# Legal Education in the Blockchain Revolution

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**ABSTRACT**

*The legal profession is one of the most disrupted sectors of the consulting industry today. The rise of Legal Technology, artificial intelligence, big data, machine learning, and, most importantly, blockchain technology is changing the practice of law. The sharing economy and platform companies challenge many of the traditional assumptions, doctrines, and concepts of law and governance—requiring litigators, judges, and regulators to adapt. Lawyers need to be equipped with the necessary skillsets to operate effectively in the new world of disruptive innovation in law. A more creative and innovative approach to educating lawyers for the twenty-first century is needed.*

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## I. INTRODUCTION

Law firms and in-house legal departments generally agree that Legal Technology (Legal Tech) impacts their future. Legal Tech startups are revolutionizing the legal industry by increasing the speed, accuracy, and performance of legal services or by replacing them altogether with new ideas.[1] Conferences, seminars, and professional magazines are dedicated to debating Legal Tech and its future implications for the legal industry. Some consensus exists among legal industry representatives that adopting Legal Tech helps law firms and legal departments improve client engagement and satisfaction.[2] Legal Tech allows clients to be more involved and provide feedback for legal services.

Yet, a closer look often reveals that law firms and legal departments themselves often struggle with innovation and the required level of innovating. While the leading firms often find innovative solutions to their clients' problems, even those firms are

1. Roland Vogl, *The Coming of Age of Legal Technology*, STAN. L. SCH. BLOGS: LEGAL AGGREGATE (Sept. 26, 2016), https://law.stanford.edu/2016/09/26/184188/ [https://perma.cc/SD7N-9HFL] ("In recent years, we have witnessed what can be best described as a legal tech start-up boom.").

2. *See* GEORGETOWN LAW CTR. FOR THE STUDY OF THE LEGAL PROFESSION & THOMSON REUTERS PEER MONITOR, 2016 REPORT ON THE STATE OF THE LEGAL MARKET 2 (2016), https://www.law.georgetown.edu/news/upload/2016_PM_GT_Final-Report.pdf [https://perma.cc/7VHN-ZCW8] ("The reactions of the law firm market to the rapidly changing environment in which firms operate parallels in some respects the story of Kodak. The current challenge in the legal market is not that firms are unaware of the threat posed to their current business model by the dramatic shift in the demands and expectations of their clients. Instead, as in the case of Kodak, the challenge is that firms are *choosing* not to act in response to the threat, even though they are fully aware of its ramifications."); *id.* at 13 ("While neither [the 2015 Altman Weil Law Firm Survey nor the 2015 Thomson Reuters Peer Monitor study] is conclusive, both strongly suggest that firms that are proactive in pursuing new strategies to meet the concerns and expectations of their clients are more likely to achieve stronger financial results than those firms that merely react to specific client demands."). The 2015 Thomson Reuters Peer Monitor study reported, among other things, the following major operational changes that upper-tier firms are implementing: "Use of software that allows firm lawyers to monitor the progress of matters, resource commitments, and budget status in real time on a matter basis" (71 percent); "[e]fficient and easily usable knowledge management system that provides lawyers with ready access to the firm's prior work product" (71 percent); "[d]ocument review software using predicitive coding based on a 'seed sample' of documents provided by firm lawyers" (71 percent); "[c]lient 'self-help' tools that allow clients to perform tasks directly that previously required active participation by firm lawyers" (29 percent); and "[u]se of e-learning systems" (65 percent). *Id.* at 13.

reluctant to fully embrace Legal Tech innovations. Only those firms and legal departments that believe Legal Tech could give them a significant competitive advantage have introduced the position of chief innovation officer (CIO) or a functional equivalent.[3] To receive an outside perspective, law firms sometimes appoint nonlawyers in those roles.[4] Their role is simple and straightforward: accelerate innovation and take it to the next level.

Key lawyer characteristics and lawyers' core skillsets in the existing legal education and regulatory framework are incompatible with the demands on lawyers of the twenty-first century. Traditionally educated lawyers are not usually known for key characteristics like agility and the capacity to innovate.[5] While some litigators in a common law system can achieve new legal grounds that could not have been accomplished by legislators in the same time frame,[6] the majority of lawyers in both civil and common law legal systems tend to be reactive, waiting for congressional or parliamentary action to provide new legal initiatives and legal

3. *See, e.g.*, Press Release, Bryan Cave LLP, Bryan Cave Announces Chief Innovation Officer (Apr. 16, 2015), https://www.bryancave.com/en/news-events/bryan-cave-announces-chief-innovation-officer.html [https://perma.cc/6SLZ-793R] ("The global law firm Bryan Cave LLP has named Denver-based Partner Katie DeBord Chief Innovation Officer."); *Baker Donelson Appoints William Painter as First Chief Innovation Officer*, LEGAL IT INSIDER (Sept. 27, 2016, 12:29 PM), https://www.legaltechnology.com/latest-news/baker-Donelson-appoints-first-chief-innovation-officer/ [https://perma.cc/2R3H-K74L].

4. *See, e.g.*, John Sterling, *Non-Lawyers: A Critical Success Factor for the Law Firm of the Future*, STERLING STRATEGIES (Dec. 5, 2013), http://sterlingstrat.com/non-lawyers-a-critical-success-factor-for-the-law-firm-of-the-future.html [https://perma.cc/R4ST-LTTG] ("More sophisticated law firms will be (are being) forced by clients and competitors to embrace technology, knowledge management, project management, lean process, and other management tools more common outside the legal industry. Successfully adopting any of those management tools requires attracting great people—well-trained, highly capable, hard-working and client focused—whose professional training is grounded in engineering, information technology, organizational psychology, management, and other fields."); Roy Strom, *The Rise of the Law Firm Management Corps*, CHI. LAW. (June 2015), http://www.chicagolawyermagazine.com/Archives/2015/06/Firm-Management-Corps-C-Suite.aspx [https://perma.cc/5536-CLQ4].

5. *See, e.g.*, RICHARD SUSSKIND, TOMORROW'S LAWYERS: AN INTRODUCTION TO YOUR FUTURE 53–54 (2013) ("I find that most traditional practices are not changing much. They are not yet adopting alternative methods of working. This is partly an issue of change management, in that law firms tend to be so busy serving clients and meeting their own financial targets that they allow little time for internal reform—it is not easy to change a wheel on a moving car. It is also, in part, a structural matter, because most law firms still aspire to the old textbook, broad-based pyramidic structure . . . whereas alternative methods of sourcing call for a revision if not rejection of that model.").

6. *See, e.g.*, Roe v. Wade, 410 U.S. 113 (1973); Brown v. Bd. of Educ., 347 U.S. 483 (1954); *see also* MacPherson v. Buick Motor Co., 111 N.E. 1050 (N.Y. 1916) (abolishing the doctrine of privity in tort law as a result of technological changes in products manufacturing).

guidance.[7] Key skills emphasized in the existing law school education include precision, in-depth analyses and syntheses, substantive legal knowledge, and policy considerations. Yet disruptive innovation in law[8] obviates many, if not most, of the traditional legal skills and characteristics of traditional lawyers. The American Bar Association (ABA), lawyers, and law schools cannot afford to ignore the new demands on lawyers of the twenty-first century.[9]

The legal profession is one of the most disrupted sectors of the consulting industry today.[10] Legal Tech, artificial intelligence (AI), machine learning, legal automation, big data applications, and blockchain technology are changing the way lawyers practice law.[11] The sharing economy challenges many of the traditional assumptions, doctrines, and concepts of law and governance.[12] Litigators, judges,

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7. *See, e.g.*, GUIDO CALABRESI, A COMMON LAW FOR THE AGE OF STATUTES 163 (1982) ("[C]ourts are not capable of writing speedily enough most of the rules that a modern society apparently needs.").

8. *See, e.g.*, Mark Fenwick, Wulf A. Kaal & Erik P.M. Vermeulen, *Regulation Tomorrow: What Happens When Technology Is Faster Than the Law?*, 6 AM. U. BUS. L. REV. (forthcoming 2017).

9. A minority of law schools, including Northwestern University's Pritzker School of Law and Chicago-Kent College of Law, have started to integrate law and technology into their curriculum or have opened centers and other initiatives to prepare students for demands placed on them by future clients. *See* Mark C. Palmer, *Legal Technology Has a Home in Law School Education*, 2CIVILITY BLOG (July 17, 2017), https://www.2civility.org/legal-technology-home-in-law-school-education/ [https://perma.cc/VFE9-5WV2] (describing how Northwestern and Chicago-Kent College of Law have invested in legal technology education). At the time of this Article's publication, the majority of law schools in the United States have engaged in marginal attempts to recognize the demands on twenty-first century lawyers. *See* Simon Canick, *Infusing Technology Skills into the Law School Curriculum*, 42 CAP. U. L. REV. 663, 668 (2014) ("Technology may be transforming legal practice, but that transformation has hardly changed the way law professors teach.").

10. *See, e.g.*, Jane Croft, *Artifical Intelligence Disrupting the Business of Law*, FIN. TIMES (Oct. 5, 2016), https://www.ft.com/content/5d96dd72-83eb-11e6-8897-2359a58ac7a5 [https://perma.cc/N7VV-ZRUM]; Bernard Marr, *How Big Data Is Disrupting Law Firms and the Legal Profession*, FORBES (Jan. 20, 2016, 2:31 AM), http://www.forbes.com/sites/bernardmarr/2016/01/20/how-big-data-is-disrupting-law-firms-and-the-legal-profession/#7836ac0a5ed6 [https://perma.cc/TFB6-L5ZK].

11. *See, e.g.*, Jane Croft, *More Than 100,000 Legal Roles to Become Automated*, FIN. TIMES (Mar. 15, 2016), https://www.ft.com/content/c8ef3f62-ea9c-11e5-888e-2eadd5fbc4a4 [https://perma.cc/H3GD-JT28]; Joe Dewey & Shawn Amuial, *Blockchain Technology Will Transform the Practice of Law*, BLOOMBERG L. (June 25, 2015), https://bol.bna.com/blockchain-technology-will-transform-the-practice-of-law/ [https://perma.cc/GCP8-MW22]; Marr, *supra* note 10.

12. *See* Benjamin G. Edelman & Damien Geradin, *Efficiencies and Regulatory Shortcuts: How Should We Regulate Companies Like Airbnb and Uber?*, 19 STAN. TECH. L. REV. 293, 294 (2016) (describing how modern technology is conflicting with some existing regulations); Abbey Stemler, *Regulation 2.0: The Marriage of New Governance and* Lex Informatica, 19 VAND. J. ENT. & TECH. L. 87, 112–13 (2016) (noting that, unlike traditional market structures, the sharing economy allows entrepreneurs to "outsourc[e] key business functions to intermediaries").

and regulators are forced to reconsider traditional approaches because of disruption via platform technologies.[13]

The challenges presented by Legal Tech, the new economy, and platform technologies justify a more creative and innovative approach for legal education in the twenty-first century. The curriculum of US law schools has only marginally changed over the last thirty or more years.[14] Yet as law firms increasingly embrace Legal Tech, the new economy, and platform technologies,[15] law schools of the twenty-first century will recognize the new reality and adapt to new demands. Such adaptation will likely entail incorporating AI into the classroom, adopting teaching by hypotheticals via AI, and introducing active machine learning in class, among many other possible innovations.[16] Curricular innovations may include coding for lawyers[17] and law and technology courses or course modules,[18] among many others. With

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13. *Id.*

14. *See* A. Benjamin Spencer, *The Law School Critique in Historical Perspective*, 69 WASH. & LEE L. REV. 1949, 2020, 2054 (2012).

15. *See, e.g.*, THOMAS S. CLAY & ERIC A. SEEGER, 2015 LAW FIRMS IN TRANSITION: AN ALTMAN WEIL FLASH SURVEY 55–56, 82–83 (2015), http://www.altmanweil.com/dir_docs/resource/1c789ef2-5cff-463a-863a-2248d23882a7_document.pdf [https://perma.cc/8NP7-XBAR]; INT'L LEGAL TECH. ASS'N & INSIDE LEGAL, 2016 ILTA/INSIDELEGAL TECHNOLOGY PURCHASING SURVEY 10 (2016), http://insidelegal.typepad.com/files/2016_ILTA_InsideLegal_Technology_Purchasing_Survey.pdf [https://perma.cc/MW9G-9AEK]; ROBERT HALF LEGAL, FUTURE LAW OFFICE: TECHNOLOGY'S TRANSFORMATION OF THE LEGAL FIELD (2013), https://www.roberthalf.com/sites/default/files/Media_Root/Images/RHL-PDFs/RHL_FLO_evolvingLegalProf.pdf [https://perma.cc/ZTR4-6Q9H]; Erin Coe, *Lawyers at Risk for Layoffs as Firms Embrace Technology*, LAW360 (June 25, 2013, 10:51 PM), https://www.law360.com/articles/452967/lawyers-at-risk-for-layoffs-as-firms-embrace-technology [https://perma.cc/CJ64-RSTT]. For background on the Legal Tech market, see Tom Wilson, *Legal Tech—Mapping Disruption*, MEDIUM (July 12, 2016), https://medium.com/@taw/legal-tech-mapping-disruption-3e6685fc4a5c#.eiufshoue [https://perma.cc/T3X6-6EVB].

