

# THE VITRUVIAN LAWYER: HOW TO THRIVE IN AN ERA OF AI AND QUANTUM TECHNOLOGIES

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## ABSTRACT

*We live in an exciting and tumultuous time as artificial intelligence (AI), and quantum technologies unleash more transformations than the agrarian, industrial, and computer revolutions combined. This new age, popularly called “The Fourth Industrial Revolution,” describes the convergence of increasingly powerful and capable digital and robotic technologies.<sup>1</sup>*

*As human-machine teaming becomes the norm, new and mid-career lawyers should actively cultivate the uniquely human personal and professional skills that machines cannot supplant. A short list of these skills includes curiosity, cognitive range (depth and breadth), creativity, and emotional intelligence. In their work as knowledge entrepreneurs and inventive problem solvers, modern lawyers must also continuously augment and leverage their education, training, and insights to spot, imagine, generate, and deliver client value.*

*Because designing and crafting one’s career in a time of flux presents a myriad of challenges, a role model to emulate can provide both guidance and inspiration. Five hundred years after his death, Leonardo da Vinci remains the quintessential Renaissance Man, and a study of his career yields many valuable lessons for twenty-first-*

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<sup>1</sup> See Klaus Schwab, *The Fourth Industrial Revolution: What It Means, How to Respond*, WORLD ECON. F. (Jan. 14, 2016), <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond> [https://perma.cc/4ZTZ-VQUK].

century lawyers.

*Vitruvian Lawyers will thrive in an era of AI and quantum technologies because they will vigorously stretch their human curiosity, cognitive range, and creativity to achieve apex imaginator status.<sup>2</sup> This Article explores how to become one.*

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<sup>2</sup> Merriam-Webster defines the noun "imaginator" as "one that imagines" and "a person who creates (as an artistic or intellectual work)." *Imaginator*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/imaginator> [https://perma.cc/Y9BT-H448].

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## I. INTRODUCTION

*“Nothing is so painful to the human mind as great and sudden change.”*

– Mary Wollstonecraft Shelley, *Frankenstein*<sup>3</sup>

We live in an exciting and tumultuous time as artificial intelligence (AI) and, eventually, quantum technologies unleash more transformations than the agrarian, industrial, and computer revolutions combined.<sup>4</sup> This new age, popularly called “The Fourth Industrial Revolution,” not only describes the convergence of increasingly powerful and capable cognitive and robotic technologies,<sup>5</sup> but it also marks the end of technologies exclusively designed and developed from the “wetware” in our analog, parallel human brains.<sup>6</sup>

As these cognitive technologies improve their capabilities over time, they

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<sup>3</sup> MARY WOLLSTONECRAFT SHELLEY, *FRANKENSTEIN: OR, THE MODERN PROMETHEUS* 195 (James Rieger ed., 1974, 1982) (1818).

<sup>4</sup> KLAUS SCHWAB, *THE FOURTH INDUSTRIAL REVOLUTION* 6–7 (2016); Peter Diamandis, *A.I. and Technology Convergence*, HUFFINGTON POST (Feb. 14, 2016, 3:42 PM), [https://www.huffpost.com/entry/ai--technology-convergen\\_b\\_9233220](https://www.huffpost.com/entry/ai--technology-convergen_b_9233220) [<https://perma.cc/H9XD-RBD4>] (describing AI advancements); Peter Diamandis, *Robotics and Technology Convergence*, HUFFINGTON POST (Mar. 14, 2016, 4:01 PM), [https://www.huffingtonpost.com/peter-diamandis/robotics--technology-conv\\_b\\_9462664.html](https://www.huffingtonpost.com/peter-diamandis/robotics--technology-conv_b_9462664.html) [<https://perma.cc/ZS67-A3CB>] (examining the exponential growth and “convergence of artificial intelligence, sensing, actuator technologies and the mobile phone revolution”); THOMAS H. DAVENPORT, *THE AI ADVANTAGE: HOW TO PUT THE ARTIFICIAL INTELLIGENCE REVOLUTION TO WORK* 29 (2018) (quoting Gill Pratt, Toyota Research Institute) (explaining that, as robots increasingly learn from and communicate with each other, robot intelligence “will mushroom” in a “Cambrian explosion” of smart machines).

<sup>5</sup> See SCHWAB, *supra* note 4, at 7; Kathleen Walch, *Why Cognitive Technology May Be a Better Term Than Artificial Intelligence*, FORBES (Dec. 22, 2019, 9:58 AM), <https://www.forbes.com/sites/cognitiveworld/2019/12/22/why-cognitive-technology-may-be-a-better-term-than-artificial-intelligence/#2f14d92f197c> [<https://perma.cc/KPA5-ATU7>].

<sup>6</sup> FLYNN COLEMAN, *A HUMAN ALGORITHM: HOW ARTIFICIAL INTELLIGENCE IS REDEFINING WHO WE ARE* xiv–xv (2019); Daniel Dennett, *The Software/wetware Distinction, Comment on “Toward a Computational Framework for Cognitive Biology: Unifying Approaches from Cognitive Neuroscience and Comparative Recognition” by W. Tecumseh Fitch*, 11 *PHYSICS LIFE REVS.* 367, 367–68 (2014), <https://doi.org/10.1016/j.plrev.2014.05.009> [<https://perma.cc/GP64-AWFN>] (“At least large parts of the human mind *are* (like) programs running on the wetware [] of teams of neurons.”); DANIEL C. DENNETT, *FROM BACTERIA TO BACH AND BACK: THE EVOLUTION OF MINDS* 154 (2017) (“Brains are analog; computers are digital.”). Dennett then observes that human brains are parallel and computers are serial processors. *Id.* at 155. See also Frank Wilczek, *Three Observations on Artificial Intelligence*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 121, 121 (John Brockman ed., 2015) (“Brains use a highly parallel architecture and mobilize many noisy analog units (i.e., neurons) firing simultaneously, while most computers use von Neumann architecture, with serial operation of much faster digital units.”).

will continue to disrupt and reprogram how we humans work and think.<sup>7</sup> Lawyers will not receive a “free pass”<sup>8</sup> since “AI is directed at high-skilled tasks”<sup>9</sup> that were once in the exclusive domain of highly educated, well-paid, white-collar workers.<sup>10</sup> The accelerating—and exponential—advancements in artificial or “synthetic”<sup>11</sup> intelligence may also cause personal and economic distress as slow-adapting humans find themselves left behind when stable, full-time, lifelong jobs increasingly disappear.<sup>12</sup> These current concerns echo Mary Shelley’s nineteenth-century observation that we often feel pain when

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<sup>7</sup> See Dana Remus & Frank Levy, *Can Robots Be Lawyers?: Computers, Lawyers, and the Practice of Law*, 30 GEO. J. LEGAL ETHICS 501, 505 (2017) (asserting “computers are changing—not simply replacing—the work of lawyers”); COLEMAN, *supra* note 6, at xvi (describing how humans “are merging with our machines, delegating more decision-making to them without acknowledging how much our own cognitive abilities are becoming enmeshed with theirs”). Professor Coleman notes that “progress often brings about mixed results, affecting our freedom, happiness, and well-being in complicated ways.” *Id.* at 8.

<sup>8</sup> MARK MURO ET AL., WHAT JOBS ARE AFFECTED BY AI? BETTER-PAID, BETTER-EDUCATED WORKERS FACE THE MOST EXPOSURE 4, 12, 23 (2019), [https://www.brookings.edu/wp-content/uploads/2019/11/2019.11.20\\_BrookingsMetro\\_What-jobs-are-affected-by-AI\\_Report-Muro-Whiton-Maxim.pdf](https://www.brookings.edu/wp-content/uploads/2019/11/2019.11.20_BrookingsMetro_What-jobs-are-affected-by-AI_Report-Muro-Whiton-Maxim.pdf) [<https://perma.cc/FL4U-ED9E>] [hereinafter MURO ET AL., WHAT JOBS ARE AFFECTED BY AI?] (noting how robots capable of performing routine factory and office work have displaced blue- and pink-collar workers).

<sup>9</sup> Michael Webb, *The Impact of Artificial Intelligence on the Labor Market* 4, 46 (Jan. 2020) (unpublished manuscript) (on file with Stanford University), [https://web.stanford.edu/~mww/webb\\_jmp.pdf](https://web.stanford.edu/~mww/webb_jmp.pdf) [<https://perma.cc/43YB-FFYW>]. Webb uses the term AI “to refer to machine learning algorithms” and specifically supervised and reinforcement machine learning algorithms. *Id.* at 35.

<sup>10</sup> See *id.* at 4, 46.

<sup>11</sup> MELANIE MITCHELL, *ARTIFICIAL INTELLIGENCE: A GUIDE FOR THINKING HUMANS* 20 (2019) (explaining that the definition of artificial intelligence is not precise, but it is broadly defined as “a branch of computer science that studies the properties of intelligence by synthesizing intelligence”). AI expert and Stanford researcher and lecturer Jerry Kaplan explains that “synthetic intellects” consist of machine learning, big data, algorithms, etc. JERRY KAPLAN, *HUMANS NEED NOT APPLY: A GUIDE TO WEALTH AND WORK IN THE AGE OF ARTIFICIAL INTELLIGENCE* 134 (2015). Neil Gershenfeld, *Really Good Hacks*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 264, 264 (John Brockman ed., 2015) (describing the exponential growth of AI technologies).

<sup>12</sup> THOMAS FRIEDMAN, *THANK YOU FOR BEING LATE: AN OPTIMIST’S GUIDE TO THRIVING IN THE AGE OF ACCELERATIONS* 33 (2016) (describing Eric “Astro” Teller’s, the CEO of Google’s X research and development lab, concerns that humans cannot keep pace with technology change—which causes “cultural angst”); SCHWAB, *supra* note 4, at 12–13, 43 (describing worker disillusionment and job loss fears). COLEMAN, *supra* note 6, at 18, 20–21 (describing some adverse consequences of technology change on humans such as information overload, reduced cognitive capacity, and mental health challenges). Professor Coleman notes, “The accelerating pace of change has left us with less and less time to assimilate before the next changes arrive.” *Id.* at 21. Peter Norvig, *Design Machines To Deal With The World’s Economic Complexity*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 175, 177 (John Brockman ed., 2015) (noting that because of AI technologies, “We may be in a period of much more rapid change that could alter the notion of a full-time job (a notion only a few centuries old)”). See generally Hilary G. Escajeda, *Zero Economic Value Humans?*, 10 WAKE FOREST J.L. & POL’Y 129 (2020).

substantial change occurs suddenly.<sup>13</sup>

To alleviate some human suffering, this Article explores strategies for how lawyers—as knowledge entrepreneurs<sup>14</sup>—can emotionally,<sup>15</sup> intellectually, creatively, and economically thrive in a “volatile” era where digital disruption represents the norm rather than the exception.<sup>16</sup> The term “inflection point” describes this uncertain time where flexibility and innovation—instead of rigidity and tradition—can yield professional dividends.<sup>17</sup> In his book, *Only The Paranoid Survive*, former Intel CEO Andrew Grove explains, “Career inflection points caused by a change in the environment do not distinguish between the qualities of the people that they dislodge by their force.”<sup>18</sup> He then advises that surviving an inflection point involves three steps: (1) clarity on where you are heading, (2) conviction and determination to meet your goals, and (3) resolute forward movement to seize the next opportunity.<sup>19</sup>

To navigate career and legal industry inflection points, this Article examines how we can become Vitruvian Lawyers by amplifying our thinking “superpower[s]”<sup>20</sup> and current status as “apex cogitators”<sup>21</sup> to cement a

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<sup>13</sup> SHELLEY, *supra* note 3; *see also* FARAI CHIDEYA, THE EPISODIC CAREER: HOW TO THRIVE AT WORK IN THE AGE OF DISRUPTION (2016) (epigraph) (quoting Buddhist monk and teacher Thích Nhất Hạnh) (“The way you support yourself can be an expression of your deepest self, or it can be a source of suffering for you and others.”). *See generally* DAVID L. BLUSTEIN, THE IMPORTANCE OF WORK IN AN AGE OF UNCERTAINTY: THE ERODING WORK EXPERIENCE IN AMERICA (2019).

