, 2018, 07:30 AM), <https://www.forbes.com/sites/forbescoachescouncil/2018/11/01/how-regulations-will-determine-the-future-of-innovation-and-the-gig-economy/#35f5298e5f43> [<https://perma.cc/WF7Z-7CCW>].

⁹² See Sulkowski & Waddock, *Midas, Cassandra & the Buddha*, *supra* note 58, at 18; see also LEE, *supra* note 31.

⁹³ See Dewey, *supra* note 56, at 655.