16. *See* Kevin D. Ashley, *Teaching Law and Digital Age Legal Practice with an AI and Law Seminar*, 88 CHI.-KENT L. REV. 783, 816 (2013). It is conceivable that first-mover law schools that make the financial investment in AI, machine learning, and blockchain will have a comparative advantage vis-à-vis their peers, regardless of the ranking of such school, because the demand for lawyers adequately trained in these technologies is likely to increase sharply at a threshold point of law firm adoption.

17. Jason Krause, *Does Learning to Code Make You a Better Lawyer?*, A.B.A. J. (Sept. 2016), http://www.abajournal.com/magazine/article/lawyer_learning_code_zvenyach_ohm/?utm_content=buffer8442b&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer [https://perma.cc/V7J6-DXBS]; Chelsea Strauss, *How I Learned Coding in Law School*, SUFFOLK U. L. SCH.: STUDENT VOICES (May 6, 2016), http://theroadto1l.blogs.law.suffolk.edu/general/student-voices-how-i-learned-coding-in-law-school/ [https://perma.cc/7WK9-C7SS].

18. On September 29, 2016, the Florida Supreme Court announced that it would require a minimum of three technology-related continuing legal education (CLE) credits in each three-year CLE reporting cycle, thus increasing the number of mandatory CLE credits from thirty to thirty-three. *See In re* Amendments to Rules Regulating the Fla. Bar 4-1.1 and 6-10.3, No. SC16-574 (Fla. Sept. 29, 2016) (per curiam); Victor Li, *Florida Supreme Court Approves Mandatory Tech CLE Classes for Lawyers*, A.B.A. J. (Sept. 30, 2016, 8:45 AM),

curriculum changes, adaptation to changes in technology, and new teaching methodologies that lend themselves more to technological adaptation, the law schools of the twenty-first century should be able to equip twenty-first century lawyers with the necessary skillsets to operate effectively in the new world of disruptive innovation that is emerging so rapidly.[19]

This Article has five parts. After this introduction to the basic tenets of the Article, Part II introduces emerging changes in Legal Tech and their implications for lawyers. These changes include the emergence of virtual law firms, the changes mandated by the sharing economy, Legal Tech innovations in several areas of the law, and changes in the practice of law. After defining blockchain ledger technology and smart contracts, Part III evaluates the effects of blockchain technology's unprecedented decentralization and its disruptive effects on the practice of law and society at large. Part III also discusses the existing, but slowly resolving, limitations of blockchain ledger technology. Part IV then analyzes the implications of Legal Tech and blockchain ledger technology both for legal education more generally and for law schools' efforts in educating lawyers who are practice ready for the twenty-first century. Part V concludes.

## II. LEGAL TECH'S DISRUPTIVE LEGAL INNOVATION

Legal Tech has evolved from support systems to fully integrated and automated services for lawyers that increasingly disrupt the practice of law. Legal Tech can generally be defined as information technology services and software, as well as platforms and their applications.[20] Since the 1970s, with the invention of the first legal databases,[21] Legal Tech has supported existing ways of operating

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http://www.abajournal.com/news/article/florida_supreme_court_approves_mandatory_tech_cles_for_lawyers?utm_source=Newsletter+email+list&utm_campaign=0ae9e44e21-EMAIL_CAMPAIGN_2017_02_21&utm_medium=email&utm_term=0_28957849de-0ae9e44e21-[https://perma.cc/7QZM-EVJV].

19. As law schools adapt to Legal Tech, a learning process is likely to set in that allows a gradual, and in some cases more radical, appreciation of impending exponential changes and their meaning for the law school communities.

20. Wilson, *supra* note 15 ("Broadly speaking, the Legal Tech market covers companies (mostly startups) utilising technology to build products solving problems faced both by industry (i.e. law firms, corporates[,] etc.) and consumers related to legal services.").

21. William G. Harrington, *A Brief History of Computer-Assisted Legal Research*, 77 LAW LIBR. J. 543, 553 (1985) (noting that Lexis was introduced in 1973 and Westlaw was introduced in 1975). For a good overview of the online services and databases available to lawyers by the mid-1980s, see S. Blair Kauffman, *Electronic Databases in Legal Research: Beyond LEXIS and WESTLAW*, 13 RUTGERS COMPUTER & TECH. L.J. 73 (1987),

and practicing law. In fact, Legal Tech created the need for additional lawyers to evaluate the new legal materials that are made more quickly available and more easily accessible by technology. At first, Legal Tech made law firms and lawyers more efficient in performing their activities. Examples include automated billing, document storage, practice management, and accounting software.[22] In the early 2010s, Legal Tech became more advanced and started to include technology that assisted legal professionals in due diligence and e-discovery processes.[23] Since 2015, Legal Tech has continued to evolve in unprecedented ways. Multiple startup companies and their investors have started to capitalize on technologies, and their

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http://digitalcommons.law.yale.edu/fss_papers/1293/ [https://perma.cc/GZJ4-DALQ]. In 2004, Bloomberg began offering "B-Law." Lynn Foster & Bruce Kennedy, *Technological Developments in Legal Research*, 2 J. APP. PRAC. & PROCESS 275, 281–82 (2000) ("During the 1990s . . . [t]he Internet became another electronic medium for legal publishing. . . . [C]ourts themelves began to host their own free websites."); Michael Robak, *The Bloomberg Citator: A First Look at BLAW's Citation Function*, 13 AM. ASS'N L. LIBR. SPECTRUM 24, 24 (2009). In the mid-1990s, firms such as VersusLaw and Loislaw began to offer solo- and small-firm lawyers lower-cost (but less comprehensive) online alternatives to Westlaw and Lexis. Robert Ambrogi, *Shake-Up in Legal Research: Fastcase Acquires Loislaw from Wolters-Kluwer*, LAW SITES (Sept. 21, 2015), http://www.lawsitesblog.com/2015/09/shake-up-in-legal-research-fastcase-acquires-loislaw-from-wolters-kluwer.html [https://perma.cc/KUP2-5Y4X]. Those services were followed in 1999 by Fastcase and Casemaker, which are notable for offering their services free to members of subscribing state bar associations. Mary Whisner, *Getting to Know Fastcase*, 106 LAW LIBR. J. 473, 473–74, 473 n.2 (2014). HeinOnline launched in 2000. *About*, WILLIAM S. HEIN & CO., http://home.wshein.com/about/history/ [https://perma.cc/7X35-XRKZ] (last visited Oct. 9, 2017). In 2010, Lexis, Westlaw, and Bloomberg introduced new versions of their research products (products which became known as WestlawNext, Lexis Advance, and Bloomberg Law), and Google Scholar entered the legal research business. Jill Schachner Chanen, *Exclusive: Inside the New Westlaw, Lexis & Bloomberg Platforms*, A.B.A. J. (Jan. 25, 2010, 3:00 AM), http://www.abajournal.com/news/article/exclusive_inside_the_new_westlaw_lexis_bloomberg_platforms/ [https://perma.cc/3EPC-XT5C]. More recently, companies such as Ravel Law are introducing new ways to search, analyze, and visualize content. *See, e.g.*, *Who We Are*, RAVEL, http://ravellaw.com/who-we-are/ [https://perma.cc/JM3Z-F56K] (last visited Oct. 9, 2017).

22. *See, e.g.*, SHARON D. NELSON ET AL., THE 2010 SOLO AND SMALL FIRM LEGAL TECHNOLOGY GUIDE 95–117 (2010); Vogl, *supra* note 1. For more recent developments, see, for example, Abdi Shayesteh & Elnaz Zarrini, *Man Vs. Machine: Or, Lawyers Vs. Legal Technology*, LAW360 (Nov. 14, 2016, 12:14 PM), https://www.law360.com/articles/862058 [https://perma.cc/2BSN-CLMN].

23. *See, e.g.*, BRUCE A. OLSON & TOM O'CONNOR, ELECTRONIC DISCOVERY FOR SMALL CASES 8 (2012) (noting increases in e-discovery technology and its impacts on the Federal Rules of Civil Procedure); John M. Facciola, *A History of Electronic Discovery*, *in* MANAGING E-DISCOVERY AND ESI 13, 14 (Michael D. Berman et al. eds., 2011); Julie Sobowale, *How Artifical Intelligence Is Transforming the Legal Profession*, A.B.A. J. (Apr. 2016), http://www.abajournal.com/magazine/article/how_artificial_intelligence_is_transforming_the_legal_profession [https://perma.cc/7U35-WN4V] (noting the launch of e-Brevia's Diligence Accelerator among other developments); Wilson, *supra* note 15.

applications are already replacing some junior lawyers and disrupting the existing parameters for the practice of law.[24]

Four categories of startups in Legal Tech can be distinguished. The first category includes startup companies that offer a range of online legal services, removing the in-person legal consultation process and guidance process for clients.[25] The second legal startup category involves online "matching" platforms that connect lawyers with clients.[26] Such platform startups help consumers find a fitting lawyer without the costly involvement of a law firm. The third

24. *See, e.g.*, DELOITTE, THE ROBOTS ARE COMING 6–8 (2015), https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/finance/deloitte-uk-finance-robots-are-coming.pdf [https://perma.cc/9KF9-JQCV]; Thomas H. Davenport, *Let's Automate All the Lawyers?*, WALL ST. J.: BLOG (Mar. 25, 2015, 12:18 PM), http://blogs.wsj.com/cio/2015/03/25/lets-automate-all-the-lawyers/ [https://perma.cc/M2ZC-WZJT]; Peter Nussey, *How Much of What Lawyers Do Can Be Automated? A Look at New Research*, LEGAL IT INSIDER (Jan. 22, 2016, 1:44 PM), https://www.legaltechnology.com/latest-news/guest-post-how-much-of-what-lawyers-do-can-be-automated-a-look-at-new-research/ [https://perma.cc/E6WX-7DT3] (charting the percentage of work lawyers perform that can be automated).

25. Some of these services—including JUSTIA, https://www.justia.com/ [https://perma.cc/L7CN-XURR] (last visited Oct. 9, 2017); LAWYERS.COM, http://www.lawyers.com/ [https://perma.cc/3RGM-K997] (last visited Oct. 9, 2017); and AVVO, https://www.avvo.com/ [https://perma.cc/G6KZ-JXZ7] (last visited Oct. 9, 2017)—are free or have free components. Avvo, for example, allows a user to ask a question for free anonymously. It notifies the questioner when a lawyer responds to the question, which it says is usually within twelve hours. *Ask a Lawyer*, AVVO, https://www.avvo.com/ask-a-lawyer# [https://perma.cc/6LKB-XABQ] (last visited Oct. 9, 2017). Some of these services are fee based or have a fee-based component. For example, in addition to its free service, Avvo also offers fixed-fee legal services in multiple practice areas, and it offers a flat-fee option for talking directly by phone for fifteen minutes with one of its top-reviewed lawyers. AVVO, *supra*. While providing some free legal advice and documents, LegalZoom offers personal and business prepaid legal service plans that offer thirty-minute consultations for each unique legal matter and a one-hour annual legal checkup. *Attorney Advice*, LEGALZOOM, https://www.legalzoom.com/attorneys/ [https://perma.cc/44SG-E9AD] (last visited Oct. 9, 2017). Rocket Lawyer focuses on helping subscribers create personal and business legal documents, providing step-by-step instructions for customizing the documents, and offering review of the documents by an attorney for a set subscription cost. It also provides access to affordable representation by licensed attorneys. ROCKET LAWYER, https://www.rocketlawyer.com [https://perma.cc/KCS4-SM2K] (last visited Oct. 9, 2017).

26. Such startups' platforms help consumers find the right lawyer without the costly involvement of a law firm. *See, e.g.*, LAWGIVES, https://www.lawgives.com/about [https://perma.cc/RGX5-D5BD] (last visited Oct. 9, 2017); LEGAL HERO, http://legalhero.com (last visited Oct. 9, 2017); UPCOUNSEL, https://www.upcounsel.com/ [https://perma.cc/5SBX-37AU] (last visited Oct. 9, 2017). *See generally* Shannon Achimalbe, *Will Client-Matching Services Turn Participating Lawyers into Uber Drivers?*, ABOVE THE LAW (Dec. 3, 2014, 3:19 PM), http://abovethelaw.com/2014/12/will-client-matching-services-turn-participating-lawyers-into-uber-drivers/ [https://perma.cc/VY7H-QM59]; Jennifer Smith, *Online Matchmakers Offer New Way to Find Legal Help*, WALL ST. J. (Dec. 2, 2013), http://www.wsj.com/news/articles/SB10001424052702303464504579107231443311754 [https://perma.cc/2TB9-H4FU].

category entails startups that use AI tools to take over their lawyers' time-consuming and expensive legal research activities such as reviewing, understanding, evaluating, and reapplying contracts.[27] Finally, startups with expertise in blockchain technology attempt to replace lawyers as intermediaries in certain types of transactions.[28]

The decentralization of law that is a central part of the startup companies' purpose and that disrupts existing legal practices has

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27. *See, e.g.*, BEAGLE, http://beagle.ai/ [https://perma.cc/2MEL-B2GL] (last visited Oct. 9, 2017); BRIGHTLEAF, http://www.brightleaf.com/ [https://perma.cc/93RL-C5F8] (last visited Oct. 9, 2017); EBREVIA, https://ebrevia.com/ [https://perma.cc/C7AP-65YR] (last visited Oct. 9, 2017); EXIGENT GRP., http://www.exigent-group.com/ [https://perma.cc/FT3E-RG8Y] (last visited Oct. 9, 2017); LEGALROBOT, https://www.legalrobot.com/ [https://perma.cc/9MWL-4LNZ] (last visited Oct. 9, 2017); LEGALSIFTER, https://www.legalsifter.com/ [https://perma.cc/6TB2-HUU3] (last visited Oct. 9, 2017); SEALSOFTWARE, https://www.seal-software.com/ [https://perma.cc/AE65-T7AZ] (last visited Oct. 9, 2017). *See generally* Julie Bort, *This Startup Invented a New Category of Search Software So Good Google Uses It*, BUS. INSIDER (Feb. 1, 2017, 8:00 PM), http://www.businessinsider.com/seal-software-invents-search-software-so-good-google-uses-it-2017-2 [https://perma.cc/Q9WJ-26CG]; *Exigent Launches Hybrid Service for Low Cost Customisable Contract Discovery*, EXIGENT (Jan. 18, 2017), http://www.exigent-group.com/exigent-launches-hybrid-service-for-low-cost-customizable-contract-discovery/ [https://perma.cc/8BM6-STE2]; Frederic Lardinois, *LegalSifter Helps Designers and Developers Read Their Contracts*, TECH CRUNCH (Aug. 7, 2014), https://techcrunch.com/2014/08/07/legalsifter-helps-designers-and-developers-read-their-contracts/ [https://perma.cc/H56Z-DD2K]; *LPO Exigent Teams Up with LexPredict to Provide NLP Contract Discovery Service*, ARTIFICIAL LAW. (Jan. 18, 2017), https://artificiallawyer.com/2017/01/18/lpo-exigent-teams-up-with-lexpredict-to-provide-contract-discovery-service/ [https://perma.cc/G4PS-KP6E]; *Seal Software: Breaking the Seal to Identify Contract Value*, SOURCING INNOVATION (Feb. 13, 2017), http://sourcinginnovation.com/wordpress/2017/02/13/seal-software-breaking-the-seal-to-identify-contract-value/ [https://perma.cc/Q8T7-5TGD].