<sup>14</sup> The term “knowledge entrepreneur” represents a twenty-first-century update to Peter Drucker’s concept of a “knowledge worker” first articulated in his 1959 book, *Landmarks of Tomorrow*. PETER DRUCKER, LANDMARKS OF TOMORROW (1959); Rick Wartzman, *What Peter Drucker Knew About 2020*, HARV. BUS. REV. (Oct. 16, 2014), <https://hbr.org/2014/10/what-peter-drucker-knew-about-2020> [<https://perma.cc/MY32-6372>].

<sup>15</sup> Humans “use emotions as well as logic to construct concepts that help us understand what we see and hear.” GARY SMITH, THE AI DELUSION 41 (2018).

<sup>16</sup> *See* CHIDEYA, *supra* note 13, at 2 (explaining that because “we are living in an age of rapid disruption,” the ability to navigate and evolve are essential life skills). Professor Chideya observes, “We can barely adjust to a new reality before a *new* reality comes along. What we learned about work from our parents and family, or even our own past careers, might not work for us anymore.” *Id.* She writes, “If I had to sum up the job market today in one word, it would be *volatile*, the result of technological and economic disruptions.” *Id.* at 25.

<sup>17</sup> ANDREW GROVE, ONLY THE PARANOID SURVIVE: HOW TO EXPLOIT THE CRISIS POINTS THAT CHALLENGE EVERY COMPANY 189 (1996) (“Just as a strategic inflection point marks a crisis point for a business, a career inflection point results from a subtle but profound shift in the operating environment, where the future of your career will be determined by the actions you take in response.”).

<sup>18</sup> *Id.* at 185.

<sup>19</sup> *See id.* at 189, 194–96.

<sup>20</sup> Chris Anderson, *The Hive Mind*, in WHAT TO THINK ABOUT MACHINES THAT THINK 282, 282 (John Brockman ed., 2015) (“Thinking is our super-power. We are not the strongest, fastest, largest or hardest species. But we can model the future and act intentionally to realize the future we model.”).

<sup>21</sup> NICK BOSTROM, SUPERINTELLIGENCE: PATHS, DANGERS, STRATEGIES 79 (2014).

perennial position as apex imaginers.<sup>22</sup> This lifelong process requires growing, nurturing, and cultivating our curiosity, cognitive range, and creativity. It also requires vision, imagination, stretching, and constant forward movement. As Vitruvian Lawyers, we can design human-centered social operating systems (the law)<sup>23</sup> and construct the legal infrastructure for an economy where we work and live with AI, robots, and other technologies.<sup>24</sup>

Specifically, this Article explores how Vitruvian Lawyers in an “information economy”<sup>25</sup> can build the knowledge, skills, and abilities<sup>26</sup> necessary for adapting to the challenges and opportunities of a shifting legal industry. Some emerging challenges to the future practice of law include: (1) human-AI teaming will be the standard operating procedure,<sup>27</sup> and (2) episodic<sup>28</sup> and composite entrepreneurial endeavors—that is, “slash careers”

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<sup>22</sup> *Imaginer*, MERRIAM-WEBSTER, *supra* note 2.

<sup>23</sup> CAITLIN “CAT” MOON, DELTA MODEL LAWYER: LAWYER COMPETENCIES FOR THE COMPUTATIONAL AGE 3 (2019) [hereinafter MOON, DELTA MODEL LAWYER], <https://law.mit.edu/pub/deltamodellawyer> [<https://perma.cc/H7G9-ULTA>] (“[L]aw is human society’s operating system[.]”).

<sup>24</sup> GILLIAN K. HADFIELD, RULES FOR A FLAT WORLD: WHY HUMANS INVENTED LAW AND HOW TO REINVENT FOR A COMPLEX GLOBAL ECONOMY 86, 150–51 (2017) (describing how rapidly changing technologies, markets, and networks have “reduce[d] the half-life of legal solutions,” making it necessary for the development of adaptive and flexible legal infrastructure(s) that can integrate public policy goals with business thinking and economic objectives). Professor Hadfield defines “legal infrastructure” as “not only the legal rules you can find in law books but also the quality—and cost—of the legal advice, planning, and solutions you can access.” *Id.* at 86. She also identifies that “[t]he challenge for the twenty-first century is to figure out how to rejuvenate the process of choosing legal rules so as to meet the demands of a newly globalized and web-enabled world.” *Id.* at 57. SCHWAB, *supra* note 4, at 88 (“And with the fusion of technologies, a key theme of this book, unpredictable dynamics inherently surface, challenging existing legal and ethical frameworks.”).

<sup>25</sup> HADFIELD, *supra* note 24, at 200 (“The information economy is the economy that rewards the ability to play with information. To find where it is hidden and send it across the barriers of language and culture and experience.”).

<sup>26</sup> DENNIS J. SNOWER, BEYOND CAPITAL AND WEALTH 9 (2018), <http://dx.doi.org/10.5018/economics-ejournal.ja.2018-21> [<https://perma.cc/WT7D-HHR3>] (“The workers of the future will require not ‘activation’ of existing skills, but ‘transformation’ of their abilities.”).

<sup>27</sup> AJAY AGRAWAL ET AL., PREDICTION MACHINES: THE SIMPLE ECONOMICS OF ARTIFICIAL INTELLIGENCE 65 (2018) (describing the “cognitive division of labor” and how “the combination of humans and machines generates the best predictions, each complementing the other’s weaknesses”). The authors explain that, when working together, AIs will produce predictions and humans will provide the complements of judgment, data, and action. *Id.* at 212. *See also* SMITH, *supra* note 15, at 179 (noting that when predicting the future, “[i]f you give a number, don’t give a date”); DAVID EPSTEIN, RANGE: WHY GENERALISTS TRIUMPH IN A SPECIALIZED WORLD 23 (2019) (describing chess champion Garry Kasparov’s conclusion that in “freestyle chess” tournaments, “human/computer” teams can play the “highest level of chess ever seen”).

<sup>28</sup> CHIDEYA, *supra* note 13, at 23 (describing how the “‘permanent job’ is yielding to new realities of episodic employment”). She explains that employment may be “sequential: one job or career path following the other” or “doing different types of work simultaneously.” *Id.* To adapt to the changing employment landscape, workers will need to understand how to navigate their “episodic careers” by using “breaks in employment to transition and reposition[.]” *Id.* at 46. *See infra* Part



(e.g., Leonardo da Vinci as artist/engineer/scientist/inventor)—rather than long-term and single-track employment may increasingly represent the norm for knowledge professionals.<sup>29</sup> These challenges may nonetheless produce abundant economic opportunities for “smart creative” and “quirky” lawyers with T-shaped skills, elastic minds, and emotional intelligence<sup>30</sup> who can imagine and design original strategies<sup>31</sup> for solving “wicked” problems.<sup>32</sup>

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V.D.1.a.–b., for discussions about the importance of lifelong learning and upskilling. Particularly relevant to this Article, Professor Chideya also briefly notes the challenges for new lawyers entering the legal field at a time that some call a “lawyer glut.” *Id.* at 19 (citing Paul B. Brown, *A Simple Solution to the Lawyer Glut*, FORBES (Oct. 30, 2013, 5:16 AM), <https://www.forbes.com/sites/actiontrumpseverything/2013/10/30/a-simple-solution-to-the-lawyer-glut/#2b58f19a20ea> [<https://perma.cc/D3M6-CMBE>]). Incidentally, Brown identifies entrepreneurship skills as essential for lawyers (and others) to “thrive in the world of work in the years ahead.” *Id.*

<sup>29</sup> MARCI ALBOHER, ONE PERSON/MULTIPLE CAREERS: THE ORIGINAL GUIDE TO THE SLASH CAREER xiv (2012) (describing how she gave up the practice of law to pursue a composite career as a speaker and author). Alboher writes, “Pursuing multiple vocations is by no means new. From Leonardo da Vinci, artist/inventor, to Benjamin Franklin, whose work included publishing, politics, and emerging technology of his day, slash careerists have always existed at the highest strata of achievement.” *Id.* Alboher emphasizes the importance of an “entrepreneurial streak,” along with “rainmaking” for productive slash careers. *Id.* at 19, 37. Simply put, “a slash career means you are taking charge of the mix of things you do.” *Id.* at 19.

<sup>30</sup> GEOFF COLVIN, HUMANS ARE UNDERRATED: WHAT HIGH ACHIEVERS KNOW THAT BRILLIANT MACHINES NEVER WILL xix (2016) (asserting that “collaboration, creativity, anticipation, empathy, and trust” are the modern “success skills” necessary for lawyers and other knowledge professionals). Colvin argues that the “new high-value skills” are those that make us human, including “sensing the thoughts and feelings of others, working productively in groups, building relationships, solving problems together, [and] expressing ourselves with greater power than logic can ever achieve.” *Id.* at 4. *See also* Mark A. Cohen, *Artificial Intelligence Will Not Replace Lawyers with IQ and EQ*, FORBES (Mar. 20, 2017, 9:12 AM), <https://www.forbes.com/sites/markcohen1/2017/03/20/artificial-intelligence-will-not-replace-lawyers-with-iq-and-eq> [<https://perma.cc/52US-249Y>] [hereinafter Cohen, *Lawyers with IQ/EQ*] (asserting that “only the best lawyers—trusted advisers—have both” IQ and EQ (“people skills”)).

<sup>31</sup> *See* ERIC SCHMIDT & JONATHAN ROSENBERG, HOW GOOGLE WORKS 17 (2014) (labeling a “smart creative” worker as one who will achieve success in the “Internet Century”); *see generally* MELISSA A. SCHILLING, QUIRKY: THE REMARKABLE STORY OF THE TRAITS, FOIBLES, AND GENIUS OF BREAKTHROUGH INNOVATORS WHO CHANGED THE WORLD (2018). EPSTEIN, *supra* note 27, at 102–04 (referencing the work of Northwestern University psychologist Dedre Gentner, Ph.D., the “world’s foremost authority on analogical thinking. . .”). “Deep analogical thinking is the practice of recognizing conceptual similarities in multiple domains or scenarios that may seem to have little in common on the surface. It is a powerful tool for solving wicked problems.” *Id.* at 102–03. LEONARD MLODINOW, ELASTIC: FLEXIBLE THINKING IN A TIME OF CHANGE 6 (2018) (“Elastic thinking is what endows us with the ability to solve novel problems and to overcome the neural and psychological barriers that can impede us from looking beyond the existing order.”). Elastic thinking does not follow a “linear train of steps, as analytical thought does,” rather it springs from “our unconscious minds.” *Id.* at 109 (citing as an example Mary Shelley’s *Frankenstein*).

<sup>32</sup> Ziyad Marar, *Are We Thinking More Like Machines?*, in WHAT TO THINK ABOUT MACHINES THAT THINK 274, 275 (John Brockman ed., 2015) (“Many of the problems we face . . . are ‘wicked’ in that they don’t have right or wrong answers. . . . They are uniquely contextual and

Further, because these Vitruvian Lawyers embrace “perpetual beta” (that is, lifelong learning and upskilling<sup>33</sup>), they will be ideally positioned to shape their careers.<sup>34</sup> Put simply, in this time of technology transformation, multidisciplinary problem-solving lawyers—who combine their curiosity,<sup>35</sup> cognitive range,<sup>36</sup> creativity,<sup>37</sup> and emotional intelligence<sup>38</sup> to generate “novel connections” and original solutions—will possess valuable economic power.<sup>39</sup>

This Article advances Leonardo da Vinci (1452–1519) as the quintessential intellectual and artistic model for new and mid-career lawyers living in a time of rapid technological and economic transformation. As knowledge entrepreneurs, modern lawyers should mirror Leonardo’s curiosity, cognitive range, and creativity. Like Leonardo, we as lawyers should use our minds and senses to explore and discover hidden opportunities and commit to

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have complex overlapping causes that . . . don’t suit narrow computational thinking well.”).