28. Ethereum is one example of a custom-built blockchain platform that runs smart contracts. *See* ETHEREUM, https://www.ethereum.org/ [https://perma.cc/K7Q7-ETUF] (last visited Oct. 9, 2017). Legal startups that use blockchain technology for smart contracts include SmartContract, Hedgy, Mifiel, rainvow, godzillion, and Katalysis. *Blockchains Startups*, ANGELLIST, https://angel.co/blockchains [https://perma.cc/D4KK-6WZY] (last visited Oct. 9, 2017). A few of the others include ADJOINT, http://www.adjoint.io/ [https://perma.cc/Y4AL-3L7Q] (last visited Oct. 9, 2017); CLAUSE, http://www.clause.io/ [https://perma.cc/C323-ZBGZ] (last visited Oct. 9, 2017); COMMONACCORD, http://www.commonaccord.org/ [https://perma.cc/L77W-WAW6] (last visited Oct. 9, 2017); and STASH, http://stashcrypto.com/products.html [https://perma.cc/X278-TCTS] (last visited Oct. 9, 2017). *See generally* James Eyers, Opinion, *Blockchain 'Smart Contracts' to Disrupt Lawyers*, AUSTL. FIN. REV. (May 30, 2016, 9:28 AM), http://www.afr.com/technology/blockchain-smart-contracts-to-disrupt-lawyers-20160529-gp6f5e [https://perma.cc/J3EA-ESG5]; Rob Marvin, *Blockchain in 2017: The Year of Smart Contracts*, PC MAG. (Dec. 12, 2016, 2:48 PM), http://www.pcmag.com/article/350088/blockchain-in-2017-the-year-of-smart-contracts [https://perma.cc/47BM-4R5B]; Bailey Reutzel, *BNP Paribas Works with Blockchain Startup to Open Source Law*, COINDESK (May 5, 2016, 4:28 PM), https://www.coindesk.com/commonaccord-legal-smart-contracts-prove-beneficial-one-bank-veritcal/ [https://perma.cc/J4J9-PQN2]; *Startup Corner: Cryptofinance Software Company Stash, Inc. to Create Smart Contracts for Digital Currency Law Firm Selachii*, LEGAL IT INSIDER (Oct. 28, 2015, 10:02 AM), https://www.legaltechnology.com/latest-news/startup-corner-cryptofinance-software-company-stash-inc-to-create-smart-contracts-for-digital-currency-law-firm-selachii/ [https://perma.cc/SWL7-83F9].

broad repercussions for the legal profession. First, existing legal services are either rendered increasingly irrelevant or replaced by Legal Tech.[29] Junior legal professionals and legal support staff are likely the first victims of the Legal Tech evolution.[30] Legal Tech applications will be able to perform most of a junior lawyer's work in the near future without the human elements that create imprecision, flaws, inaccuracies, possible lawsuits, and delay.[31] Second, and most importantly, the legal profession will be forced by such startup companies to innovate in perpetuity, a task that is not easily accomplished by overextended, and often cumbersome, legal organizations that have lost the capacity for agile reinvention.

### *A. Virtual Law Firms*

Legal Tech has the potential to rapidly transform law firms and legal departments into virtual law firms. Virtual law firms may dominate in the future. A virtual law firm is basically a platform with emphases on connecting legal and other professionals and collaboration. When implemented successfully, the effect of the platform model will be the creation of a flexible and accessible community of professionals with different skills and experience. The bigger the community, the easier it is to offer solutions tailored to the needs of the clients.

The virtual law firm model attracts a wide spectrum of law firms. One extreme is represented by the traditional law firm, characterized by a hierarchy with partners at the top and varying

29. *See, e.g.*, DELOITTE, DEVELOPING LEGAL TALENT: STEPPING INTO THE FUTURE LAW FIRM 4 (2016), http://www.legalfutures.co.uk/wp-content/uploads/developing-legal-talent-2016.pdf [https://perma.cc/7GQB-RPA2].

30. *See, e.g.*, CHRISTIAN VEITH ET AL., HOW LEGAL TECHNOLOGY WILL CHANGE THE BUSINESS OF LAW 10–11 (2016), http://media.wix.com/ugd/b30d31_7b407b2c8c6b44d697957b7fa5db48c8.pdf [https://perma.cc/CUL7-B5GF]; David Kravets, *Law Firm Bosses Envision Watson-Type Computers Replacing Young Lawyers*, ARS TECHNICA (Oct. 26, 2015, 12:06 PM), https://arstechnica.com/tech-policy/2015/10/law-firm-bosses-envision-watson-type-computers-replacing-young-lawyers/ [https://perma.cc/2WNE-FYTU]; Dan Mangan, *Lawyers Could Be the Next Profession to Be Replaced by Computers*, CNBC (Feb. 17, 2017, 4:10 PM), http://www.cnbc.com/2017/02/17/lawyers-could-be-replaced-by-artificial-intelligence.html [https://perma.cc/9FGV-UYZJ]; Karen Turner, *Meet 'Ross,' the Newly Hired Legal Robot*, WASH. POST (May 16, 2016), https://www.washingtonpost.com/news/innovations/wp/2016/05/16/meet-ross-the-newly-hired-legal-robot/?utm_term=.950014c34c52 [https://perma.cc/7PX7-ZXN6]; Jacqui Walker, *The Future of Law: Is Technology Stealing Young Lawyer Jobs?*, LEGALER BLOG (Mar. 1, 2015), http://blog.legaler.com/2015/03/01/the-future-of-law-is-technology-stealing-young-lawyer-jobs/ [https://perma.cc/6RZG-GLQC].

31. *See, e.g.*, Mangan, *supra* note 30; Turner, *supra* note 30.

levels of associates, paralegals, and nonlawyers below them.[32] On the other end of the spectrum are those firms that adopt an Airbnb-type platform organization—mainly providing a match-making or coordination service.[33] Enormous variations exist between the two extremes depending on the level of implementation of Legal Tech.

Legal platforms adopt a variety of approaches. For instance, UpCounsel offers entrepreneurs on-demand access to experienced lawyers.[34] LawyerlinQ in the Netherlands[35] offers law firms the possibility to insource special knowledge and skills for more complex projects.[36] LexSemble is a crowdsourcing platform that allows multiple users to edit legal knowledge entries.[37] The information gathered from the Cloud helps the platform to develop a machine learning analytics engine. This engine can be used to assist in legal decision-making and prediction activities.

### *B. Reevaluation of Applicable Law*

Legal Tech's disruptive innovation, in combination with the principles established by the sharing economy, requires lawyers and lawmakers to reevaluate their understanding of many areas of the law. Because of the disruptive effects of the sharing economy,[38] legal doctrines, principles, and concepts need to be redesigned around sharing and decentralized peer-to-peer platforms. Such an undertaking requires out-of-the-box thinking for lawyers who were trained during law school and during their entire careers to think inside the box.

The areas of law that are most clearly affected by disruptive innovation in law, the sharing economy, machine learning, AI, and blockchain technology include property law, privacy law, and employment law, to name only a few.

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32. *See, e.g.*, *About S&C*, SULLIVAN & CROMWELL, https://www.sullcrom.com/overview [https://perma.cc/6MZ8-6LRU] (last visited Oct. 9, 2017); *Culture*, DAVISPOLK, https://www.davispolk.com/firm/culture/ [https://perma.cc/HP5H-JAF5] (last visited Oct. 9, 2017); *Overview*, DEBEVOISE & PLIMPTON, http://www.debevoise.com/aboutus/overview (last visited Oct. 9, 2017); *Philosophy*, CRAVATH, SWAINE & MOORE, https://www.cravath.com/philosophy/ (last visited Oct. 9, 2017).

33. Achimalbe, *supra* note 26; Smith, *supra* note 26.

34. UPCOUNSEL, *supra* note 26.

35. *About*, LAWYERLINQ, http://about.lawyerlinq.com [https://perma.cc/7ZR4-L8NE] (last visited Oct. 9, 2017).

36. For an overview of how to set up a simple virtual law practice, see Chad E. Burton, *Launching a Virtual Law Firm*, 31 GP SOLO, Jan.–Feb. 2014, at 24, 26.

37. LEXSEMBLE, https://lexsemble.com/ [https://perma.cc/96H5-V7KF] (last visited Oct. 9, 2017).

38. *See* discussion *infra* Part III.C.

Property law is a prime example. With the accelerating rise of the sharing economy, people are likely to care less over time about ownership. Given these incremental changes in society, property law may adjust over time. In the sharing economy, products and legal rights pertaining to products and land may become less relevant and may iteratively become services.[39] As such, ownership, title, and legal rights pertaining to real property and chattel are becoming less relevant. Moreover, as the distinction between commercial property and personal consumption property becomes blurred, other areas of law need to be revised. Such areas may include tax law, bankruptcy law, and liability and insurance law, among many others.

Privacy law provides another prominent example. With the development and exponential evolution of the Internet of Things (IoT), AI, machine learning, big data analytics, blockchain technology, and smart contracts, more and more personal information will be registered, recorded, and analyzed.

### *C. Changing Legal Practice*

Legal Tech is replacing the traditional role of legal professionals. Legal professionals play a crucial role in establishing trust and truth in legal transactions.[40] They negotiate, draft, and interpret contracts and help enforce them; create laws and regulations that protect the weaker parties; and design structures that enable the registration and transfer of tangible property and intellectual property. Well-drafted legal contracts help the contracting parties establish trust and confidence in the validity and economic benefits of the transaction. Important matters, such as the truth about ownership and control, the transfer of ownership, and the allocation of risk and control, are normally covered in a contract. However, the counseling, deal-making, matchmaking, gatekeeping, and enforcing roles are increasingly performed by technology.[41] This trend is likely

39. *See, e.g.*, Adrian Kuenzler, *Promoting Access over Ownership: Realigning Antitrust and Intellectual Property Law to Usher in an Era of Collaborate Consumption*, 19 VAND. J. ENT. & TECH. L. 473, 529 (2016) ("[B]usinesses that share information about product design and distribution and offer independent maintenance and repair services ostensibly have seen an upsurge in demand.").

40. *See, e.g.*, George Dent, *Lawyers and Trust in Business Alliances*, 58 BUS. LAW. 45, 57 (2002); John O. McGinnis & Russell G. Pearce, *The Great Disruption: How Machine Intelligence Will Transform the Role of Lawyers in the Delivery of Legal Services*, 82 FORDHAM L. REV. 3041, 3055 (2014); *Estate Planning FAQs: The Lawyer's Role*, A.B.A., http://www.americanbar.org/groups/real_property_trust_estate/resources/estate_planning/the_lawyer_s_role.html [https://perma.cc/4UJP-7TBA] (last visited Oct. 9, 2017).

41. Benjamin H. Barton, *The Lawyer's Monopoly—What Goes and What Stays*, 82 FORDHAM L. REV. 3067, 3075–76 (2014); McGinnis & Pearce, *supra* note 40, at 3056.

to accelerate in the near future, enabled by blockchain technology and smart contracting.[42]

## III. BLOCKCHAIN LEDGER TECHNOLOGY

Leading technologists around the world have hailed blockchain technology as one of the most important technological innovations since the Internet.[43] Blockchain technology provides near-unlimited opportunities and applications through peer-to-peer interactions and transactions in a decentralized network where all participants are equal. Blockchain technology provides verification and validation of each transaction in the decentralized network.[44] For instance, in the financial world, a global consensus record of information and transactions creates much-needed transparency while at the same time opening global access to finance—including in areas of the world where the banking system is not readily available—in contrast to a

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42. See *infra* Part III (discussing the revolutionary role of blockchain technology in the legal field).

43. *See, e.g.*, COGNIZANT, MARKETFORCE & PEGASYSTEMS, THE FUTURE OF RETAIL FINANCIAL SERVICES 6, 28 (2016), https://www.pega.com/sites/pega.com/files/docs/2016/Jan/the-future-of-retail-financial-services-study.pdf [https://perma.cc/7HKR-RE8K]; MICHAEL CROSBY ET AL., SUTARDJA CTR. FOR ENTREPRENEURSHIP & TECH., BLOCKCHAIN TECHNOLOGY: BEYOND BITCOIN 3 (2015), http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf [https://perma.cc/5ZNL-4DEF]; Rich Daly, *Blockchain: Wall Street's Most Game-Changing Technology Advance Since the Internet*, FORBES (July 11, 2016, 6:00 AM), https://www.forbes.com/sites/richdaly/2016/07/11/blockchain-wall-streets-most-game-changing-technology-advance-since-the-internet/#33987a154d87 [https://perma.cc/VPM4-87V3]; Dinis Guarda, *Over 50 Bitcoin and Blockchain Thoughts and Quotes You Need to Read*, TRADERSDNA (Apr. 7, 2016, 2:05 AM), http://www.tradersdna.com/bitcoin-and-blockchain/over-50-bitcoin-and-blockchain-thoughts-and-quotes-you-need-to-read/ [https://perma.cc/TQ8A-279V]; William Mougayar, *The Blockchain Is the New Google*, TECH CRUNCH (May 11, 2016), https://techcrunch.com/2016/05/11/the-blockchain-is-the-new-google/ [https://perma.cc/ND5B-4DGC]; John Naughton, Opinion, *Is Blockchain the Most Important IT Invention of Our Age?*, GUARDIAN (Jan. 24, 2016, 4:00 PM), https://www.theguardian.com/commentisfree/2016/jan/24/blockchain-bitcoin-technology-most-important-tech-invention-of-our-age-sir-mark-walport [https://perma.cc/PK74-6QTZ]; Kyle Torpey, *Why the Bitcoin Blockchain Is the Biggest Thing Since the Internet*, NASDAQ (Apr. 19, 2016, 9:32 AM), http://www.nasdaq.com/article/why-the-bitcoin-blockchain-is-the-biggest-thing-since-the-internet-cm608228; *see also* Carrie Kirby, *Andreessen at CoinSummit: Bitcoin Today Is the Internet in 1994*, COINDESK (Mar. 25, 2014, 8:21 PM), http://www.coindesk.com/marc-andreessen-balaji-srinivasan-discuss-bitcoin/ [https://perma.cc/K9BX-NC2T] (echoing Netscape founder Marc Andreessen's assertion that "[l]ike the Internet in 1994, bitcoin today is seen by the mainstream as 'weird and scary[.]'").

44. For example, blockchain has been described as "a ledger of transactions with 'universally verifiable and trackable data.'" Daniel DeConinck, *Overstock Completes First Public Stock Issuance Using Blockchain*, 36 REV. BANKING & FIN. L. 416, 418 (2017) (quoting Joshua Ashley Klayman & F. Dario de Martino, *The (Heart)Beat Has Sounded: The World Economic Forum Places Blochchain Front and Center*, MORRISON & FOERSTER (Aug. 18, 2016), at 2, https://media2.mofo.com/documents/160817-world-economic-forum-blockchain.pdf).

mobile telephone network.[45] Blockchain technology eliminates the need for intermediation by incentivizing direct transactions—including compensation—between the creator and consumer.[46]

Blockchain technology creates a platform for trust through truth and transparency between parties. Because the blockchain (at least the public blockchain) is in fact public and immutable,[47] the technology increases transparency while at the same time significantly reducing transaction costs. Intermediaries, including lawyers, are replaced by code, connectivity, crowd, and collaboration.[48]

### *A. Blockchain Technology Defined*

Blockchain technology has been defined in many different ways, and no truly uniform definition seems to exist. Some refer to it as a giant, worldwide, distributed, immutable "Google spreadsheet"

45. *See, e.g.*, Yessi Bello Perez, *Can Bitcoin Make a Difference in the Global Aid Sector?*, COINDESK (Sept. 9, 2015, 10:30 AM), http://www.coindesk.com/can-bitcoin-make-a-difference-in-the-global-aid-sector/ [https://perma.cc/UP2M-G64L] (suggesting that donations and aid to third world countries can finally be provided without the interference of suboptimal bureaucratic organizations that don't allocate the aid as intended by the donor); Michele Chandler, *Mobile Banking Takes Off in Nigeria*, STAN. GRADUATE SCH. BUS. (Jan. 24, 2012), https://www.gsb.stanford.edu/insights/mobile-banking-takes-nigeria [https://perma.cc/V3RB-AZ8U] (noting that in Nigeria banking transactions are readily executed over mobile phones because no infrastructure exists for consumer banking); Cade Metz, *Why Bitcoin Will Thrive First in the Developing World*, WIRED (Feb. 2, 2016, 8:00 AM), https://www.wired.com/2016/02/why-bitcoin-will-thrive-first-in-the-developing-world/ [https://perma.cc/4492-D44P].

46. *See, e.g.*, Brett Scott, *How Can Cryptocurrency and Blockchain Technology Play a Role in Building Social and Solidarity Finance?* 5 (U.N. Research Inst. for Soc. Dev., Working Paper No. 2016-1, 2016), http://www.unrisd.org/brett-scott [https://perma.cc/A7PB-TKN2]; Perez, *supra* note 45; *infra* Part III.B.

47. *See, e.g.*, DeConinck, *supra* note 44, at 422 ("The platform publishes all ledger entries to a publicly accessible blockchain, however, in order to promote transparency.").

48. *See, e.g.*, Eric Piscini et al., *Blockchain: Trust Economy*, *in* DELOITTE, TECH TRENDS 2017: THE KINETIC ENTERPRISE 92, 93 (2017), https://dupress.deloitte.com/dup-us-en/focus/tech-trends/2017/blockchain-trust-economy.html [https://perma.cc/J4XE-HQ5Z]; Mohit Kaushal & Sheel Tyle, *The Blockchain: What It Is and Why It Matters*, BROOKINGS: TECHTANK (Jan. 13, 2105), https://www.brookings.edu/blog/techtank/2015/01/13/the-blockchain-what-it-is-and-why-it-matters/ [https://perma.cc/TG7G-XV44]; Jason Leibowitz, *Blockchain's Big Innovation Is Trust, Not Money*, COINDESK (May 21, 2016, 4:57 PM), http://www.coindesk.com/blockchain-innovation-trust-money/ [https://perma.cc/AW6E-AMUD]; Don Tapscott & Alex Tapscott, *How Blockchain Will Change Organzations*, MIT SLOAN MGMT. REV. (Dec. 7, 2016), http://sloanreview.mit.edu/article/how-blockchain-will-change-organizations/?social_token=5393525f2c938c2283f4f53795e343a4&utm_source=twitter&utm_medium=social&utm_campaign=sm-direct [https://perma.cc/42NG-5SPR]; *The Trust Machine: The Technology Behind Bitcoin Could Transform How the Economy Works*, ECONOMIST (Oct. 31, 2015), http://www.economist.com/news/leaders/21677198-technology-behind-bitcoin-could-transform-how-economy-works-trust-machine [https://perma.cc/A7V2-88T2].

for transactions.[49] Others define blockchain by focusing on its central elements—an electronic, decentralized, immutable transaction ledger that provides cryptographic verification.[50] Vitalik Buterin, the founder of Ethereum, perhaps most prominently defined blockchain as follows:

> [A] public blockchain is a blockchain that anyone in the world can read, anyone in the world can send transactions to and expect to see them included if they are valid, and anyone in the world can participate in the consensus process—the process for determining what blocks get added to the chain and what the current state is. As a substitute for centralized or quasi-centralized trust, public blockchains are secured by cryptoeconomics—the combination of economic incentives and cryptographic verification using mechanisms such as proof of work or proof of stake, following a general principle that the degree to which someone can have an influence in the consensus process is proportional to the quantity of economic resources that they can bring to bear. These blockchains are generally considered to be "fully decentralized[.]"[51]

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49. Craig Leppan, *Who Is Blockchain Going to Affect Most*, OVATIONS (July 29, 2015), http://www.ovationsgroup.com/blockchain/ [https://perma.cc/J4AB-FS9N]; Jonathan Shieber, *Colu Aims to Bring Blockchain Technology Everywhere*, TECH CRUNCH (Jan. 27, 2015), https://techcrunch.com/2015/01/27/colu-aims-to-bring-blockchain-technology-everywhere/ [https://perma.cc/MMY3-Q5HB].

50. *See, e.g.*, DELOITTE, BLOCKCHAIN: ENIGMA. PARADOX. OPPORTUNITY 4–5 (2016), https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-full-report.pdf [https://perma.cc/U32H-JLX6]; ALAN MORRISON, PWC, BLOCKCHAIN AND SMART CONTRACT AUTOMATION: BLOCKCHAINS DEFINED 2 (2016), http://www.pwc.com/us/en/technology-forecast/2016/blockchain/pwc-smart-contract-automation-definition.pdf [https://perma.cc/EH2K-MPP2]; Alistair Dabbs, *What Is a Blockchain, and Why Is It Growing in Popularity?*, ARS TECHNICA (Nov. 6, 2016, 8:00 AM), https://arstechnica.com/information-technology/2016/11/what-is-blockchain/ [https://perma.cc/Y7N2-XN3C]; Lee Grant, *Blockchain—Definition, Origin, and History*, TECHBULLION (Sept. 6, 2016), http://www.techbullion.com/blockchain-definition-origin-history [https://perma.cc/HSJ9-J6P5].

51. Vitalik Buterin, *On Public and Private Blockchains*, ETHEREUM BLOG (Aug. 7, 2015), https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/ [https://perma.cc/6Y7W-FXVH]. Buterin contrasted public blockchains (the original idea) with consortium blockchains and fully private blockchains:

> [A] consortium blockchain is a blockchain where the consensus process is controlled by a pre-selected set of nodes; for example, one might imagine a consortium of 15 financial institutions, each of which operates a node and of which 10 must sign every block in order for the block to be valid. The right to read the blockchain may be public, or restricted to the participants, and there are also hybrid routes such as the root hashes of the blocks being public together with an API that allows members of the public to make a limited number of queries and get back cryptographic proofs of some parts of the blockchain state. These blockchains may be considered "partially decentralized[.]"

*See id.* ("[A] fully private blockchain is a blockchain where write permissions are kept centralized to one organization. Read permissions may be public or restricted to an arbitrary extent. Likely applications include database management, auditing, etc [sic] internal to a single company, and so public readability may not be necessary in many cases at all, though in other cases public auditability is desired.").

Rather than attempting to agree on a mutually acceptable phraseology for a definition, a description of the core elements of ledger technology can help define the blockchain. As such, a blockchain is a shared digital ledger or database that maintains a continuously growing list of transactions among participating parties regarding digital assets—together described as "blocks."[52] The linear and chronological order of transactions in a chain will be extended with another transaction link that is added to the block once an additional transaction is validated, verified, and completed.[53] The chain of transactions is distributed to a limitless number of participants—so-called "nodes"[54]—around the world in a public or private peer-to-peer network.

Blockchain technology removes fraudulent transactions. Blockchain's security measures make blockchain validation technologies more transparent and less prone to error and corruption.[55] While blockchain's use of digital signatures helps establish the identity and authenticity of the parties involved in the transaction, it is the Internet's completely decentralized network connectivity that allows the most protection against fraud.[56] Network connectivity allows multiple copies of the blockchain to be available to all participants across the distributed network.[57] The decentralized and fully distributed nature of the blockchain makes information in

52. *See* Michele D'Aliessi, *How Does the Blockchain Work?*, MEDIUM (June 1, 2016), https://medium.com/@micheledaliessi/how-does-the-blockchain-work-98c8cd01d2ae#.w76hifcu2 [https://perma.cc/9CSS-HKR4]; Monica Pearson, *Blockchain Is the New Buzzword*, EXPERIAN (Jan. 31, 2016), https://www.experian.com/blogs/insights/2016/01/blockchain-is-the-new-buzzword/ [https://perma.cc/F6B2-QVWB].

53. *See* D'Aliessi, *supra* note 52; Pearson, *supra* note 52.

54. *See* D'Aliessi, *supra* note 52. Participants can be individuals, organizations, and even things. *See* Sloane Brakeville & Bhargav Perepa, *Blockchain Basics: Introduction to Distributed Ledgers*, IBM: DEVELOPERWORKS (Aug. 21, 2017), https://www.ibm.com/developerworks/cloud/library/cl-blockchain-basics-intro-bluemix-trs/ [https://perma.cc/T3UB-V6X8]; Hemant Saxena, *Blockchain Technology Explained; Microsoft's Plan to Develop Blockchain as a Service*, WINDOWS CLUB (Feb. 16, 2017), http://www.thewindowsclub.com/blockchain-microsoft-plans-develop-service?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+TheWindowsClub+%28The+Windows+Club%29 [https://perma.cc/3ZAK-MKQW]. The only condition for participants is the necessity of an Internet connection. *See* D'Aliessi, *supra* note 52.

55. *See* REED SMITH, BEYOND BITCOIN: BLOCKCHAIN 19 (2016), [https://perma.cc/HE94-AVB2] ("Because the blockchain is not controlled by a central party, but instead involves decentralized control, the blockchain is less vulnerable to (if not immune from) cyberattack. The blockchain cannot be lost or corrupted by participants, and thus counterparty risk in transactions is significantly reduced.").