<sup>33</sup> Mark A. Cohen, *Upskilling: Why it Might be the Most Important Word in the Legal Lexicon*, FORBES (Sept. 3, 2019, 5:49 AM), <https://www.forbes.com/sites/markcohen1/2019/09/03/upskilling-why-it-might-be-the-most-important-word-in-the-legal-lexicon> [https://perma.cc/GGQ8-WSHS] (describing how lawyers need to learn new skills to adapt to the “tectonic shift[s] in the workplace caused by technology”) [hereinafter Cohen, *Upskilling*]; SCHWAB, *supra* note 4, at 63 (describing how the “philosophy of ‘always in beta’ (always evolving) will become more prevalent”).

<sup>34</sup> PHILIP E. TETLOCK & DAN GARDNER, *SUPERFORECASTING: THE ART AND SCIENCE OF PREDICTION* 190 (2015) (“Computer programmers have a wonderful term for a program that is not intended to be released in a final version but will be used, analyzed, and improved without end. It is ‘perpetual beta.’”). The authors add that the term “perpetual beta” also describes “the degree to which one is committed to belief updating and self-improvement.” *Id.* at 192.

<sup>35</sup> IAN LESLIE, *CURIOS: THE DESIRE TO KNOW AND WHY YOUR FUTURE DEPENDS ON IT* xx (2014) (“Curiosity starts with the itch to explore.”). Diversive curiosity describes an attraction to the novelties and encourages humans to seek out new experiences and people. *Id.* Epistemic curiosity involves the “quest for knowledge and understanding” and describes the desire for “intellectual and cultural exploration.” *Id.*

<sup>36</sup> EPSTEIN, *supra* note 27, at 34 (describing how “successful [career] adapters were excellent at taking knowledge from one pursuit and applying it creatively to another, and at avoiding cognitive retrenchment”).

<sup>37</sup> AGUSTÍN FUENTES, *THE CREATIVE SPARK: HOW IMAGINATION MADE HUMANS EXCEPTIONAL* 1 (2017) (“Creativity is built on interconnections of ideas, experiences, and imagination.”); MARCUS DU SAUTOY, *THE CREATIVITY CODE: ART AND INNOVATION IN THE AGE OF AI* 3 (2019) (defining “creativity as the drive to come up with something that is new, that is surprising, and that has value”). Value includes something “that changes the way we see or experience things.” *Id.* at 4.

<sup>38</sup> See *infra* Part III.B.; Jacques Bughin et al., *Skill Shift: Automation and the Future of the Workforce*, MCKINSEY & COMPANY (May 2018), <https://www.mckinsey.com/featured-insights/future-of-work/skill-shift-automation-and-the-future-of-the-workforce> [https://perma.cc/MT7G-4QAP] (“The need for some skills, such as technological as well as social and emotional skills, will rise, even as the demand for others, including physical and manual skills, will fall.”).

<sup>39</sup> Scott A. Westfahl & David B. Wilkins, *The Leadership Imperative: A Collaborative Approach to Professional Development in the Global Age of More for Less*, 69 STAN. L. REV. 1667, 1671 (2017) (observing that “clients increasingly expect lawyers to function as multidisciplinary problem-solvers”); ETHAN ZUCKERMAN, *REWIRE: DIGITAL COSMOPOLITANS IN THE AGE OF CONNECTION* 245 (2013).

lifelong “curiosity-experimentation-innovation.”<sup>40</sup> We should also mimic how Leonardo employed his drawing skills to think, reflect, visualize, and improve his designs<sup>41</sup>—akin to the modern process of “iterative prototyping.”<sup>42</sup> By becoming Vitruvian Lawyers in a digital (eventually quantum) economy, we as knowledge entrepreneurs will (1) effectively team with advanced cognitive and computational technologies and (2) engage our uniquely human skills to serve our clients and “improve the delivery of legal services, justice systems, and the law itself.”<sup>43</sup>

Part II opens our study of Leonardo with a description of how the printing press—the Internet of the Renaissance—distributed the books that shaped Leonardo’s worldview. It then identifies Leonardo’s extraordinary eyesight as the wellspring of his creative genius. Next, it traces how Leonardo’s wide-ranging intellectual curiosity, creative adventures,<sup>44</sup> continuous experimentation,<sup>45</sup> and collaborations powered his artistic, scientific, and engineering innovations. It then posits Leonardo’s *Vitruvian Man* as a visual model for modern lawyers. It follows with a quick detour into some of his futuristic technology designs—befitting of the year 2020 and beyond. Part II finishes by highlighting some of Leonardo’s quirky work habits that supported and endangered his professional accomplishments.

Part III explores how the modern practice of law will synergize three types of intelligence: “intellectual (IQ), emotional (EQ), and artificial (AI).”<sup>46</sup>

<sup>40</sup> FUENTES, *supra* note 37, at 255; *see also* EDWARD O. WILSON, *THE ORIGINS OF CREATIVITY* 40–41 (2017) (“The drive for innovation can be viewed as an analogue of genetic evolution, and to good effect. Cultural evolution adapts our species to the inevitable and constantly changing conditions of the environment. Its innovations are the equivalent of mutations in the genome.”).

<sup>41</sup> *See* WALTER ISAACSON, *LEONARDO DA VINCI* 436 (2017).

<sup>42</sup> *See, e.g.,* Robert I. Sutton, *The Power of the Prototyping Mind-Set*, HARV. BUS. REV. (May 21, 2007), <https://hbr.org/2007/05/the-power-of-the-prototyping-m-1> [<https://perma.cc/52N6-ZSE7>]; Roger L. Martin, *Strategy is Iterative Prototyping*, HARV. BUS. REV. (June 6, 2014), <https://hbr.org/2014/06/strategy-is-iterative-prototyping> [<https://perma.cc/3C8E-J593>]; HADFIELD, *supra* note 24, at 223 (describing how prototypes can be used for “feedback” and “to feed innovation”).

<sup>43</sup> DANIEL W. LINNA, JR., *THE FUTURE OF LAW AND COMPUTATIONAL TECHNOLOGIES: TWO SIDES OF THE SAME COIN*, MIT (Dec. 6, 2019), <https://law.mit.edu/pub/thefutureoflawandcomputationaltechnologies> [<https://perma.cc/9ZFY-ZRTR>] (“Computational technologies offer the distinctive capability to embed law, regulations, respect for human rights, and democratic principles directly into processes, products, systems, and platforms by design and default.”).

<sup>44</sup> JAMES H. AUSTIN, *CHASE, CHANCE, AND CREATIVITY: THE LUCKY ART OF NOVELTY* 61 (2003) (“[Creativity] is an adventure. To be fully creative, you must respond positively to the risk and the challenge of exploring new frontiers.”).

<sup>45</sup> *See* ISAACSON, *supra* note 41, at 87 (describing Leonardo’s constant experimentation). Isaacson writes,

As frustrating as it is to us today, there was a poignant and inspiring aspect to Leonardo’s unwillingness to declare a painting done and relinquish it: he knew that there was always more he might learn, new techniques he might master, and further inspirations that might strike him. And he was right. *Id.*

<sup>46</sup> Mark A. Cohen, *Getting Beyond the Tech in Legal Tech*, FORBES (May 3, 2019, 7:57 AM),

It begins by surveying artificial intelligence technologies and the AI-subfield of machine learning. It then explores the uniquely human concept of emotional intelligence, followed by a scan of how these synthetic intelligences will reorganize the legal industry and how human-AI teaming will outperform both humans and machines working alone.<sup>47</sup>

Part IV introduces and illustrates the concept of T-shaped skills. T-shaped skills mirror many of the attributes exhibited by Leonardo da Vinci, which in turn made him a “Renaissance man.”<sup>48</sup> It next considers models for lawyers navigating legal industry shifts. It closes with a brief study of foxes, hedgehogs, and foxhogs.

Part V sculpts the basic form of a “Vitruvian Lawyer” by examining the topics of legal imagination; curiosity, cognitive range, and creativity; lawyers as professional problem solvers; and knowledge entrepreneurship. It also opens a discussion about how to discern the precise tasks clients will request (and be willing to pay for) human lawyers to complete, followed by consideration of how lawyers should respond to these client and market demands when developing their unique portfolios of professional cognitive services. This Part closes with Leonardo’s “To-Do List” updated for quantum lawyers.

Part VI concludes our Leonardo study and invites fellow legal innovation travelers to collaborate and co-create a future where smart, curious, creative, and emotionally intelligent lawyers effectively team with synthetic intellects and flourish professionally. Last, the Appendix sketches the preliminary contours of a Vitruvian Lawyer.

## II. LEONARDO DA VINCI

*“The real voyage of discovery consists, not in seeking new landscapes, but in having new eyes.”*

— Marcel Proust, *The Prisoner*<sup>49</sup>

In *Leonardo da Vinci*, Tulane University Professor of History Walter

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<https://www.forbes.com/sites/markcohen1/2019/05/03/getting-beyond-the-tech-in-legal-tech/#4e81639c16fc> [https://perma.cc/H7DJ-C93T] [hereinafter Cohen, *Getting Beyond The Tech*].

<sup>47</sup> See MEREDITH BROUSSARD, ARTIFICIAL UNINTELLIGENCE: HOW COMPUTERS MISUNDERSTAND THE WORLD 175 (2018). In 2016, billionaire Paul Tudor Jones, head of Tudor Investment Corporation, famously quipped to his hedge fund employees, “No man is better than a machine, and no machine is better than with a man with a machine.” *Id.* at 188.

<sup>48</sup> Merriam-Webster defines the noun “Renaissance man” as “a person who has wide interests and is expert in several areas.” *Renaissance Man*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/Renaissance%20man> [https://perma.cc/4NN6-Y4B5].

<sup>49</sup> 5 MARCEL PROUST, THE PRISONER: IN SEARCH OF LOST TIME 244 (Carol Clark & Christopher Prendergast eds., 2019). For a popular English translation, see GOODREADS.COM, <https://www.goodreads.com/quotes/33702-the-real-voyage-of-discovery-consists-not-in-seeking-new> [https://perma.cc/P5A2-W436].

Isaacson contends that Leonardo represents the ultimate example of “how the ability to make connections across disciplines—arts and sciences, humanities and technology—is the key to innovation, imagination, and genius.”<sup>50</sup> Isaacson spotlights how Leonardo’s union of observation and imagination made him “history’s consummate innovator.”<sup>51</sup> Because Leonardo relished living in “a world in flux,” he eagerly embraced dynamic processes, regularly refined his ideas, and continuously iterated his painting and drawings to incorporate fresh insights that still reverberate five hundred years after his death.<sup>52</sup>

As the pages ahead reflect, a survey of Leonardo’s creative process yields valuable insights for modern knowledge professionals. Like Leonardo, twenty-first-century lawyers find themselves in an era of digital and economic transformation.<sup>53</sup> In such times, lawyers must set aside their familiar tools and black-and-white thought palette to embrace new technologies, colors, theories, and approaches. Although a lawyer’s work product will likely never be on par with the genius of Leonardo’s *Vitruvian Man* or his *Mona Lisa*, solving client problems in an effective, ethical, and elegant way constitutes a valuable achievement and an important public service.

To begin our journey, we now transport our lawyerly minds and open eyes to fifteenth-century Europe.

#### A. *Printing Press: The Renaissance Internet*

Appreciating Leonardo da Vinci’s “superhuman”<sup>54</sup> body of work begins by understanding how the printing press—the Internet of the Renaissance—shaped his knowledge and world view. Johannes Gutenberg debuted his printing press in Mainz, Germany, around 1440.<sup>55</sup> Within a mere thirty years, Gutenberg’s printing technology had crossed the Alps and rooted and

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<sup>50</sup> ISAACSON, *supra* note 41, at 2–3.

<sup>51</sup> *Id.* at 4.

<sup>52</sup> *See id.* at 518.