56. *See* Brakeville & Perepa, *supra* note 54. For an in-depth, nuanced discussion of this point, see PETER VAN VALKENBURGH, OPEN MATTERS: WHY PERMISSIONLESS BLOCKCHAINS ARE ESSENTIAL TO THE FUTURE OF THE INTERNET 23–32 (2016), https://coincenter.org/files/2016-12/openmattersv1-1.pdf [https://perma.cc/J4EF-MDQ8].

57. *See* D'Aliessi, *supra* note 52.

the blockchain practically impossible to reverse, alter, or erase.[58] Blockchain's distributed consensus model—that is, the network nodes' verification and validation of chain transactions before execution of the transactions—makes it extremely rare for a fraudulent transaction to be recorded in the blockchain.[59] That model also allows node verification of transactions without compromising the privacy of the parties and is therefore arguably safer than a traditional model that requires third-party intermediary validation of transactions.[60]

Cryptographic "hashes" further increase blockchain security. Cryptographic hashes are complex algorithms that use details of all previous transactions in the existing blockchain before adding the next block to generate a unique hash value.[61] That hash value ensures the authenticity of each transaction before it is added to the block. The smallest change to the blockchain, even a single digit or value, results in a different hash value. A different hash value makes any form of manipulation immediately detectable.[62]

Blockchain-enabled computer protocols that verify, facilitate, monitor, and enforce the negotiation and performance of a contract are known as "smart contracts" and "smart property."[63] The term "smart contract" was first introduced by Nick Szabo, a computer scientist and

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58. *See, e.g.*, Brakeville & Perepa, *supra* note 54; Antony Lewis, *A Gentle Introduction to Immutability of Blockchains*, BITS ON BLOCKS (Feb. 29, 2016), https://bitsonblocks.net/2016/02/29/a-gentle-introduction-to-immutability-of-blockchains/ [https://perma.cc/2PNJ-7L65].

59. *See, e.g.*, François Zaninotto, *The Blockchain Explained to Web Developers, Part 1: The Theory*, MARMELAB BLOG (Apr. 28, 2016), https://marmelab.com/blog/2016/04/28/blockchain-for-web-developers-the-theory.html [https://perma.cc/RE62-CRAY]. *But see* Razvan Peteanu, *Fraud Detection in the World of Bitcoin*, BITCOINMAG. (Mar. 26, 2014, 5:50 AM), https://bitcoinmagazine.com/articles/fraud-detection-world-bitcoin-1395827419/ [https://perma.cc/JP8S-B82Z] ("Fundamentally, detecting fraud is hard precisely because it is rare, dynamic, and not necessarily obviously fraudulent.").

60. For a discussion of privacy on the blockchain, see VAN VALKENBURGH, *supra* note 56, at 33–40. For an overview of various consensus mechanisms, see SIGRID SEIBOLD & GEORGE SAMMAN, KPMG, CONSENSUS: IMMUTABLE AGREEMENT FOR THE INTERNET OF VALUE (2016), https://assets.kpmg.com/content/dam/kpmg/pdf/2016/07/kpmg-blockchain-consensus-mechanism-channel-islands.pdf [https://perma.cc/7MMU-KWW2]; VAN VALKENBURGH, *supra* note 56, at 10–12, 15–40.

61. *See* Lewis, *supra* note 58.

62. *Id.*

63. *See* John Danaher, *Blockchains, Smart Contracts and Smart Property*, ALGOCRACY & THE TRANSHUMANIST PROJECT (Mar. 5, 2016), https://algocracy.wordpress.com/2016/03/05/blockchains-smart-contracts-and-smart-property/ [https://perma.cc/874T-GMLA]; Nicolette Kost De Sevres & Bradley Cohen, *The Blockchain Revolution, Smart Contracts and Financial Transactions*, DLA PIPER (Apr. 26, 2016), https://www.dlapiper.com/en/czech/insights/publications/2016/04/the-blockchain-revolution/ [https://perma.cc/CF9T-NWMM]; *see also* MORRISON, *supra* note 50 ("In the bitcoin blockchain, each smart transaction is itself a smart contract in miniature.").

legal theorist, in 1994.[64] An often-cited example for smart contracts is the purchase of music through Apple's iTunes platform.[65] A computer code ensures that the "purchaser" can only listen to the music file on a limited number of Apple devices.[66]

More complex smart contract arrangements, in which several parties are involved, require a verifiable and unhackable system provided by blockchain technology.[67] Through blockchain technology, smart contracting often makes conventional legal contracting unnecessary, as smart contracts often emulate the logic of legal contract clauses.[68] Ethereum, the leading platform for smart contracting, describes smart contracting in this context as follows:

> Ethereum is a *decentralized platform that runs smart contracts*: applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference. These apps run on a custom built *blockchain, an enormously powerful shared global infrastructure that can move value around and represent the ownership of property*. This enables developers to create markets, store registries of debts or promises, move funds in accordance with instructions

64. *Not-So-Clever Contracts*, ECONOMIST (July 28, 2016), http://www.economist.com/news/business/21702758-time-being-least-human-judgment-still-better-bet-cold-hearted [https://perma.cc/325V-LPLU]; *see also Smart Contracts: The Blockchain Technology That Will Replace Lawyers*, BLOCKGEEKS, http://blockgeeks.com/guides/smart-contracts/ [https://perma.cc/BW2V-7RSQ] (last visited Oct. 10, 2017) [hereinafter *Smart Contracts*].

65. *See, e.g.*, THORSTEN KOEPPL & JEREMY KRONIK, C.D. HOWE INST., BLOCKCHAIN TECHNOLOGY—WHAT'S IN STORE FOR CANADA'S ECONOMY AND FINANCIAL MARKETS? 15 (2017), https://www.cdhowe.org/sites/default/files/attachments/research_papers/mixed/Commentary_468_0.pdf [https://perma.cc/XXC9-JUMN]; Douglas Vaughn & Anna Outzer, *Understanding How Blockchain Could Impact Legal Industry*, LAW360 (Jan. 11, 2017, 12:17 PM), https://www.law360.com/articles/879810/understanding-how-blockchain-could-impact-legal-industry [https://perma.cc/RN7G-R4XV].

66. Jeffrey Glazer, *Smart Contracts Are a Future*, LAW & ENTREPRENEURSHIP CLINIC (Sept. 14, 2015), https://www.uwle.org/blog/smart-contracts-are-a-future [https://perma.cc/K8CU-N4KE]; *see also* Vaughn & Outzer, *supra* note 65.

67. *See, e.g.*, ETHEREUM, *supra* note 28; Luke Parker, *Industry Research Papers Highlight Blockchain Technology's Disruptive Potential*, BRAVE NEWCOIN (July 3, 2016), https://bravenewcoin.com/news/industry-research-papers-highlight-blockchain-technologys-disruptive-potential/ [https://perma.cc/QN2E-RVPL]; *Smart Contracts*, *supra* note 64.

68. *See, e.g.*, Josh Stark, *How Close Are Smart Contracts to Impacting Real-World Law?*, COINDESK (Apr. 11, 2016, 2:00 PM), http://www.coindesk.com/blockchain-smarts-contracts-real-world-law/ [https://perma.cc/85LC-AKZ5]; Josh Stark, *Making Sense of Blockchain Smart Contracts*, COINDESK (June 4, 2016, 3:39 PM GMT), http://www.coindesk.com/making-sense-smart-contracts/ [https://perma.cc/Q5J7-JCN9]; *see also, e.g.*, Ted Mlynar & Ira Schaefer, *Why Smart Contracts Will Need 'Smart Term Sheets' to Match*, COINDESK (Dec. 9, 2016, 2:36 PM), http://www.coindesk.com/smart-contracts-will-need-smart-term-sheets-match/ [https://perma.cc/Q899-759H]. For an example of what startups hope to accomplish with smart contracting, see LEGALESE, https://legalese.com/ [https://perma.cc/6FDL-ECG9] (last visited Oct. 10, 2017).

> given long in the past (like a will or a futures contract) and many other things that have not been invented yet, all without a middle man or counterparty risk.[69]

### *B. Decentralization*

Rapid technological change allows society to become increasingly decentralized by overcoming vertical hierarchies and enabling a world of horizontal, open, and autonomous networks.[70] The Internet enabled a free, fast, and global exchange of information and ideas. Social media further reformed and accelerated the way society exchanges and shares information. Both inventions continue to have a broad and astonishing social impact. Within one generation, many aspects of social interaction have been transformed.

Blockchain technology is transforming society for an even more decentralized future. Figure 1 illustrates the currently shifting and intersecting paradigms of user connectivity and the move towards corporate decentralization. Corporate decentralization started with firms such as Netflix, Amazon, Tesla, and Under Armour, among several others, that favored flatter corporate hierarchies, open communication, a best-idea-wins culture, and a focus on Millennials' preferences.[71] This trend toward decentralization has been accompanied by an ever-increasing interconnectivity of users.[72] Figure 2 suggests that around 2015–17 a paradigm shift began that allowed the interconnectivity of users to substantially increase, enabled and supported by smart contracts and blockchain technology, while at the same time blockchain-enabled distributed networks allowed for a radical increase in decentralization.

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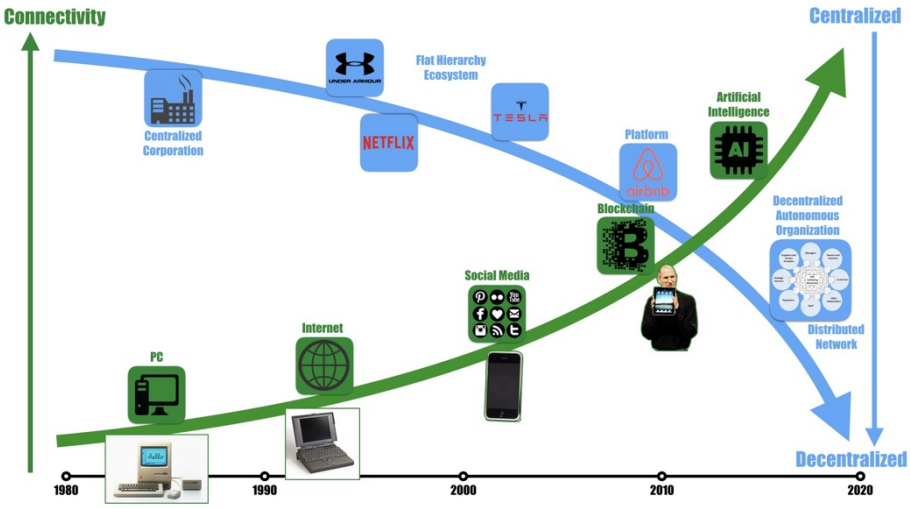
69. ETHEREUM, *supra* note 28 (emphasis in original).

70. *See, e.g.*, Don Tapscott, *Why Blockchain Will Smash Hierarchies*, DUKE CORP. EDUC. (Sept. 2016), http://www.dukece.com/article-library/blockchain-will-smash-hierarchies/ [https://perma.cc/K63E-8A76].

71. *See generally* Eric Biber et al., *Regulating Business Innovation as Policy Disruption: From the Model T to Airbnb*, 70 VAND. L. REV. 1561, 1570–71, 1583–84, 1601–02 (2017) (examining the disruptive impact and commercial appeal of Netflix, Amazon, and Tesla on their respective markets and certain regulatory responses).

72. *See, e.g.*, Pauline Meyer, *Tesla Motors, Inc.'s Organizational Structure, Characteristics (an Analysis)*, PANMORE INST. (Feb. 21, 2017), http://panmore.com/tesla-motors-inc-organizational-structure-characteristics-analysis [https://perma.cc/N3RN-8EYQ].

**Figure 1: Time series 1980–2020 societal connectivity and platform decentralization.**[73]




These findings have significant implications. Increased connectivity enabled by blockchain technology in combination with increased decentralization allows for the removal of intermediaries, including lawyers, financial intermediaries, and platform companies. Changes in social media platform companies provide a prominent example. Until recently, consumers of information were dependent on centralized media organizations and corporations to disseminate information.[74] However, society relies increasingly on information that is created, produced, and consumed by the crowd. This crowd functionality slowly removes the role of journalists, media, and other expert intermediaries because crowd-based social media platforms facilitate the real-time exchange of information.[75] But social media

73. Figure 1 illustrates the relationship between decentralization and user connectivity. Erik P.M. Vermeulen, *There Is No Escape from Blockchains and Artificial Intelligence… Lawyers Better Be Prepared!*, MEDIUM (Jan. 23, 2017), https://medium.com/@erikpmvermeulen/there-is-no-escape-from-blockchains-and-artificial-intelligence-lawyers-better-be-prepared-2d7a8221c627 [https://perma.cc/6C2L-ZYM5].