<sup>53</sup> *See* MLODINOW, *supra* note 31, at 219–20 (noting rapid technology change). Mlodinow writes, “To be successful today, we must not only cope with the flood of knowledge and data about the present; we must also be able to anticipate the future, because change happens so rapidly that what works well now will be dated and irrelevant tomorrow. The world today is a moving target.” *Id.* at 219.

<sup>54</sup> SERGE BRAMLY, *LEONARDO: THE ARTIST AND THE MAN* 5 (1994) (referencing Giorgio Vasari’s 1550, possibly 1564, description of Leonardo as an “*il divino*”).

<sup>55</sup> JOHN MAN, *THE GUTENBERG REVOLUTION: THE STORY OF A GENIUS AND AN INVENTION THAT CHANGED THE WORLD* 37 (2002). Almost six centuries later, Gutenberg’s printing press—modernly classified as recombinant or combinatorial technology innovation—continued to change the world because it: (1) “created the possibility of an intellectual genome, a basis of knowledge which could be based on from generation to generation,” and (2) facilitated global dissemination of knowledge, news, and information. *Id.* at 246–81. *See also* Amy Watson, *U.S. Book Industry – Statistic & Facts*, STATISTA (Jan. 16, 2019), <https://www.statista.com/topics/1177/book-market/> [<https://perma.cc/ALR3-CA84>] (noting the 2018 sale of 675 million printed books in the United States).

flourished in Venice, Italy, when Johannes de Spira opened his commercial publishing house in 1469.<sup>56</sup> By 1500, Venice's vibrant printing industry had produced over two million volumes, making it the center of European publishing.<sup>57</sup> More than five centuries of historical perspective makes clear that Gutenberg's invention "changed the world" by seeding the information ecosystem that forms our current world of knowledge and ideas.<sup>58</sup>

### **B. Family History, Limited Education, and Lifelong Learning via Books**

Amid the whirling activity in Italian printing houses, Leonardo di ser Piero da Vinci was born out of wedlock to Piero da Vinci and Caterina Lippi on April 15, 1542.<sup>59</sup> Illegitimacy liberated Leonardo from the constraints of social convention, the family trade as a notary, and strict education.<sup>60</sup> Despite his limited schooling, Leonardo combined his curiosity, diverse interests, and freethinking to become a "disciple of experience and experiment."<sup>61</sup> The self-described "man without letters"<sup>62</sup> became—and remains—the quintessential modern experimenter-thinker and a lifelong learner.<sup>63</sup>

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<sup>56</sup> ISAACSON, *supra* note 41, at 172.

<sup>57</sup> *Id.* By 1471, printing shops existed in Florence, Milan, Naples, Bologna, Padua, Genoa, and Ferrara. *Id.* Man similarly describes the growth in printing as "exponential" due to market demand from lawyers and academics. MAN, *supra* note 55, at 220–21, 252–53. He notes that by 1480, "122 towns in Western Europe had printing presses" with almost fifty percent of them in Italy. *Id.* at 221.

<sup>58</sup> MAN, *supra* note 55, at 14, 19. He also notes that printing advanced science, reason, and scholarship. *Id.* at 247. He writes, "For the first time, specialists could agree on their agendas and feed off of each other, as if stabilized by the whirling gyroscope of printing." *Id.* at 247–48 ("[T]he print shops of Europe became a force for commercial and academic change. The master printer emerged as a social force, coordinating finance, authors, proofreaders, suppliers, punch-cutters, typefounders, pressmen and salesmen, rivalling each other with promises of clearer title pages and better indexes and ever more perfect proofreading.").

<sup>59</sup> ISAACSON, *supra* note 41, at 12–13.

<sup>60</sup> *Id.* at 11–12, 16–17.

<sup>61</sup> *Id.* at 17. Leonardo signed a work as "Leonardo da Vinci, dissepolo della sperientia." *Id.* Isaacson notes, Leonardo's "method was rooted in experiment, curiosity, and the ability to marvel at the phenomena that the rest of us rarely pause to ponder after we've outgrown our wonder years." *Id.* at 17–18.

<sup>62</sup> *Id.* at 170. In 1441, Florence's first public library opened. MAN, *supra* note 55, at 93.

<sup>63</sup> PAULA FINDLEN ET AL., *LEONARDO'S LIBRARY: THE WORLD OF A RENAISSANCE READER* ix (2019) (describing Leonardo as a "lifelong learner" and "one of the most creative and probing Renaissance intellects"). In the accompanying catalogue to Stanford University's 2019 exhibition, *Leonardo's Library: The World of a Renaissance Reader*, Professor Paula Findlen, Stanford Professor of Early Modern Europe and History of Science, and her co-authors' describe how books informed Leonardo's probing intellect and inspired his breakthrough ideas. *Id.* For example, Findlen et al. explain that Leonardo's books functioned as a "visual archive introducing him to the conventions of depicting scientific and technical information" that further stimulated and fed his abundant imagination. *Id.* at 116. Findlen et al. explain, "Reading printed books introduced Leonardo to consider the different conventions of representing mathematical and cosmological diagrams, plants and animals, natural catastrophes, monsters and marvels, the human body, and the workings of machines." *Id.* at 121.

Leonardo recognized the power of books and the information contained therein. He accumulated a personal library on par in quality and scope with those held by Renaissance doctors, lawyers, and scholars.<sup>64</sup> Leonardo fed his “omnivorous curiosity”<sup>65</sup> through a combination of independent reading, collaboration, observation, and experimentation.<sup>66</sup> With the benefit of historical insight, we can see how Leonardo’s rapacious reading habits paired with his quest for lifelong learning made him “the first major European thinker to acquire a serious knowledge of science without being formally schooled in Latin or Greek.”<sup>67</sup> According to Professor Isaacson, Leonardo’s genius was a “human one, wrought by his own will and ambition.”<sup>68</sup> A preliminary inventory reveals that Leonardo’s creative genius sprang forth from his: (1) unquenchable curiosity; (2) commitment to lifelong learning; (3) extraordinary powers of sight and observation; and (4) fantastic imagination—skills that we modern thinkers can strive to develop and hone.<sup>69</sup>

As we will see in Part III, digital and quantum technologies currently shape our age much in the way that printing transformed Leonardo’s world.<sup>70</sup> Ahead, this Article will highlight some important lessons that modern lawyers can learn from Leonardo. But first, we concentrate our focus on his extraordinary curiosity, cognitive range, and creativity.

### C. Curiosity, Cognitive Range, and Creativity

In his book, *The Origins of Creativity*, two-time Pulitzer prize winner and Harvard Professor (emeritus) Edward O. Wilson asserts that “[s]cience and the humanities share the same origin and brain processes of creativity.”<sup>71</sup> Leonardo’s work exemplifies this fusion of science and the humanities. In his sketches and paintings, Leonardo seamlessly integrated science and art by

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<sup>64</sup> See *id.* at 8, 15, 56 (noting that the books held in Leonardo’s library “evolved with his intellectual interests”). Findlen et al. writes, “Leonardo’s understanding of what books could do changed dramatically in his lifetime. The acquisition of a library was essential to this process.” *Id.* at 15. Findlen et al. observes that because Leonardo “came of age with the printing press . . . he grew up with an awareness that the book was a rapidly changing object.” *Id.* at 56.

<sup>65</sup> ISAACSON, *supra* note 41, at 178 (noting that Leonardo’s talent for curiosity “may have been connected to growing up with a love of nature while not being overly schooled in received wisdom”).

<sup>66</sup> *Id.* at 173.

<sup>67</sup> *Id.* at 172.

<sup>68</sup> *Id.* at 3.

<sup>69</sup> *Id.* at 3–4.

<sup>70</sup> *Id.* at 9.

<sup>71</sup> WILSON, *supra* note 40, at 81. Professor Wilson explains, “The two great branches of learning, science and the humanities, are complementary in our pursuit of creativity. They share the same roots of innovative endeavor. The realm of science is everything possible in the universe; the realm of the humanities is everything conceivable to the human mind.” *Id.* at 3–4. Further, the humanities represent an “ensemble of disciplines that explain ‘what it means to be human.’” *Id.* at 188.

uniting his keen powers of observation, voracious curiosity, deep and broad cognitive range, extraordinary creativity, elastic mind, and ability to imagine and entertain the impossible.<sup>72</sup> Because Leonardo was never satisfied with mastering just one discipline, he not only sought knowledge and expertise in multiple disciplines but even tested the boundaries of these disciplines by rejecting thought silos.<sup>73</sup>

Contemporary art scholars identify Leonardo's "endless curiosity" about nature and science as the fuel for his intellectual explorations, and the inspiration for his innovative drawings and paintings; experiments with structure, form, and materials; and use of pioneering artistic techniques,<sup>74</sup> such as *chiaroscuro* and *sfumato*.<sup>75</sup> Stylistically, Leonardo consistently used *sfumato* "to blur hard lines delineating objects" and infuse his paintings with drama, motion, and mystery.<sup>76</sup> He intuitively knew that innovative ideas often emerge from the shadows and along the margins.<sup>77</sup> Leonardo's "recognizable style, artistic personality, and individual genius" catapulted him into Renaissance superstar status.<sup>78</sup> If Leonardo were alive in the twenty-first century, he would likely thrive in modern Silicon Valley, a place that celebrates bold heterodox ideas and values iterative visionaries.<sup>79</sup>

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<sup>72</sup> *Id.* at 186–87 (asserting that science and humanities form a continuum). He explains that science includes three levels: (1) "scientific observation [that] addresses all phenomena existing in the real world," (2) "scientific experimentation [that] addresses all possible real worlds," and (3) "scientific theory [that] addresses all conceivable real worlds." *Id.* at 187. He explains that the humanities go farther than these three levels of science because it encompasses "the infinity of all fantasy worlds." *Id.*

<sup>73</sup> GILLIAN TETT, *THE SILO EFFECT: THE PERIL OF EXPERTISE AND THE PROMISE OF BREAKING DOWN BARRIERS* 14 (2016) (explaining that while specialization may initially produce near term efficiencies, such thought-work silos can become sclerotic and inefficient due to fragmentation, "tunnel vision," and "mental blindness, which causes people to do stupid things").

<sup>74</sup> Jeffrey Brown & Frank Carlson, *Blockbuster da Vinci Exhibition Showcases the Master's 'Endless Curiosity'*, PBS NEWSHOUR (Nov. 8, 2019, 6:35 PM), <https://www.pbs.org/newshour/show/blockbuster-da-vinci-exhibition-showcases-the-masters-endless-curiosity> [<https://perma.cc/88CB-Q788>] (describing how Leonardo based his paintings on scientific explorations and his continuous experimentation with techniques such as *sfumato*); ISAACSON, *supra* note 41, at 122 (describing how Leonardo "was constantly experimenting with drawing methods").

<sup>75</sup> ISAACSON, *supra* note 41, at 41 ("Chiaroscuro, from the Italian for 'light/dark,' is the use of contrasts of light and shadow as a modeling technique for achieving the illusion of plasticity and three-dimensional volume in a two-dimensional drawing or painting."). "*Sfumato* derives from the Italian word for 'smoke,' or more precisely the dissipation and gradual vanishing of smoke into the air." *Id.* Leonardo wrote, "[y]our shadows and lights should be blended without lines or borders in the manner of smoke losing itself in the air." *Id.*

<sup>76</sup> *Id.* at 281 (describing *The Last Supper*).

<sup>77</sup> TETT, *supra* note 73, at 204, 221 (finding innovation occurs along the edges where thought silos breakdown). Similarly, the Cleveland Clinic's Dr. Toby Cosgrove states, "Innovation happens at the margins, where one discipline rubs up against the other." *Id.* at 204.

<sup>78</sup> *Id.* at 379.

<sup>79</sup> EPSTEIN, *supra* note 27, at 164.



Although other Renaissance artists shared experimental mindsets, flexibility and adaptability, and a willingness to seek new challenges, the differences in Leonardo's style justifies pause and reflection.<sup>80</sup> Specifically, his paintings frame the personal and professional challenges that modern knowledge professionals must balance—that is, whether to embrace ambiguity and flexibility or seek clarity and structure. As lawyers designing and crafting our careers, we need to harmonize these tensions and develop our own styles which may include conscious decisions to: (1) explore the shadows where there may be opportunities to grow our practice and serve clients, or (2) build our career with clear lines and firm boundaries. No matter the path selected, we should adopt a test-and-learn approach and adapt or change course as circumstances dictate.