74. *See, e.g.*, Ricardo Gandour, *Study: Decline of Traditional Media Feeds Polarization*, COLUM. JOURNALISM REV. (Sept. 19, 2016), https://www.cjr.org/analysis/media_polarization_journalism.php [https://perma.cc/WPP2-C6UX]; Bailey Roy, *Social vs. Traditional Media: Has the Battle Already Ended?*, PRSA PUBLICATIONS (Apr. 1, 2016), [https://perma.cc/68NU-BAGV]

75. *See, e.g.*, Michael Barthel, *Newspapers: Fact Sheet*, *in* STATE OF THE NEWS MEDIA 2016, at 9, 19 (2016), http://assets.pewresearch.org/wp-content/uploads/sites/13/2016/06/30143308/state-of-the-news-media-report-2016-final.pdf [https://perma.cc/5UK6-M6SL] (noting that the number of daily newspapers decreased by more than 100 from 2004 to 2014); Jeffrey

companies such as Twitter and LinkedIn are still just intermediary platform companies that can be removed with the proliferation of blockchain technology. Take, for instance, Akasha,[76] a next-generation social media network powered by the Ethereum world computer and embedded into the interplanetary file system.[77] Akasha requires no platform company for social media purposes but allows the direct peer-to-peer exchange of content, with the difference that user content is published over a decentralized network rather than individual servers.[78] Akasha shows great potential to remove remaining issues with the shifting content generation by the crowd.[79]

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Gottfried & Elisa Shearer, *News Use Across Social Media Platforms 2016*, PEW RES. CTR. (May 26, 2016), http://www.journalism.org/2016/05/26/news-use-across-social-media-platforms-2016/ [https://perma.cc/ZA4K-CVDG] (noting that 62 percent of the adults in the United States now get news on social media); Kalev Leetaru, *Will Facebook Replace the News Media?*, FORBES (Sept. 12, 2016, 2:13 PM), http://www.forbes.com/sites/kalevleetaru/2016/09/12/will-facebook-replace-the-news-media/#17f135d4bd56 (noting that 44 percent of the public gets its news from Facebook alone).

76. AKASHA, https://akasha.world (last visited Oct. 10, 2017).

77. The interplanetary file system "aims to be a global, peer-to-peer database of content files." Lance Koonce, *The Wild, Distributed World: Get Ready for Radical Infrastructure Changes, from Blockchains to the Interplanetary File System to the Internet of Things*, 28 No. 10 INTELL. PROP. & TECH. L.J. 3, 4 (2016).

78. *Id.*

79. For instance, "fake news," biased information, and the explosion of "native advertisements" (where ads cannot easily be distinguished from the real content) are a rapidly increasing problem on social media. James Carson, *What Is Fake News? Its Origins and How It Grew in 2016*, TELEGRAPH (Mar. 16, 2017, 1:57 PM), http://www.telegraph.co.uk/technology/0/fake-news-origins-grew-2016/. That is not to say that the "pre-social media" era was devoid of fake news. *See id.* Yet many argue that traditional newspapers and other official media outlets (if independent) provide at least some verification for published information. *See, e.g.*, Molly A. Dugan, *Journalism Ethics and the Independent Journalist*, 39 MCGEORGE L. REV. 801, 801–04 (2008); Kenneth Jost, *Digital Journalism: Is News Quality Better or Worse Online?*, 24 CQ RESEARCHER 457, 463 (2014), http://library.cqpress.com/cqresearcher/getpdf.php?id=cqresrre2014053000 [https://perma.cc/J97Y-NPPF]; Craig Silverman, *New Research Details How Journalists Verify Information*, POYNTER (Feb. 27, 2013), https://www.poynter.org/2013/new-research-details-how-journalists-verify-information/203728/ [https://perma.cc/QJK6-G7ZS]. However, other ways exist to solve these "fake news" issues. The social media platforms themselves can engage in fact-checking, or they can introduce a third-party verification system. *See also* Hannah L. Cook, *Flagging the Middle Ground of the Right to be Forgotten: Combatting Old News with Search Engine Flags*, 20 VAND. J. ENT. & TECH. L. 1, 18–24 (2017) (proposing a flagging system to address misleading information on the Internet). This will, however, add a bureaucratic layer between the "creator" and "consumer." It will run counter to the decentralization trend society is currently experiencing. *See, e.g.*, Clyde Hughes, *Facebook 'Disputed' Tag: Fact-Checkers Eye Posts Flagged As Fake News*, NEWSMAX (Mar. 6, 2017, 3:19 PM), http://www.newsmax.com/TheWire/facebook-disputed-tag-fake/2017/03/06/id/777192/ [https://perma.cc/YV3C-J3CP]; Amber Jamieson & Olivia Solon, *Facebook to Begin Flagging Fake News in Response to Mounting Criticism*, GUARDIAN (Dec. 15, 2016, 3:05 PM), https://www.theguardian.com/technology/2016/dec/15/facebook-flag-fake-news-fact-check [https://perma.cc/Z78D-8Y4B]. A combination of technology and the crowd will likely offer a solution soon. *See, e.g.*, Jessica Davies, *5 New Automated Fact-Checking Projects Under Way*,

### *C. Disruptive Innovation*

Blockchain technology has vast disruptive, innovative properties. Despite the very early-stage development of blockchain technology, the possible applications are nearly limitless. Consider the blockchain-based currency Bitcoin. Until recently, most commentators viewed Bitcoin as a hype—susceptible to fraud, price manipulation, and corruption.[80] But today, "[t]he issue is no longer whether cryptocurrency will survive, but rather how it will evolve."[81] The high levels of investor activity in the blockchain area appear to provide a reliable indicator of the commercial maturity of blockchain technology. Figure 2 shows that venture capital (VC) investment in startup companies that utilize blockchain technology has increased exponentially since 2012. Investor interest in the technology will undoubtedly further increase. Particularly, the applicability of blockchain-based smart contracts to digital marketplaces, the sharing economy, the IoT, and AI will further accelerate its development.

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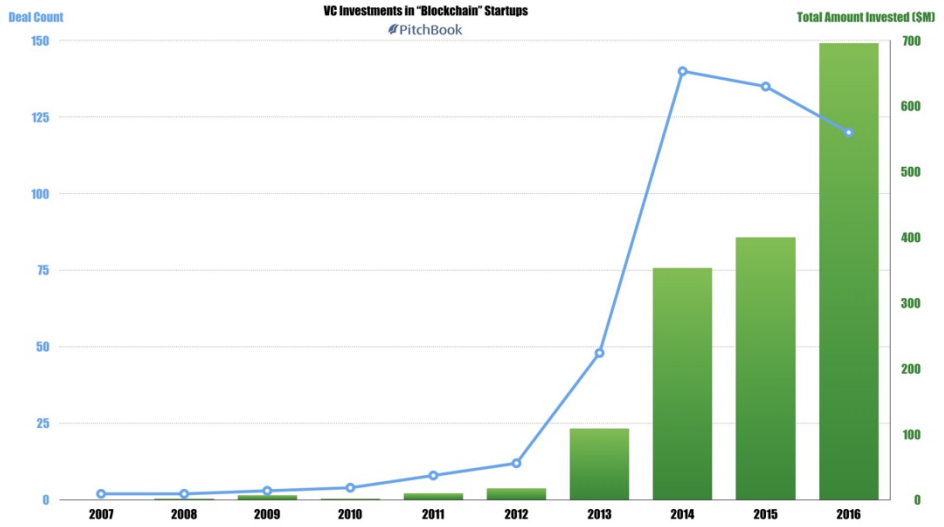
DIGIDAY (Dec. 22, 2016), http://digiday.com/uk/5-new-automated-fact-checking-projects-underway/ [https://perma.cc/6N3C-J2BS]; Dhruv Ghulati, *Introducing Factmata—Artificial Intelligence for Political Fact-Checking*, MEDIUM (Dec. 6, 2016), https://medium.com/factmata/introducing-factmata-artificial-intelligence-for-political-fact-checking-db8acdbf4cf1#.3alzobkgh [https://perma.cc/6N9G-KQPX]; Kate Starbird & Emma Spiro, *Slowing the Spread of Viral Misinformation: Can Crowdsourcing Help?*, HUFFINGTON POST (Dec. 20, 2016, 10:23 AM), http://www.huffingtonpost.com/entry/slowing-the-spread-of-viral-misinformation-can-crowdsourcing_us_58594084e4b0630a254235a7 [https://perma.cc/D6D8-3VQW]. These solutions correspond to the peer-to-peer "exchange" of assets and services facilitated by the blockchain technology. *See, e.g.*, Brakeville & Perepa, *supra* note 54.

80. *See, e.g.*, OFFICE OF INV'R EDUC. & ADVOCACY, SEC, PUB. NO. 153, PONZI SCHEMES USING VIRTUAL CURRENCIES 1 (2013), http://www.sec.gov/investor/alerts/ia_virtualcurrencies.pdf [https://perma.cc/AT52-PXXJ]; Izabella Kaminska et al., *Bitcoin and Blockchain: The Future of Money or Just Hype?*, FIN. TIMES (Sept. 21, 2016), https://www.ft.com/content/3bea303c-7a7e-11e6-b837-eb4b4333ee43 [https://perma.cc/F528-Z7M4].

81. PWC, MONEY IS NO OBJECT: UNDERSTANDING THE EVOLVING CRYPTOCURRENCY MARKET 1 (2015), https://www.pwc.com/us/en/financial-services/publications/assets/pwc-cryptocurrency-evolution.pdf [https://perma.cc/P6KC-QS3Q].

**Figure 2: VC investments in blockchain startups from 2007 to 2016.**[82]




Blockchain technology startups attempt to replace lawyers as intermediaries in many types of transactions, including and most notably contracts analyses, real estate, and intellectual property.[83] Moreover, such startups have the potential to create lasting societal changes. Some commentators predict a future in which blockchain startups can remove lawyers from commerce altogether, as smart contracts in the blockchain—such as those in the Ethereum

82. Vermeulen, *supra* note 73.

83. Clause is an example. It describes itself this way:

> Clause is a revolutionary new platform that enables commercial contracts to "come alive" and autonomously manage themselves. Our proprietary, patent-pending infrastructure seamlessly integrates legally enforceable contracts with real-time data from the "internet of things", web services, and business and accounting systems. Clause leaves behind the world of static, paper-based contracts and unleashes the massive potential of dynamic contracts. Prices, warranties, delivery requirements, and other terms update in response to data after the parties form their initial agreement. Clause brings an unprecedented level of speed, integration, and automation to the business world. We currently have several partnerships with industry and technology leaders in progress. We invented the infrastructure for "intelligent" or "self-managing" legal contracts. Our proprietary technology leverages cryptography, NLP, RESTful API integrations, and distributed ledgers.

Clause.io, LINKEDIN, https://www.linkedin.com/company/clause [https://perma.cc/8F3S-X8YL] (last visited Oct. 10, 2017); *see* CLAUSE, https://clause.workable.com [https://perma.cc/2NVN-SM73].

platform[84]—regulate commerce entirely, enabled by the trust created between parties through immutable blockchain technology.[85]

Business, administrative, and legal processes that rely on legal intermediaries may become redundant because of advances in acceptance and implementation of blockchain technology. Forms of keeping legal ledgers—such as notary and registry services, motion practice in court, and legal title searches, among several others—may be among the first services to disappear in the not-too-distant future. Similarly, corporate processes that have ledger functionality but rely on legal intermediaries could be streamlined very quickly by implementing blockchain technology. When blockchain technology becomes more widely accepted and applications spread into consumer territory, existing legal processes and structures will likely be among the first processes to become redundant.

The combination of blockchain technology startups with platforms, AI, and machine learning offers opportunities for developing new technologies. Leveraging the big data that is collected by using Legal Tech solutions and blockchain applications in combination with machine learning creates more creative and faster tools. This, in turn, creates a surge of new and innovative platforms with disruptive effects for the legal industry, among others.

### *D. Limitations*

Blockchain technology and smart contracts executed on blockchain technology platforms, such as Ethereum, are faced with multiple possible technological and legal limitations. First, the world of blockchain and smart contracting has clearly not yet reached maturity.[86] While blockchain-enabled smart contracts generally do

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84. *See supra* note 51 and accompanying text; *see also* Frances Coppola, *Ethereum: Towards a New BitSociety*, FORBES (Apr. 3, 2016, 1:02 PM), https://www.forbes.com/sites/francescoppola/2016/04/03/ethereum-towards-a-new-bitsociety/#7e8d17fb3adc [https://perma.cc/7RRV-2PQQ] ("Buterin announces the death of lawyers. Who needs lawyers when the terms of your contract, or the evidence of your ownership of an asset, or even your own identity, are securely encoded within the blockchain and verified by the entire network?").

85. *See, e.g.*, Michael Kokal, *The Coming Blockchain Disruption: Trust Without the "Middle-Man"*, NAT'L L. REV. (Feb. 23, 2017), http://www.natlawreview.com/article/coming-blockchain-disruption-trust-without-middle-man [https://perma.cc/A57L-WK3D]; Lewis, *supra* note 58.

86. *See, e.g.*, ALAN MORRISON, PWC, BLOCKCHAIN AND SMART CONTRACT AUTOMATION: HOW SMART CONTRACTS AUTOMATE DIGITAL BUSINESS 5–8 (2016), https://www.pwc.com/us/en/technology-forecast/2016/blockchain/pwc-smart-contract-automation-digital-business.pdf [https://perma.cc/Z85E-5DLG]; PRASAD SATYAVOLU & ABHIJEET SANGAMNERKAR, COGNIZANT, BLOCKCHAIN'S SMART CONTRACTS: DRIVING THE NEXT WAVE OF INNOVATION ACROSS MANUFACTURING VALUE CHAINS 6–9 (2016),

not require legal involvement across the spectrum of transactions, legal professionals often still believe that "code" in smart contracts can only deal with very simple transactions—such as buying music or perhaps a car—and argue that more complicated legal arrangements will necessitate the draftsmanship and negotiations of traditional lawyers.[87] Even if more complex transactions could be coded and included in smart contracts, a widespread belief in the legal community suggests that lawyers will remain responsible for drafting the terms and arrangements that would later have to be coded by specialists.[88]

Legal limitations pertaining to smart contracts and blockchain technology originate mostly from concerns over the legal origin of smart contracting. While smart contracts may reflect the underlying contract between parties, lawyers may argue that smart contracts are

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https://www.cognizant.com/whitepapers/blockchains-smart-contracts-driving-the-next-wave-of-innovation-across-manufacturing-value-chains-codex2113.pdf [https://perma.cc/FUE2-TE7U]; *2016: A Pivotal Year for Blockchain*, SWIFT (May 12, 2016), https://www.swift.com/insights/news/2016_a-pivotal-year-for-blockchain [https://perma.cc/KPY2-4EFH]; Garrick Hileman, *State of Blockchain Q1 2016: Blockchain Funding Overtakes Bitcoin*, COINDESK (May 11, 2016, 3:15 PM), http://www.coindesk.com/state-of-blockchain-q1-2016/ [https://perma.cc/B5AF-ZAX5]; Chris Kanaracus, *Don't Believe the Blockchain Hype: Examining the Weaknesses and Risks*, ZDNET (Apr. 13, 2016, 9:22 PM), http://www.zdnet.com/article/dont-believe-the-blockchain-hype-examining-its-weaknesses-and-risks/ [https://perma.cc/G5UM-S7S6]; Rob Marvin, *Blockchain in 2017: The Year of Smart Contracts*, PC MAG. (Dec. 12, 2016, 2:48 PM), http://www.pcmag.com/article/350088/blockchain-in-2017-the-year-of-smart-contracts [https://perma.cc/SX5Z-EZXX]; Laura Shin, *Looking to Integrate Blockchain into Your Business? Here's How*, FORBES (May 10, 2016, 8:00 AM), https://www.forbes.com/sites/laurashin/2016/05/10/looking-to-integrate-blockchain-into-your-business-heres-how/#715aa8911a15 [https://perma.cc/PZ2D-KMKB].

87. *See, e.g.*, NORTON ROSE FULBRIGHT, SMART CONTRACTS: CODING THE FINE PRINT 24 (2016), https://www.accmeetings.com/AM16/faculty/files/Article_471_734F_NRF24493_Smart_Contracts_V6_LR.PDF [https://perma.cc/6CT7-7H4B]; Richad Howlett, *A Lawyer's Perspective: Can Smart Contracts Exist Outside the Legal Structure?*, BITCOIN MAG. (July 11, 2016, 2:52 PM), https://bitcoinmagazine.com/articles/a-lawyer-s-perspective-can-smart-contracts-exist-outside-the-legal-structure-1468263134/ [https://perma.cc/92RN-XZV7]; Ted Mlynar & Ira Schaefer, *Blockchain Smart Contracts Need a New Kind of Due Diligence*, COINDESK (Sept. 21, 2016, 3:33 PM), https://www.coindesk.com/blockchain-smart-contracts-need-new-kind-due-diligence/ [https://perma.cc/FCV8-J6M7]; Andy Robinson & Tom Hingley, Opinion, *Smart Contracts: The Next Frontier?*, U. OXFORD: BUS. L. BLOG (May 23, 2016), https://www.law.ox.ac.uk/business-law-blog/blog/2016/05/smart-contracts-next-frontier [https://perma.cc/A8US-VB6D]; Kevin Shook, *Self-Enforcing Smart Contracts Will Change Your Life*, CORP. COUNS. (Feb. 6, 2017), http://www.corpcounsel.com/id=1202778557927/SelfEnforcing-Smart-Contracts-Will-Change-Your-Life?slreturn=20170213090556 [https://perma.cc/CEG3-8U9G].

88. *See, e.g.*, Mlynar & Schaefer, *supra* note 87; Caitlin Moon, *Blockchain for Lawyers 101; Part* 2, LAW TECH. TODAY (Jan. 31, 2017), http://www.lawtechnologytoday.org/2017/01/blockchain-lawyers-101-part-2/ [https://perma.cc/K3MM-M5X5]; Robinson & Hingley, *supra* note 87; Shook, *supra* note 87; Evan Weinberger, *'Smart Contracts' Won't Eliminate Need for Lawyers*, LAW360 (Apr. 6, 2015, 6:46 PM), https://www.law360.com/articles/637833/smart-contracts-won-t-eliminate-need-for-lawyers [https://perma.cc/74XF-9XCN].

void and unenforceable under the law.[89] Contractual legal rules regarding formation, interpretation, conditions, and remedies require substantive adjustments of smart contracts in contract law.[90]

Blockchain evolution in combination with smart contracting also raises legal concerns regarding privacy, data protection, security, and integrity. While blockchain technology itself offers unprecedented genuine data and privacy protection, the storage of blockchain data across a global network of nodes often will not comply with specific consumer protection rules, directives, and guidelines around the world.[91] The existing legal issues arising in the context of sharing platforms[92] demonstrate that future blockchain-enabled sharing services may not be accepted quickly by, or without resistance from, incumbents challenged by new ways of delivering a service or product.

A prominent example, the Decentralized Autonomous Organization (DAO), provides ample evidence pertaining to the outstanding technological and legal issues that surround blockchain technology. DAO was launched in May 2016[93] in the founders'

89. *See* Alan Cohn, Travis West & Chelsea Parker, *Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids*, 1 GEO. L. TECH. REV. 273, 284–85 (2017) (discussing the question of enforceability of smart contracts).

90. Mark Hines & Niklas Holmberg, *Lex Disturbia: The Impact of Smart Contracts on the Law*, LEXOLOGY (Mar. 16, 2016), http://www.lexology.com/library/detail.aspx?g=0b7cf43a-7032-4750-9220-caca5c529281 [https://perma.cc/ZR4C-QWS6]; Matthew McMillan, *Smart Contracts: Legal and Regulatory Challenges of Smart Contracts*, HENRY DAVIS YORK (Dec. 8, 2016), https://www.hdy.com.au/our-insights/insights/legal-regulatory-challenges-of-smart-contracts [https://perma.cc/6EJC-FY5T]; Martin von Haller Gronbaek, *Blockchain 2.0, Smart Contracts and Challenges*, BIRD & BIRD (June 16, 2016), https://www.twobirds.com/en/news/articles/2016/uk/blockchain-2-0—smart-contracts-and-challenges [https://perma.cc/L3UE-NE3G]; Kate H. Withers, *Smart Contracts: Opportunties and Legal Risks in FinTech*, NAT'L L. REV. (Nov. 8, 2016), http://www.natlawreview.com/article/smart-contracts-opportunities-and-legal-risks-fintech [https://perma.cc/379R-J2BT].

91. *See, e.g.*, Andres Guadamuz & Chris Marsden, *Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies*, FIRST MONDAY (Dec. 7, 2015), http://firstmonday.org/article/view/6198/5163 [https://perma.cc/XNG4-P585]. For a good overview of the complexities of the global regulation of blockchain technology, see Javier Sebastian Cermeño, *Blockchain in Financial Services: Regulatory Landscape and Future Challenges for Its Commercial Application* 6–18 (BBVA Research, Working Paper No. 16/20, 2016), https://www.bbvaresearch.com/wp-content/uploads/2016/12/WP_16-20.pdf [https://perma.cc/LN9C-4VHC]. For a summary of international law actions relating to digital currencies, see *Digital Currencies: International Actions and Regulations*, PERKINS COIE, https://www.perkinscoie.com/en/news-insights/digital-currencies-international-actions-and-regulations.html [https://perma.cc/634Z-AR7P] (last updated May 2017).

92. Examples include Uber (cars), Airbnb (lodging), ETSY (marketplace), Kickstarter (crowdfunding), Lending Club (lending), Open Table (dining), SoundCloud (music), DogVacay (pet vacation), and Liquid (bike sharing).

93. Christoph Jentzsch, the co-founder of the IoT company *Slock.it*, was one of the "key founders" of DAO, a new style venture capital fund. Carla L. Reyes et al., *Distributed Governance*, 59 WM. & MARY L. REV. ONLINE 1, 4–5 (2016), http://wmlawreview.org/sites/default/

attempt to set up a corporate-type organization without using a conventional corporate structure. The founders' central idea was that the wisdom of the crowd would lead to smarter and more game-changing investment decisions.[94] DAO operated as a kind of venture capital fund managed directly by its token holders.[95]

The DAO governance structure was built on software code and smart contracts that ran on the public decentralized blockchain platform Ethereum.[96] DAO did not have a physical address, as it was merely computer code. And it was not an organization with a traditional hierarchy known from traditional corporate structures, where authority and empowerment flow downwards from investors and shareholders through a board of directors to management and eventually staff.[97] Indeed, DAO had no directors, managers, or employees. Because a series of smart contracts granted DAO token holders voting rights,[98] the blockchain-based smart contracts imitated the role of articles of association or bylaws. Because the DAO code was open-source, the token holders would vote not only on investment proposals but also on any change made to the code.[99] Accepted

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files/Reyes%2C%20Packin%2C%20Edwards%20-%20Distributed%20Governance_0.pdf [https://perma.cc/BK6G-ASV3]; Shah Gilani, *This Fintech Experiment Could Be Huge… Here's What You Need to Know Before You Invest*, WALL ST. INSIGHTS & INDICTMENTS (May 27, 2016), http://wallstreetinsightsandindictments.com/2016/05/this-fintech-experiment-could-be-huge-heres-what-you-need-to-know-before-you-invest/ [https://perma.cc/9K8F-9NTC]; Cade Metz, *The Biggest Crowdfunding Project Ever—The DAO—Is Kind of a Mess*, WIRED (June 6, 2016, 7:00 AM), https://www.wired.com/2016/06/biggest-crowdfunding-project-ever-dao-mess/ [https://perma.cc/2AKX-RE8B].

94. *See, e.g.*, Reyes et al., *supra* note 93, at 5; Kyle Torpey, *The Wisdom (or Lack Thereof) of the DAO*, AM. BANKER (June 1, 2016, 4:10 PM), https://www.americanbanker.com/opinion/the-wisdom-or-lack-thereof-of-the-dao [https://perma.cc/J44Z-97AM].

95. *See, e.g.*, Reyes et al., *supra* note 93, at 5; Seth Bannon, *The Tao of "The DAO" or: How the Autonomous Corporation Is Already Here*, TECH CRUNCH (May 16, 2016), https://techcrunch.com/2016/05/16/the-tao-of-the-dao-or-how-the-autonomous-corporation-is-already-here/ [https://perma.cc/TWJ8-LLBT].

96. Klint Finley, *A $50 Million Hack Just Showed That the DAO Was All Too Human*, WIRED (June 18, 2016, 4:30 AM), https://www.wired.com/2016/06/50-million-hack-just-showed-dao-human/ [https://perma.cc/C8F2-46DG]; Brent Miller, *Smart Contracts and the Role of Lawyers (Part 2)—About "Code Is Law"*, BIG L. KM (Oct. 22, 2016), https://biglawkm.com/2016/10/22/smart-contracts-and-the-role-of-lawyers-part-2-about-code-is-law/ [https://perma.cc/L5S2-MNW7].

97. Carla L. Reyes et al., *Companies Face Risk and Opportunity with Distributed Governance Structures*, COLUM. L. SCH.: CLS BLUE SKY BLOG (Jan. 19, 2017), http://clsbluesky.law.columbia.edu/2017/01/19/companies-face-risk-and-opportunity-with-distributed-governance-structures/ [https://perma.cc/2N5J-S723].

98. *Id.*

99. Michael del Castillo, *The DAO Crisis: Or How Vigilantism and Blockchain Democrary Became the Best Hope for Burned Investors*, COINDESK (July 13, 2016, 4:05 PM), http://www.coindesk.com/author-daos-original-code-minimize-regulatory-backlash/ [https://perma.cc/57L6-MJXD]; Metz, *supra* note 93.

proposals would also be backed by a software code defining the relationship (in terms of rights, obligations, and performance metrics) between DAO and the funded proposals.

During a crowdfunding campaign in May 2016, all investors could become DAO participants by purchasing DAO tokens.[100] DAO raised more than $168 million from approximately ten thousand "investors."[101]

Alas, things went terribly wrong with DAO. Fundamental flaws in the DAO code enabled hackers to transfer one-third of the total funds to a subsidiary account.[102] This hack, in combination with additional technological limitations, brought down the DAO initiative.[103]

Open legal issues pertaining to DAO need to be addressed before future DAO setups can operate seamlessly.[104] Such legal issues include the following:

(1) What legal regime governs the issuance of DAO tokens?

(2) Are minority DAO token holders protected and, if so, how?

(3) Are DAOs subject to taxation?

(4) Do DAO smart contracts create legally binding obligations?

(5) Who owns the intellectual property rights generated by the crowd-funded proposals?

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100. *See, e.g.*, Gilani, *supra* note 93; Giulio Prisco, *The DAO Raises More Than $117 Million in World's Largest Crowdfunding to Date*, BITCOIN MAG. (May 16, 2016, 2:09 PM), https://bitcoinmagazine.com/articles/the-dao-raises-more-than-million-in-world-s-largest-crowdfunding-to-date-1463422191/ [https://perma.cc/KU6R-JRB5].

101. Metz, *supra* note 93.

102. Nathaniel Popper, *A Hacking of More Than $50 Million Dashes Hopes in the World of Virtual Currency*, N.Y. TIMES (June 17, 2016), https://www.nytimes.com/2016/06/18/business/dealbook/hacker-may-have-removed-more-than-50-million-from-experimental-cybercurrency-project.html [https://perma.cc/HN7J-7U8K].