#### **D. Highlights of Leonardo's Creative Process**

As current observers of his work, we recognize how Leonardo combined his extraordinary intellect, great powers of observation, and phenomenal drawing skills in his unified pursuit of art and science.<sup>81</sup> This Section begins by exploring how Leonardo's extraordinary ability to see into shadows and past the mind's limits enabled him to blend theory with experimentation, explore new ideas, collaborate across disparate disciplines, and venture toward the murky boundaries of the "adjacent possible."<sup>82</sup>

##### **i. *Saper Vedere*: Knowing How to See**

In his *paragone*,<sup>83</sup> Leonardo exalted the "interplay between art and science."<sup>84</sup> Professor Isaacson asserts Leonardo's *paragone* is "integral to understanding his genius: that true creativity involves the ability to combine observation with imagination, thereby blurring the border between reality and

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<sup>80</sup> By contrast, Leonardo's artistic rival, Michelangelo Buonarroti (1475–1564), "favored a *disegno* based on outlined contours" to define the characters and objects in his paintings. ISAACSON, *supra* note 41, at 374–77. Isaacson distinguishes between the different schools of Florentine art: (1) *sfumato* and *chiaroscuro* (Leonardo's approach), and (2) defined contours (Michaelangelo's approach). *Id.* at 377.

<sup>81</sup> See Ludwig Heinrich Heydenreich, *Leonardo da Vinci: Italian Artist, Engineer, and Scientist*, ENCYCLOPAEDIA BRITANNICA (Aug. 22, 2019), <https://www.britannica.com/biography/Leonardo-da-Vinci> [<https://perma.cc/V5TC-NHG3>].

<sup>82</sup> STEVEN JOHNSON, *WHERE GOOD IDEAS COME FROM: THE NATURAL HISTORY OF INNOVATION* 31 (2010) (noting the phrase "adjacent possible" "captures both the limits and the creative potential of change and innovation"). Johnson explains, "The adjacent possible is a kind of shadow future, hovering on the edges of the present state of things, a map of all the ways in which the present can reinvent itself." *Id.* He adds, "What the adjacent possible tells us is that at any moment the world is capable of extraordinary change, but only *certain* changes can happen." *Id.* COLEMAN, *supra* note 6, at 202 ("The adjacent possible is the horizon at the edge of possibility—we can just manage to see it, but we can't quite get there.").

<sup>83</sup> A *paragone* is an argument likely made "in front of an admiring ducal court audience." ISAACSON, *supra* note 41, at 261.

<sup>84</sup> *Id.*

fantasy.”<sup>85</sup> Leonardo then proclaimed, “[a] great painter depicts both.”<sup>86</sup>

The concept of *saper vedere* (knowing how to see) guided and informed Leonardo’s artistic and scientific studies.<sup>87</sup> Leonardo viewed his eyesight as the key to knowledge and understanding.<sup>88</sup> For instance, after observing a dragonfly in motion, perhaps on an evening walk around the Sforza Castle in Milan, Leonardo wrote, “The dragonfly flies with four wings, and when those in front are raised those behind are lowered.”<sup>89</sup> Leonardo’s keen observation skills augmented and amplified his imagination, thereby forming his “intellectual vision.”<sup>90</sup>

Leonardo regularly synthesized disparate concepts in art and mathematics to discover intriguing relationships and create “imaginative combinations”—a process modernly referred to as recombinant innovation.<sup>91</sup> In a notebook, he

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<sup>85</sup> *Id.*

<sup>86</sup> *Id.*

<sup>87</sup> Heydenreich, *supra* note 81. See also LUDWIG HEINRICH HEYDENREICH, LEONARDO DA VINCI 118 (1954) [hereinafter HEYDENREICH, LEONARDO DA VINCI] (describing Leonardo’s “experimental method” as being “based wholly and exclusively on the axiom *saper vedere*). Heydenreich explains that *saper vedere* as “[t]he most minute phenomena and processes of nature were revealed to his keen and impartial perception; they were then tested by the method of comparative observation, and finally demonstrated by graphic visualization.” *Id.*

<sup>88</sup> BRAMLY, *supra* note 54, at 264 (“Open your eyes, he says. You have only to *see things properly* to understand.”); see HEYDENREICH, LEONARDO DA VINCI, *supra* note 87, at 161 (describing how Leonardo evolved his methods and research from *saper vedere* and explaining “[s]*aper vedere*, the key which unlocked all of the secrets of the visible world to his outer and inner eye included both the precise sensory intuitive faculty which led him to make many astonishing scientific discoveries, and the artistic imagination which enabled him to symbolize (in the original sense of the word) the essence of his scientific metaphysics in his Visions of the End of the World.”).

<sup>89</sup> ISAACSON, *supra* note 41, at 179–80; WILSON, *supra* note 40, at 60 (noting that humans are “audiovisual” and we rely on sound and sight to find our way).

<sup>90</sup> ISAACSON, *supra* note 41, at 264; HEYDENREICH, LEONARDO DA VINCI, *supra* note 87, at 168 (“His mind represents that form of ‘intellectual vision’ which progresses from sensory experience to cognition, using the sensory organs as the instruments of objective examination.”). Heydenreich also describes Leonardo’s “Theory of Vision” as “being based equally upon nature and mathematics[,]” which enabled him “to perceive, understand, and represent nature in its forms and functions—that is, the forces at work in the forms.” *Id.* at 101. Leonardo’s “Theory of Forms” applied to animate and inanimate nature. *Id.* This Leonardo theory starts with mathematics and focuses on “studies of *proportion*—that is, of the sizes of bodies and their relationships.” *Id.*

<sup>91</sup> ISAACSON, *supra* note 41, at 264. This process is modernly referred to as recombinant or combinatorial innovation. Recombinant innovation, articulated in economist Paul Romer’s “new growth theory,” posits that economic growth occurs when individuals add to and rearrange raw materials and existing knowledge in ways that generate more value. Paul M. Romer, *Endogenous Technological Change*, 98 J. POL. ECON. 71, 72–75 (1990). Google’s chief economist Hal Varian calls this process “combinatorial innovation.” See also HAL R. VARIAN ET AL., RAFAELE MATTIOLI LECTURES: THE ECONOMICS OF INFORMATION TECHNOLOGY 5 (2004) (identifying the provenance of this theory by identifying influential thought-leaders Joseph A. Schumpeter (1934), S. Colum Gilfillan (1935), Abbott Usher (1954), Stuart Kauffman (1995), and Martin Weitzman (1998)); Hal Varian on *How the Web Challenges Managers*, MCKINSEY & CO. (Jan.

reflected on the fusion of art and mathematics when drawing human figures, plants, and animals by reminding himself to “[m]ake sure that every portion of the whole is well-proportioned in relation to that whole.”<sup>92</sup>

Additionally, Leonardo was obsessed with shadows; he wrote about darkness, haziness, shade, and what is obscured more than any other topic.<sup>93</sup> According to Leonardo, “[s]hadow is the means by which bodies display their form. The forms of bodies could not be understood in detail but for shadow.”<sup>94</sup> He then combined his observational and mathematical skills to develop a “radical insight” that “there was no such thing in nature as a precisely visible outline or border to an object. It was not just our way of perceiving objects that made their borders look blurred. He realized nature itself, independent of how our eyes perceive it, does not have precise lines.”<sup>95</sup> Leonardo’s works regularly employed the *sfumato* technique of smoky and hazy lines to obscure the boundaries between art and science.<sup>96</sup> In doing so, he challenged his viewers to embrace mystery, see beyond the surface, and push the mind toward discovering the unknown.

## ii. Experimentation, Exploration, Active Open-Mindedness, and Perpetual Beta

Leonardo embraced experimentation, skeptical inquiry, and “active open-mindedness.”<sup>97</sup> Unbound by formal education and traditional ways of thinking, his scientific studies relied on careful observation, pattern detection, analogical thinking,<sup>98</sup> and repetition.<sup>99</sup> Because Leonardo’s insatiable curiosity crossed

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2009), <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/hal-varian-on-how-the-web-challenges-managers> [<https://perma.cc/LQY2-VEUQ>].

<sup>92</sup> HEYDENREICH, LEONARDO DA VINCI, *supra* note 87, at 101.

<sup>93</sup> See ISAACSON, *supra* note 41, at 266. Leonardo wrote at least “fifteen thousand words on the topic [of shadows], which would fill thirty pages of a book, still survives, and that is probably less than half of what he originally wrote.” *Id.* at 267.

<sup>94</sup> *Id.* at 266.

<sup>95</sup> *Id.* at 268–69.

<sup>96</sup> *Id.* at 269–70 (describing the *Mona Lisa*’s mysterious smile).

<sup>97</sup> *Id.* at 174; TETLOCK & GARDNER, *supra* note 34, at 126 (referencing University of Pennsylvania Psychology Professor Jonathan Baron’s research on “active open-mindedness”); Donald J. Kochan, *Thinking Like Thinkers: Is the Art and Discipline of an “Attitude Suspended Conclusion” Lost on Lawyers?*, 35 SEATTLE U. L. REV. 1, 56 n.244 (2011) (explaining Professor Baron’s “goal of teaching ‘active open-mindedness’; that is, the capacity to thoughtfully consider arguments on multiple sides of an issue”). Psychologist Jonathan Baron argues “that one main problem with our thinking and decision making is that much of it suffers from a lack of active open-mindedness. We ignore possibilities, evidence, and goals that we ought to consider, and we make inferences in ways that protect our favored ideas.” Peter H. Huang, *Achieving American Retirement Prosperity by Changing Americans’ Thinking About Retirement*, 22 STAN. J.L. BUS. & FIN. 189, 250 (2017).

<sup>98</sup> Leonardo employed pattern spotting and analogies to develop his “rudimentary method of theorizing.” ISAACSON, *supra* note 41, at 31. Because real intelligence includes the ability to recognize and analyze the significance of situations and experiences, humans analogize to use the “familiar to recognize the unfamiliar.” SMITH, *supra* note 15, at 23. According to Indiana University Professor of Cognitive Science and Comparative Literature Douglas Hofstadter,

many disciplines, he developed a “profound feel for nature’s patterns and crosscurrents” that further kindled his inquiries.<sup>100</sup>

Predating the scientific method, Leonardo wrote, “Before you make a general rule of this case, test it two or three times and observe whether the tests produce the same effects.”<sup>101</sup> Over time, his process incorporated what we now view as “our modern method of combining theory, experiment, and handed-down knowledge—and constantly testing them against each other.”<sup>102</sup> In 1510, Leonardo wrote, “Practice must always be founded on sound theory.”<sup>103</sup> Professor Isaacson elegantly summarizes Leonardo’s ability to engage between theory and experience by writing: “[b]ut [Leonardo’s] uncanny abilities to engage in the dialogue between experience and theory made him a prime example of how acute observations, fanatic curiosity, experimental testing, a willingness to question dogma, and the ability to discern patterns across disciplines can lead to great leaps in human understanding.”<sup>104</sup>

When he discovered patterns, Leonardo employed analogies to gain greater insights.<sup>105</sup> Leonardo’s flexible, creative, and scientific mind would surrender his preconceptions, revise his thinking, and develop a new theory to advance his understanding in situations where he discovered conflicts between his theory and experience.<sup>106</sup> Similarly, as part of his anatomy studies, Leonardo analogized the arteries and veins uncovered in his dissections to river flows and plant branches.<sup>107</sup> He also applied these analogical thinking skills in his studies of machines and the human body.<sup>108</sup> Like his mechanical drawings, his illustrations of human body parts included “exploded views, multiple

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intelligence initially involves the collection and categorization of facts and experiences, followed by a fluid process of comparing, contrasting, and combining these inputs to form ideas and conclusions. *Id.* See generally DOUGLAS HOFSTADTER, GÖDEL, ESCHER, BACH: AN ETERNAL GOLDEN BRAID (1979) (Pulitzer prize winning book); DOUGLAS HOFSTADTER & EMMANUEL SANDERS, SURFACES AND ESSENCES: ANALOGY AS THE FUEL AND FIRE OF THINKING (2013).