103. *See, e.g.*, *Not-So-Clever Contracts*, *supra* note 64; Paul Vigna, *Fund Based on Digital Currency Ethereum to Wind Down After Alleged Attack*, WALL ST. J. (June 17, 2016, 7:27 PM), https://www.wsj.com/articles/investment-fund-based-on-digital-currency-to-wind-down-after-alleged-hack-1466175033?mod=rss_Technology [https://perma.cc/NE8E-TJCX].

104. *See, e.g.*, Reuben Bramanathan, *Blockchains, Smart Contracts and the Law*, COINBASE BLOG (June 24, 2016), https://blog.coinbase.com/blockchains-smart-contracts-and-the-law-709c5b4a9895#.qnnsleuz5 [https://perma.cc/G3K9-8RYC]; Drew Hinkes, *A Legal Analysis of the DAO Exploit and Possible Investor Rights*, BITCOIN MAG. (June 21, 2016, 11:57 AM), https://bitcoinmagazine.com/articles/a-legal-analysis-of-the-dao-exploit-and-possible-investor-rights-1466524659/ [https://perma.cc/2AMC-GMFM]; Tanaya Macheel, *The DAO Might Be Groundbreaking, But Is It Legal?*, AM. BANKER (May 19, 2016, 3:12 PM), https://www.americanbanker.com/news/the-dao-might-be-groundbreaking-but-is-it-legal [https://perma.cc/BDC9-X6YE]; *see also* CLYDE & CO., BLOCKCHAIN AND THE LAW: AN UNCHARTED LANDSCAPE 3 (2016), http://www.clydeco.com/uploads/Files/CC010565_Blockchain_brochure_10-06-16_LOWRES.PDF [https://perma.cc/2M6Z-T8S4] ("While uncertainty remains, the courts will seek to give effect to some kind of oversight and legally recognised status to DAOs and distributed ledgers.").

(6) How are conflicts resolved between DAO token holders, the DAO itself, and the proposals?

## IV. EDUCATING THE TWENTY-FIRST CENTURY LAWYER

Law schools need to develop approaches to enable their students to get ready for the increasingly disrupted legal world of the twenty-first century. The exponentially increasing disruptive innovation worldwide will cause clients to frequently ask legal professionals to deal with issues that lawyers cannot fully understand, within a legal framework that does not always offer clear or helpful answers. Because of these challenges facing the practice of law, law schools have an obligation to help their students evaluate possible niches in the future legal market.

Increasing law students' capacity to better understand the challenges of today's society can enable them to provide more effective service to clients in the economy of the future. For example, a law school course on "Disruptive Innovation," such as the one taught by the Authors,[105] not only helps law students appreciate emerging technology and the importance of software code, but, more importantly, provides students with the resources and capacities to help them become the much-needed legal professionals in the decentralized world.

Law schools need to find ways to educate lawyers who can add value in helping clients and society adjust to an increasingly technological environment, rather than lawyers who will create unnecessary or unwise restrictions on it.[106] Such restrictions will not stop innovations and developments in technology. Take, for example, Spotify, the online music streaming service that—instead of emphasizing the illegality of its main competitor's (Napster's) business model of peer-to-peer music sharing[107]—found ways to charge

105. *Disruptive Innovation*, WULF KAAL, https://wulfkaal.com/courses/disruptive-innovation-why-lawyers-matter/ [https://perma.cc/3ZRP-SF4Z] (last visited Oct. 10, 2017); *see* Wulf Kaal, *Future of Innovation and Law*, MEDIUM (Jan. 12, 2017), https://medium.com/@wulfkaal/future-of-innovation-and-law-535d7ef739a#.uzqta5n8l [https://perma.cc/3TGU-JJJU] (describing the purpose of the Disruptive Innovation course).

106. While the Authors believe that leading technologists and law professors are becoming increasingly equipped to help law students get ready for the future practice of law, the emphasis in law school hiring on constitutional law, among other less disrupted legal fields and disciplines, impedes the necessary innovation in legal education. *See* Kaal, *supra* note 105.

107. Napster was a peer-to-peer file sharing company that allowed users to share digital music files in the MP3 format over the Internet for free. A&M Records v. Napster, Inc., 239 F.3d 1004, 1011 (9th Cir. 2001). In 2000, the Recording Industry of America sued Napster under the Digital Millennium Copyright Act for violating copyright. *Id.* Napster lost the case at both the district and appellate court levels, and when it was unable to comply with the district court order

consumers without sacrificing the convenience and accessibility of the streaming service. Similarly, instead of using legal arguments and concerns as barriers to innovation, law schools need to find ways to educate the lawyers of the twenty-first century to find ways to encourage friction-free interactions and conversations and the creative exchange of assets and services.

Legal Tech, and especially blockchain ledger technology, presents tremendous opportunities for law students. Despite the blockchain's disruptive properties,[108] legal professionals can in fact benefit from the technology if they focus on the opportunities to enter into contracts in a cheaper and more secure way. Traditional lawyers too often bring a traditional legal "tool kit" to solving the legal problems of the twenty-first century, which often leads to disastrous outcomes. This approach might have worked adequately when innovation cycles were longer, but in a world where innovations occur exponentially, the traditional legal tool kit is regularly out of touch with the radically different needs of a decentralized world. Most lawyers and law industry representatives underestimate the implications of the emerging Legal Tech.[109] Particularly in the case of blockchain technology, law schools should raise awareness of the opportunities associated with the technology for their graduates. In order to advise on blockchain contracts, law students and lawyers have to become familiar with the technology and learn at least basic coding as it pertains to Ethereum smart contracts.[110]

Law students' capacity to work in multidisciplinary teams will take on a much greater significance in the future. Lawyers are

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to block infringing uses, it was forced to shut down. *See generally* Corey Rayburn, Note, *After* Napster, 6 VA. J.L. & TECH. 16 (2001); Matt Richtel, *The* Napster *Decision: The Overview; Appellate Judges Back Limitations on Copying Music*, N.Y. TIMES (Feb. 13, 2001), http://www.nytimes.com/2001/02/13/business/napster-decision-overview-appellate-judges-back-limitations-copying-music.html [https://perma.cc/9XV4-CCAS]; Erica D. Rowell, *Court Rules Against Napster*, ABC NEWS (Feb. 12, 2001), http://abcnews.go.com/Technology/story?id=98767&page=1 [https://perma.cc/T7VQ-LALY].

108. *See supra* Part III.

109. Anecdotal evidence based on discussions with law firm and corporate lawyers—including lawyers in Asia, Europe, and the United States, among other anecdotal evidence—indicates that very few legal professionals are aware of developments in Legal Tech. Typical reactions to information about the opportunities these new technologies present involve giving several reasons why blockchain-based smart contracts and other developments are unlikely to fundamentally change the need for lawyers or the way that lawyers work.

110. David Colarusso, *Hello, World! Should Attorneys Learn to Code?*, LAWYERIST (Aug. 25, 2016), https://lawyerist.com/hello-world-attorneys-learn-code/ [https://perma.cc/M4NY-H6XJ]; Krause, *supra* note 17; *Wolfram Alpha Founder: Lawyers Should Code and Contracts Be Computable*, ARTIFICIAL LAW. (Oct. 14, 2016), https://www.artificiallawyer.com/2016/10/14/wolfram-alpha-founder-lawyers-should-code-and-contracts-be-computable/ [https://perma.cc/4CYA-AKEY].

becoming increasingly involved in complex, nonstandard legal tasks.[111] The automation and standardization of high-volume legal tasks will further transform the role of lawyers and other legal professionals. Big data and AI will make Legal Tech solutions more effective, networked, and intelligent. Legal work such as contract drafting, legal risk management, and dispute resolution will increasingly be outsourced to technology and robots.[112] Lawyers and legal advisors will increasingly assume the role of project managers and business advisors.

For law students, the growth of multidisciplinary teams in the technology-based society and economy means that they will be required to work closely not only with accountants or fiscal advisors but also and ever increasingly with engineers, designers, and architects. Crucially, lawyers and legal advisors will find themselves operating as a bridge between the diverse range of actors who must now work together in dealing with increasingly complex challenges. A business-oriented perspective means that legal professionals are better placed to help their clients maximize efficiency, enhance client services, and reduce costs.

Specifically, law schools need to enable their students to work in interdisciplinary teams with software engineers. It is essential for law students to gain a greater appreciation of the means by which code can be utilized and integrated in legal contexts. Legal Tech startups and software engineers are increasingly using predictive coding and algorithms for legal applications.[113] Lawyers benefit from

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111. For examples of law firms that have established multidisciplinary practices, see Laura Shin, *As Bitcoin Technology Makes Inroads, One Law Firm Launches Multidisciplinary Blockchain Practice*, FORBES (Aug. 9, 2016, 8:00 AM), https://www.forbes.com/sites/laurashin/2016/08/09/as-bitcoin-technology-makes-inroads-one-law-firm-launches-multidisciplinary-blockchain-practice/#41044fc42dab [https://perma.cc/76DX-UP32]; *Steptoe's Blockchain Team Expands into Multidisciplinary Practice*, STEPTOE & JOHNSON (Aug. 9, 2016), http://www.steptoe.com/news-2342.html [https://perma.cc/3YDR-9HZT].

112. Dana Remus & Frank S. Levy, *Can Computers Be Lawyers? Computers, Lawyers, and the Practice of Law* 22, 30–31, 34 (Spencer Found., Working Paper, 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2701092 [https://perma.cc/37C4-UCDN]; Jeff Bennion, *Are Robots Going to Take Our Legal Jobs?*, ABOVE THE LAW (June 21, 2016, 2:02 PM), http://abovethelaw.com/2016/06/are-robots-going-to-take-our-legal-jobs/ [https://perma.cc/RLQ8-RQB4]; Michael Cross, *Role of Artificial Intelligence in Law*, RACONTEUR (Feb. 19, 2015), https://www.raconteur.net/business/time-for-technology-to-take-over [https://perma.cc/LJW6-VTXV]; Chris Holder & Vikram Khurana, *Robotics Process Automation and Outsourcing*, LAWYERISSUE (May 16, 2016), http://www.lawyerissue.com/robotics-process-automation-and-outsourcing/ [https://perma.cc/M9K5-PBH7].

113. *See, e.g.*, Crowded Ocean, *New Startup Marketing Terms for July*, CROWDED OCEAN (July 19, 2012), http://www.crowdedocean.com/blog/tag/predictive-coding/ [https://perma.cc/JY65-MJBE]; *Start Up or Predictive Coding Giant? Merger and Acquisition Attorneys in San Antonio Familiar with Equivio Technology Know the Real Story*, SHUMWAY VAN (Oct. 24, 2017),

such algorithmic technology applications in the context of e-discovery, contract drafting, and legal research, among many others.[114] Curricular changes, including the introduction of a course on "coding for lawyers," can help facilitate a greater understanding of interdisciplinary skill requirements for students. The purpose of a course on coding for lawyers would be for students to gain a general conceptual understanding of the possible applications of innovative and disruptive technologies and their algorithmic implementations in the context of law.

Law school initiatives should help students evaluate the most important legal applications of algorithmic technology solutions and explain how software engineers are applying code to provide efficient legal solutions. Students should learn basic mathematical principles for coded technology solutions in law—including legal applications of big data, AI, machine learning, and blockchain technology. Based on mathematical foundations, students should develop basic conceptual coding skills that enable them to engage with representatives of the hard sciences on a daily basis and develop client solutions in interdisciplinary teams.

## V. CONCLUSION

Lawyers and law schools cannot afford to ignore the changes discussed in this Article. The legal profession is one of the most disrupted sectors of the consulting industry today. Legal Tech, AI, blockchain technology, the sharing economy, and platform companies are changing legal practice. Traditional legal assumptions, doctrines, and concepts of law and governance have to be reevaluated in light of the impending disruptive changes. Law schools' attempts to innovate in order to get their students practice ready for the twenty-first century, and equipped with the necessary skill set to operate effectively in the new world of disruptive innovation, require experimentation with new ways and a more creative and innovative approach to the law school curriculum. Legal Tech, and especially blockchain ledger technology, presents tremendous opportunities for law students wishing to get practice ready for the twenty-first century.

While blockchain-centered legal jobs of the future will be the centerpiece of any law school reform agenda, the future of

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https://www.attorneysanantonio.com/single-post/Start-up-or-predictive-coding-giant-Merger-and-acquisition-attorneys-in-San-Antonio-familiar-with-Equivio-technology-know-the-real-story [https://perma.cc/99GN-GU5V]; Troutman Sanders LLP, *Startups Seek to Revolutionize Due Diligence*, INFO. INTERSECTION (Jan. 25, 2013), http://www.informationintersection.com/2013/01/startups-seek-to-revolutionize-due-diligence/ [https://perma.cc/CW7F-4SWB].

114. *See supra* notes 23 and 112 and accompanying text.

non-blockchain-centered legal employment is equally important. For instance, future lawyers will have to be able to distinguish blockchain-based contracting from traditional legal contracting and advise clients on optimal blockchain and non-blockchain contracting allocations. Certain parts of larger legal arrangements, contracts, and dealmaking will certainly be "blockchainable" in the future, providing trust, efficiency, cost savings, and legal clarity. Other parts of dealmaking and other legal tasks, however, will continue to require the ambiguity and flexibility of the law. For the parts of dealmaking and the other legal tasks that are non-blockchainable, the role for other, non-blockchainable agents of trust may expand. It seems possible that the blockchain-driven disintermediation of law itself creates additional legal tasks that require human lawyer input.