<sup>99</sup> ISAACSON, *supra* note 41, at 174, 400–01.

<sup>100</sup> *Id.* at 519.

<sup>101</sup> *Id.* at 174.

<sup>102</sup> *Id.* at 175.

<sup>103</sup> *Id.*

<sup>104</sup> *Id.* at 176.

<sup>105</sup> ISAACSON, *supra* note 41, at 176–77, 422.

<sup>106</sup> *Id.* at 435. Professor Isaacson writes, “One mark of a great mind is the willingness to change it.” *Id.* Isaacson describes that Leonardo was “a good scientist” willing to “revise[] his thinking.” *Id.* at 438. His explorations uncovered intriguing connections that guided subsequent inquiries, such as when he considered whether water eddies and air turbulence could explain how birds fly. *Id.* at 178. Leonardo wrote, “To arrive at the knowledge of the motions in birds in the air, it is first necessary to acquire knowledge of the winds, which we will prove by the motions of water.” *Id.* For Leonardo, the beauty and unity of nature’s patterns revealed “essential truths” that propelled ongoing investigations. *Id.*

<sup>107</sup> *Id.* at 401.

<sup>108</sup> *Id.* at 402.

angles, and stacked-up layers.”<sup>109</sup> For instance, when painting the enigmatic *Mona Lisa* (see Illustration 1), his notebooks contained detailed drawings of mouth muscles and nerves, thereby infusing into his masterwork “the scientific anatomy of the human smile.”<sup>110</sup>



Illustration 1: Leonardo's *Mona Lisa* (detail) (c. 1503–19)<sup>111</sup>

Professor Isaacson adoringly and admiringly describes this painting as “the culmination of a life spent perfecting an ability to stand at the intersection of art and nature.”<sup>112</sup> He then notes that “the poplar panel with multiple layers of light oil glazes, applied over the course of many years, exemplifies the multiple layers of Leonardo’s genius.”<sup>113</sup> Five centuries later, the mysterious *Mona Lisa* still draws in curious viewers who find themselves mesmerized by the infinite wonders of Leonardo’s imagination and his shadowy

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<sup>109</sup> *Id.*

<sup>110</sup> *Id.* at 413; see also Walter Isaacson, *The Science Behind Mona Lisa’s Smile*, ATLANTIC, Nov. 2017, <https://www.theatlantic.com/magazine/archive/2017/11/leonardo-da-vinci-mona-lisa-smile/540636/> [<https://perma.cc/WZK6-KMLV>].

<sup>111</sup> Cécile Scaillièrez, *Mona Lisa – Portrait of Lisa Gherardini, Wife of Francesco del Giocondo*, LOUVRE, <https://www.louvre.fr/en/oeuvre-notices/mona-lisa-portrait-lisa-gherardini-wife-francesco-del-giocondo> [<https://perma.cc/P3WR-KYQF>]; WIKIMEDIA COMMONS, [https://commons.wikimedia.org/wiki/File:MonaLisa\\_sfumato.jpeg](https://commons.wikimedia.org/wiki/File:MonaLisa_sfumato.jpeg) [<https://perma.cc/3DC4-LUC9>].

<sup>112</sup> ISAACSON, *supra* note 41, at 475.

<sup>113</sup> *Id.*

explorations.<sup>114</sup>

Last, as modern observers, we can see that Leonardo manifested what we now call “perpetual beta”<sup>115</sup> since he continuously studied and improved his masterwork, the *Mona Lisa*, until the very end of his life.<sup>116</sup> Professor Isaacson speculates that Leonardo could have spent another decade refining the *Mona Lisa* because “[r]elinquishing a work, declaring it finished, froze its evolution.”<sup>117</sup> For Leonardo, work provided him with not only more learning opportunities but also another brush stroke or a fresh vantage point might bring his picture closer to his goal—perfection.<sup>118</sup>

### iii. Cross-disciplinary and Team Collaborations

Always seeking “intellectual ferment,” Leonardo augmented his endless curiosity with cross-disciplinary collaborations.<sup>119</sup> For example, on July 24, 1490, Leonardo dined with Giacomo Andrea da Ferrara in Milan.<sup>120</sup> The two friends discussed Vitruvius’s architectural decree for symmetry in temple design, particularly that “[t]here must be a precise relation between its components, as in the case of those of a well-shaped man.”<sup>121</sup>

Over the years, Leonardo discussed Vitruvius’s architectural decree and viewed sketches by his friend, Francesco di Giorgio.<sup>122</sup> Fueled by these collaborations and perhaps to honor Andrea’s life after his brutal death,<sup>123</sup> Leonardo not only embraced Vitruvius’s challenge, but it became “central” to his “worldview.”<sup>124</sup> Ahead, Section II.E. examines Leonardo’s *Vitruvian Man* in more detail.

Leonardo also had a passion for “pick[ing] people’s brains.”<sup>125</sup> His notebooks include the names of subject matter experts whom he wanted to meet and ask questions. Some examples from his to-do list include:

- “Ask Benedetto Portinari how they walk on ice in Flanders.”
- “Ask Maestro Antonio how mortars are positioned on bastions by day or night.”

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<sup>114</sup> *Id.* at 516.

<sup>115</sup> TETLOCK & GARDNER, *supra* note 34, at 190.

<sup>116</sup> *Id.*; ISAACSON, *supra* note 41, at 518.

<sup>117</sup> ISAACSON, *supra* note 41, at 518.

<sup>118</sup> *Id.*

<sup>119</sup> *Id.* at 391.

<sup>120</sup> *Id.* at 152.

<sup>121</sup> *Id.* at 149. Marcus Vitruvius Pollio (born around 80 BC) served in Caesar’s Roman army. *Id.* at 148–49. He wrote the only surviving architecture book from classical antiquity known today as *The Ten Books on Architecture*. *Id.* at 149.

<sup>122</sup> ISAACSON, *supra* note 41, at 150–53.

<sup>123</sup> *Id.* at 152–53 (noting French troops killed Andrea when they captured Milan).

<sup>124</sup> *Id.* at 150.

<sup>125</sup> *Id.* at 173.

- “Ask Maestro Giovanni how the tower of Ferrera is walled without loopholes.”<sup>126</sup>

Leonardo’s notebooks reveal that he prized both received wisdom from experts and the knowledge he derived from experience<sup>127</sup>—in other words, his mind operated in perpetual beta.

In addition to seeking peer and expert perspectives, Leonardo’s workshop whirled with continuous collaborations. Contemporary chronicles about Leonardo’s Florentine studio detail active exchanges between Leonardo and his apprentices.<sup>128</sup> For example, a letter written by Pietro da Novellara describes “two of his apprentices [] painting portraits to which [Leonardo] sometimes add[ed] a few touches.”<sup>129</sup> Professor Isaacson disabuses “romantic” visions of the lone artist singularly “creating works of genius,” and instead emphasizes how smart creatives<sup>130</sup> working with others—in the processes of imagination and execution—can uncoil latent ingenuity.<sup>131</sup>

#### iv. Leonardo’s Scientific, Engineering, and Anatomical Explorations

In *Leonardo da Vinci*, Professor Ludwig Heinrich Heydenreich writes that Leonardo stood at “an important crossroads in the history of human thought.”<sup>132</sup> He explains that this crossroads represented the point at which “the natural sciences were about to separate from the province of universal science, and to develop an independent method of thinking based on abstraction.”<sup>133</sup> As a lifelong learner and questioner with avid curiosity, Leonardo creatively connected divergent concepts. Critically, Leonardo’s mastery of the “experimental process” combined with his “artistic and scientific imagination” led to his brilliant, heterodox revelation that very little separates art from science.<sup>134</sup> As modern viewers, we can observe how Leonardo united the arts and sciences in his sketches of waterwheels, Archimedean screws, and the human shoulder (below). By studying these detailed drawings, we can witness how Leonardo’s cross-disciplinary studies

<sup>126</sup> *Id.*

<sup>127</sup> *Id.*

<sup>128</sup> ISAACSON, *supra* note 41, at 309 (noting in 1500, Leonardo “set up a collaborative workshop, and production of some pictures, especially small devotional ones, became a team effort, just as it had been in Verrocchio’s studio”).

<sup>129</sup> *Id.* at 313.

<sup>130</sup> SCHMIDT & ROSENBERG, *supra* note 31, at 17 (describing smart creatives as individuals with the following characteristics: curious, flexible, embrace risk, independent, articulate, savvy, and exhibit flair).

<sup>131</sup> ISAACSON, *supra* note 41, at 313 (likening Leonardo’s studio to an artisan’s workshop).

<sup>132</sup> HEYDENREICH, LEONARDO DA VINCI, *supra* note 87, at 174.

<sup>133</sup> *Id.*

<sup>134</sup> *Id.* at 175. SCHILLING, *supra* note 31, at 261. Professor Schilling notes that “a tolerance for complexity and ambiguity could prompt heterodox thinking and enable more sophisticated abstraction.” *Id.* at 114. She adds that heterodox thinkers may also be breakthrough innovators. *Id.* at 261.

of disassembled machines and dissected bodies enabled him to first see and then make innovations between disciplines.<sup>135</sup> These drawings reveal how he visualized motion—energy in action—in machines and muscle by concentrating on the details, deconstructing the physical components, and then identifying sources of power generation or slowing friction.<sup>136</sup>

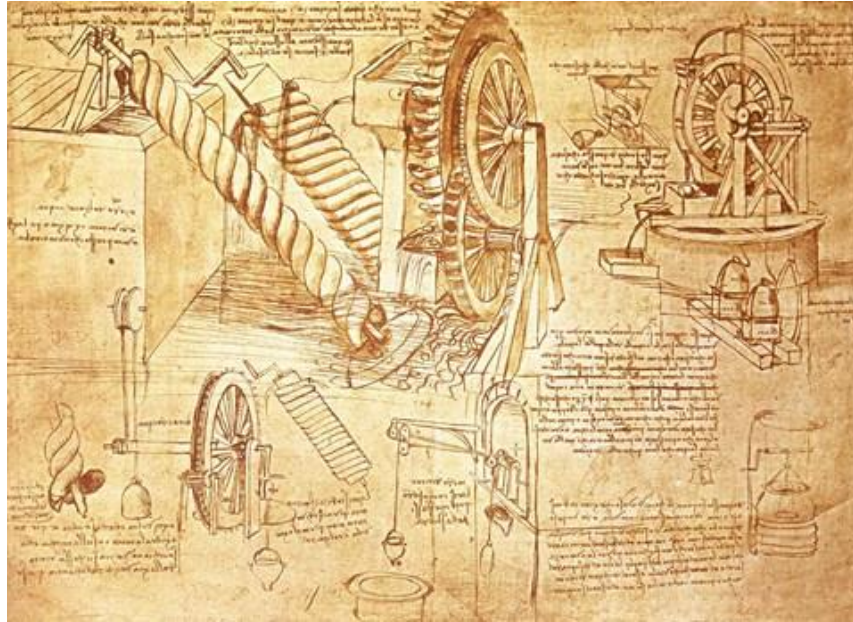


Illustration 2: Leonardo's Study of Waterwheels and Archimedean Screws (c. 1478–1519)<sup>137</sup>

<sup>135</sup> ISAACSON, *supra* note 41, at 190. Isaacson notes that Leonardo viewed his scientific and anatomical studies as “interwoven. Art required a deep understanding of anatomy, which in turn was aided by a profound appreciation for the beauty of nature.” *Id.* at 213. HEYDENREICH, LEONARDO DA VINCI, *supra* note 87, at 103–04 (describing how Leonardo viewed it essential that he “know the anatomy of the sinews, bones, tendons, and muscles” to understand anatomical function and the mechanics of human movement).

<sup>136</sup> ISAACSON, *supra* note 41, at 190–99; HEYDENREICH, LEONARDO DA VINCI, *supra* note 87, at 118–20 (describing his mechanical inquiries and observations about force and motion). Leonardo wrote, “Without force nothing moves.” *Id.*

<sup>137</sup> *Codex Atlanticus*, WIKIMEDIA COMMONS, <https://commons.wikimedia.org/wiki/File:Facsimile-of-codex-atlanticus-screws-and-water-wheels-laminate.jpg> [<https://perma.cc/22PZ-KA47>].





Illustration 3: Leonardo's Study of Shoulder (c. 1510–11)<sup>138</sup>

<sup>138</sup> Leonardo da Vinci - Anatomical Studies of the Shoulder, WIKIMEDIA COMMONS, [https://commons.wikimedia.org/wiki/File:Leonardo\\_da\\_Vinci\\_-\\_Anatomical\\_studies\\_of\\_the\\_shoulders\\_-\\_WGA12824.jpg](https://commons.wikimedia.org/wiki/File:Leonardo_da_Vinci_-_Anatomical_studies_of_the_shoulders_-_WGA12824.jpg) [https://perma.cc/U53H-6GQM].

Leonardo's drawings show how careful and detailed study serves as a prerequisite for building knowledge and understanding, forming creative insights, and making innovative connections that may yield novel solutions.

Since this is an Article written for lawyers, this next Section considers how Leonardo's *Vitruvian Man* functions as a model for modern lawyers whose work involves investigating and understanding client issues followed by creative problem-solving.

### **E. *The Vitruvian Man: A Model for Modern Lawyers***

In his pen-and-ink masterpiece, the *Vitruvian Man*, Leonardo meticulously studied the male figure's form and proportion.<sup>139</sup> For modern viewers, the *Vitruvian Man* symbolizes "classical perfection of body and mind due to the superb juxtaposition of art and science."<sup>140</sup> Leonardo created an iconic drawing of a "perfectly proportioned man spread-eagle inside a circle and square" by ingeniously combining his scientific observations with his renowned artistic skills.<sup>141</sup> Over the past five centuries, the *Vitruvian Man* has come "to symbolize the harmonious relationship between man and the universe."<sup>142</sup> Echoing the same sentiment, Professor Isaacson concludes his study of the *Vitruvian Man* by observing:

Leonardo's *Vitruvian Man* embodies a moment when art and science combined to allow mortal minds to probe timeless questions about who we are and how we fit into the grand order of the universe. It also symbolizes an ideal of humanism that celebrates the dignity, value, and rational agency of humans as individuals. Inside the square and the circle, we can see the essence of Leonardo da Vinci, and the essence of ourselves, standing naked at the intersection of the earthly and the cosmic.<sup>143</sup>

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<sup>139</sup> Since 1822, Leonardo's "Vitruvian Man" has been part of the "principal collection" of Gallerie dell'Accademia in Venice. Elisabetta Povoledo, *'Virtuvian Man' Will Be in the Louvre's Leonardo Show, After All*, N.Y. TIMES (Oct. 16, 2019), <https://www.nytimes.com/2019/10/16/arts/vitruvian-man-louvre-leonardo.html> [https://perma.cc/B86T-RZY7]; see ISAACSON, *supra* note 41, at 222 (describing Leonardo's quest to "fathom" the "universal measure of man"—an endeavor that united his lifelong study of the sciences and arts).

<sup>140</sup> *Leonardo da Vinci. Man is the Model of the World' at the Gallerie dell'Accademia*, VENETOINSIDE, <https://www.venetoinside.com/events-in-veneto/event/leonardo-da-vinci-man-is-the-model-of-the-world-at-the-galleria-dellaccademia/> [https://perma.cc/M2UR-NTG5].

<sup>141</sup> ISAACSON, *supra* note 41, at 1.

<sup>142</sup> *Id.* at 141.

<sup>143</sup> *Id.* at 157.

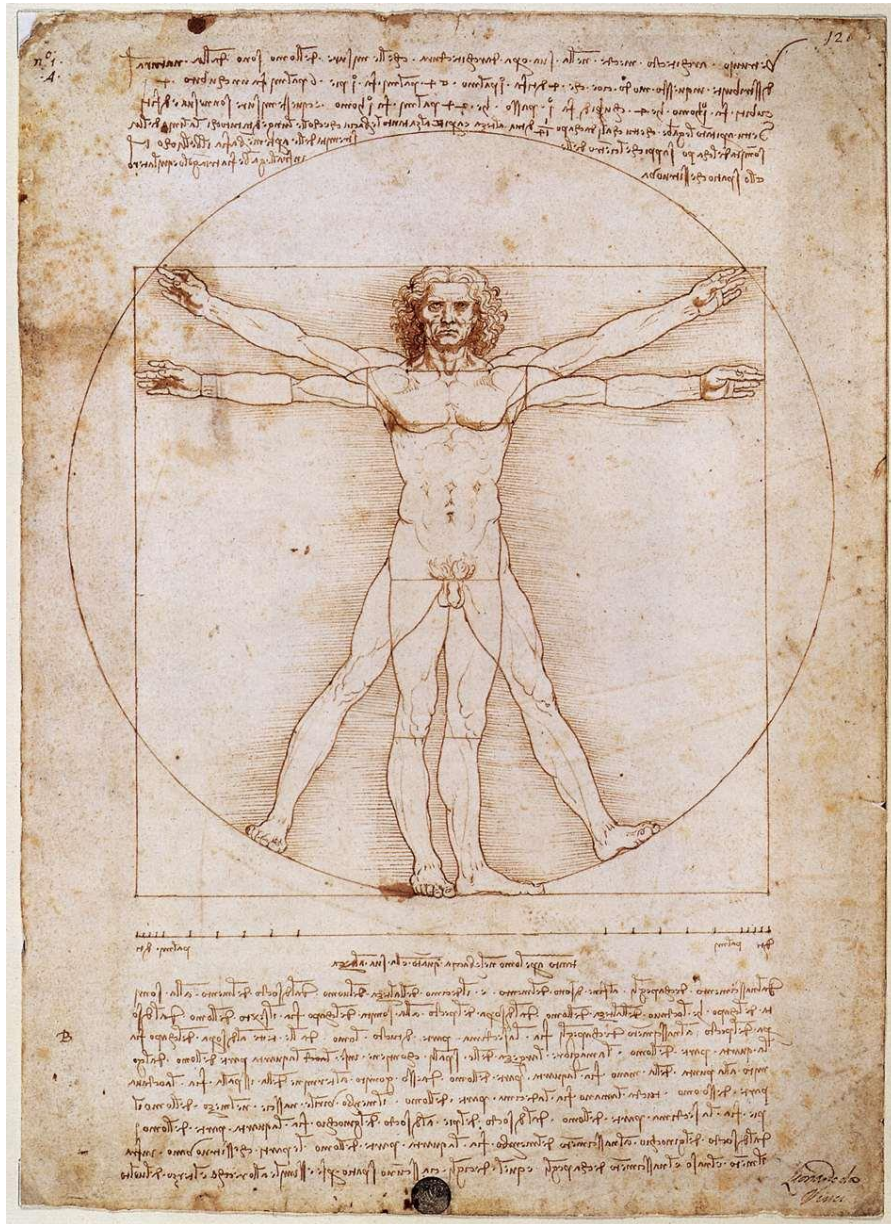


Illustration 4: Leonardo's *Vitruvian Man* (c. 1487)<sup>144</sup>

<sup>144</sup> *Vitruvian Man*, WIKIMEDIA COMMONS, <https://commons.wikimedia.org/wiki/File:Vitruvian.jpg#/media/File:Vitruvian.jpg> [https://perma.cc/F7MB-J7B5].



Refocusing on the thesis of this Article—that Leonardo’s work yields fruitful insights on how to navigate a legal industry in flux—let us now take a moment to look carefully at Leonardo’s drawing (Illustration 4). Even though we only have access to a digital facsimile of the *Vitruvian Man*, close observation reveals a man in constant motion stretching his body to its limits.<sup>145</sup> We can see that his arms extend and reach outward and upward, his legs shift between a vertical position and a wide stance, and his fingers stretch and push to touch both the circle and square. An astute viewer may also notice that the horizontally outstretched arms on a figure with firm vertical footing make the shape of a “T.” By depicting the *Vitruvian Man* as a man of action, Leonardo’s pen tests the limits of the paper’s ordinary freeze-frame.<sup>146</sup> For lawyers, the *Vitruvian Man* serves as our visual model to push, stretch, and always move forward.

#### F. Futuristic Technology Designs

Before we return to the twenty-first century, Leonardo’s futuristic visions and designs deserve a brief exploration because they preview the modern concept, attributed to Steve Jobs, that “innovation requires a reality distortion field.”<sup>147</sup> In many of his works, we can see how Leonardo’s ideas frequently danced and darted between fantasy and reality.<sup>148</sup> While some critics regard Leonardo’s fantastical ideas as foibles, others recognize that true innovators “overreach” and “fail.”<sup>149</sup> Professor Isaacson observes, for example, that some of Leonardo’s most outlandish visions of flying machines and scuba gear

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<sup>145</sup> ISAACSON, *supra* note 41, at 156 (“The man seems to be in motion, vibrant and energetic, just like the four-winged dragonflies that Leonardo studied. Leonardo has made us sense, almost see, one leg and then the other being pushed out and pulled back, the arms flapping as in flight.”).

<sup>146</sup> *Id.* at 180. (“Leonardo sought to freeze-frame an event while also showing it in motion.”). Given the tragic backstory on how this drawing came into existence, sentimental viewers may appreciate how Leonardo’s *Vitruvian Man* represents the culmination of observation, study, reflection, and collaboration over many years with a cherished and deceased friend, Giacomo Andrea, on how to “harmonize the proportions of a human to that of a church.” *Id.* at 141. The French brutally killed Giacomo Andrea. *Id.* at 152–53. Professor Isaacson describes how the writings of an ancient Roman architect inspired Leonardo’s quest to harmonize the proportions of a human to a church. *Id.* at 140–41. Isaacson notes that Leonardo frequently collaborated with colleagues. *Id.* at 158. Isaacson writes, “Conceiving ideas was for Leonardo, as it has been throughout history for other cross-disciplinary thinkers, a collaborative endeavor.” *Id.* He notes how Steve Jobs and Benjamin Franklin created places where “people with diverse interests encounter one another serendipitously.” *Id.* at 159.

<sup>147</sup> *Id.* at 353; *see also* WALTER ISAACSON, STEVE JOBS 161 (2011) [hereinafter ISAACSON, STEVE JOBS]. Reflecting on his reality distortion field, Jobs quoted the White Queen from Lewis Carroll’s *Through the Looking Glass*. *Id.* at 235. In response to Alice’s lament that “she can’t believe impossible things, the White Queen retorts, ‘[w]hy, sometimes I’ve believed as many as six impossible things before breakfast.’” *Id.*

<sup>148</sup> ISAACSON, *supra* note 41, at 353.

<sup>149</sup> *Id.* at 353; FUENTES, *supra* note 37, at 275 (“Being human, seeking to be creative, requires failing often.”).

became reality centuries later.<sup>150</sup> Simply put, the once impossible may, in fact, be possible over time.<sup>151</sup>

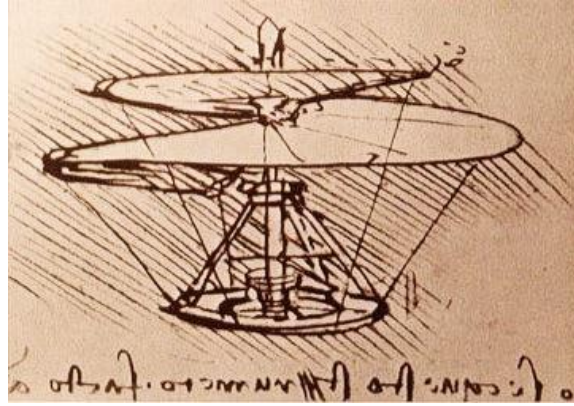


Illustration 5: Leonardo's Sketch of Early Helicopter (c. 1480)<sup>152</sup>

As the quintessential Renaissance man with his eyes seeing and mind imagining far ahead, Leonardo's futuristic ideas and sketches prove remarkably prescient, including his idealized vision for modern facial recognition technologies—which currently raise dystopian concerns.<sup>153</sup> Though “Leonardo knew none of these latter-day Frankenstein fears, nor could he imagine outsourcing the work of our eyes” to machines, his extraordinary sketches of birds, humans, ebbing waters, and visionary machines reveal his

<sup>150</sup> ISAACSON, *supra* note 41, at 354 (“Sometimes fantasies are paths to reality.”).

<sup>151</sup> SCHMIDT & ROSENBERG, *supra* note 31, at 11.

<sup>152</sup> *Arial Screw/Helicopter*, WIKIMEDIA COMMONS, [https://commons.wikimedia.org/wiki/File:Leonardo\\_da\\_Vinci\\_helicopter.jpg](https://commons.wikimedia.org/wiki/File:Leonardo_da_Vinci_helicopter.jpg) [<https://perma.cc/YS6A-DFKU>].

<sup>153</sup> See generally HANNAH FRY, *HELLO WORLD: BEING HUMAN IN THE AGE OF ALGORITHMS* 169 (2018) (describing the poor performance of facial recognition algorithms); Kashmir Hill, *The Secretive Company That Might End Privacy as We Know It*, N.Y. TIMES (Jan. 18, 2020), <https://www.nytimes.com/2020/01/18/technology/clearview-privacy-facial-recognition.html> [<https://perma.cc/UYX7-XTQ2>] (describing the Clearview AI facial recognition app that “helps law enforcement match photos of unknown people to their online images”); Cat Zakrzewski, *The Technology 202: Facial Recognition Gets Another Look on Capitol Hill Today From Skeptical Lawmakers*, WASH. POST (Jan. 15, 2020), <https://www.washingtonpost.com/news/powerpost/paloma/the-technology-202/2020/01/15/the-technology-202-facial-recognition-gets-another-look-on-capitol-hill-today-from-skeptical-lawmakers/5e1dfc4588e0fa2262dcd2b5/> [<https://perma.cc/SB96-KJM4>]; Jessica Porter, *Surprising Results after Activists Test Facial Recognition Technology on Denver City Council*, DENVER CHANNEL (Jan. 13, 2020, 10:10 PM), <https://www.thedenverchannel.com/news/local-news/surprising-results-after-activists-test-facial-recognition-technology-on-denver-city-council> [<https://perma.cc/PL5M-A2SQ>] (“A test done by a grassroots campaign to ban facial recognition technology in Denver found it falsely matched Denver City Council members to people in the sex offender registry.”).

gritty determination to unlock the hidden powers and mechanics of motion.<sup>154</sup>

### G. Leonardo's "Quirky Work Habits"

To avoid leaving the reader with a rose-tinted impression about Leonardo's career, Leonardo's "quirky work habits" often elicited negative responses by powerful patrons expecting timely delivery of their art commissions.<sup>155</sup> As we will see in the three following examples, Leonardo's idiosyncratic work habits represented a mixed bag—some worth emulating and others requiring elimination.

First, a review of Leonardo's started and often uncompleted projects reveals that "he was a genius undisciplined by diligence" and that "he preferred the conception to the execution."<sup>156</sup> To rein in his uneven delivery of artistic commissions, records show how Leonardo's father and other patrons' drafted strict contracts to ensure timely work production and completion.<sup>157</sup> Five hundred years ago, Leonardo's active and creative mind was apparently viewed as a liability since he generated an abundance of "seed ideas."<sup>158</sup> As modern knowledge professionals, we understand that many of his fantastical ideas did not take root and grow fruit for many reasons, some outside of Leonardo's control—especially his conceptions that were centuries ahead of their time. Now, we celebrate Leonardo's creative genius and recognize the value of his bold and visionary ideas—whether they were germinating seeds or completed masterpieces.

Second, because Leonardo believed that ideas must marinate and intuition needs nurture, he found it necessary to navigate and finesse patron expectations. In response to complaints about the slowness of his work, Leonardo wrote, "Men of lofty genius sometimes accomplish the most when they work the least for their minds are occupied with their ideas and the

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<sup>154</sup> Philip Kennicott, *Not Every Leonardo is in the Huge Leonardo da Vinci Exhibition. What's at the Louvre, though, is Brilliant.*, WASH. POST (Oct. 18, 2019, 2:00 PM), [https://www.washingtonpost.com/entertainment/museums/not-every-leonardo-is-in-the-huge-louvre-exhibition-whats-there-though-is-brilliant/2019/10/18/f8a9937e-f1b9-11e9-89eb-ec56cd414732\\_story.html](https://www.washingtonpost.com/entertainment/museums/not-every-leonardo-is-in-the-huge-louvre-exhibition-whats-there-though-is-brilliant/2019/10/18/f8a9937e-f1b9-11e9-89eb-ec56cd414732_story.html) [<https://perma.cc/GT3A-9KUN>] (noting how five centuries before the advent of modern facial recognition technologies, Leonardo produced a "unprepossessing sketch of a man's head and eyes, with proportions carefully annotated with measuring lines"); DU SAUTOY, *supra* note 37, at 120. Professor du Sautoy notes that Leonardo's sketchbooks included detailed measurements of human faces and various facial features. *Id.* Some art experts posit that "Leonardo was applying the mathematical idea of the golden ratio to create the perfect face." *Id.*

<sup>155</sup> ISAACSON, *supra* note 41, at 279–80.

<sup>156</sup> *Id.* at 82.

<sup>157</sup> *Id.* at 82. In the conclusion of his biography, Isaacson notes Leonardo's trail of unfinished projects, which also revealed his genius. *Id.* at 517. Isaacson argues that his unfinished works offer key insights into Leonardo's creative processes and that "by refusing to churn out works that he had not perfected, he sealed his reputation as a genius rather than a master craftsman." *Id.* at 518.

<sup>158</sup> Martin L. Weitzman, *Recombinant Growth*, 113 Q.J. ECON. 331, 333 (1998).

perfection of their conceptions, to which they afterwards give form.”<sup>159</sup> Long before the concept of the unconscious mind came into being, Leonardo intuited the importance of rest and the constructive powers of daydreaming to his creativity.<sup>160</sup>

Third, the following vignette depicts a witty exchange between Leonardo and Ludovico Sforza, Duke of Milan, over the commission to paint the *Last Supper* by highlighting the tensions between an artistic genius and a production-focused patron.<sup>161</sup> Irritated by his procrastination, the Duke expressed his frustrations to Leonardo.<sup>162</sup> In response, Leonardo mentioned that he had two remaining heads to paint: Christ and Judas.<sup>163</sup> Leonardo then mentioned that he would use the Duke’s image for Judas if he continued to hound him.<sup>164</sup> Mortified by the possibility of such pictorial posterity, the Duke let Leonardo proceed at his own pace.<sup>165</sup> The Duke perhaps ultimately felt the wait worthwhile since *The Last Supper* has been described as “the most spellbinding narrative painting in history, displaying multiple elements of Leonardo’s brilliance.”<sup>166</sup>

The three takeaway lessons here for lawyers are (1) creative seed ideas need time to germinate, take root, and mature, (2) daydreaming and rest supports creative problem solving, and (3) unless we possess Leonardo’s artistic genius, modern innovators should heed Steve Jobs’s smart advice: “real artists ship.”<sup>167</sup>

Having completed our survey of Leonardo’s genius, we now return to the challenge of lawyering in the twenty-first century, where human-machine teaming increasingly represents the standard operating procedure.

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<sup>159</sup> ISAACSON, *supra* note 41, at 280.

<sup>160</sup> MLODINOW, *supra* note 31, at 126–27.

<sup>161</sup> ISAACSON, *supra* note 41, at 280.

<sup>162</sup> *Id.*

<sup>163</sup> *Id.*

<sup>164</sup> *Id.*

<sup>165</sup> *Id.*

<sup>166</sup> *Id.* at 280–81. Isaacson highlights Leonardo’s brilliant use of “complex perspective” which mixes both “natural and artificial perspective” to accommodate the viewers’ differing vantage points. *Id.* at 287–88. He describes *The Last Supper* as “a mix of scientific perspective and theatrical license, of intellect and fantasy, worthy of Leonardo. His study of perspective science had not made him rigid or academic as a painter. Instead, it was complemented by the cleverness and ingenuity he had picked up as a stage impresario. Once he knew the rules, he became a master at fudging and distorting them, as if creating perspectival sfumato.” *Id.* at 290.

<sup>167</sup> ISAACSON, *supra* note 41, at 161.

### III. MODERN LAW: TEAMING OF SYNTHETIC AND HUMAN INTELLIGENCE

*“Code is law, and law is increasingly becoming code.”*

— Alex “Sandy” Petland<sup>168</sup>

*“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”*

— Roy Amara, *Amara’s Law*<sup>169</sup>

In her wide-ranging book, *The Human Algorithm: How Artificial Intelligence is Redefining Who We Are*, human rights attorney and law professor Flynn Coleman asserts that we find ourselves at a crossroads “in the history of technology [that] compels us to assess the value of intelligence, both organic and synthetic.”<sup>170</sup>

Similarly, recognizing this crossroads for the legal profession, this Article offers a preliminary appraisal for the future of humans practicing law with synthetic intelligences, while keeping in mind the maxim that “new technologies = new perceptions.”<sup>171</sup> In particular, this Article posits that, as increasingly capable “synthetic intellects”<sup>172</sup> perform more routine legal tasks, curious, cognitively diverse, creative, entrepreneurial, and emotionally intelligent human lawyers will be best positioned to “race with” instead of “against the machines.”<sup>173</sup> To prepare for this race, this Part surveys the growing capabilities and current limitations of AI technologies. It then drills down with a machine learning explainer. This Part then explores organic human emotional intelligence, followed by some observations and reflections on how synthetic intellects may restructure the practice of law.

Before turning to the topic of synthetic and human intelligences, let us begin by decoding the word intelligence, distinguishing between specialized and general intelligence, addressing an important emerging entanglement, and recognizing an economic reality. We start by broadly defining intelligence as:

<sup>168</sup> Alex “Sandy” Petland, *A Perspective on Legal Algorithms*, MIT (Dec. 6, 2019), <https://law.mit.edu/pub/aperspectiveonlegalalgorithms> [<https://perma.cc/ME7B-FHSA>].

<sup>169</sup> Roy Amara (1925–2007), OXFORD REFERENCE, <https://www.oxfordreference.com/view/10.1093/acref/9780191826719.001.0001/q-oro-ed4-00018679> [<https://perma.cc/55FH-TZFG>].

<sup>170</sup> COLEMAN, *supra* note 6, at xiv.

<sup>171</sup> John Brockman, *Introduction*, in POSSIBLE MINDS: TWENTY-FIVE WAYS OF LOOKING AT AI xvii (John Brockman ed., 2019).

<sup>172</sup> KAPLAN, *supra* note 11, at 4–6.

<sup>173</sup> ERIK BRYNJOLFSSON & ANDREW MCAFEE, *THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES* 187 (2014) [hereinafter BRYNJOLFSSON & MCAFEE, *THE SECOND MACHINE AGE*] (positing the strategy of “rac[ing] with” machines); ERIK BRYNJOLFSSON & ANDREW MCAFEE, *RACE AGAINST THE MACHINE* 36 (2011) [hereinafter BRYNJOLFSSON & MCAFEE, *RACE AGAINST THE MACHINE*] (writing that “some human workers may lose out in the race against the machine”).



- “the ability to deploy novel means to attain a goal; the goals are extraneous to the intelligence itself”;<sup>174</sup>
- “a whole set of solutions to independent problems”;<sup>175</sup>
- “knowing why things happen and what emotions they stir up, and being able to predict possible consequences of actions”;<sup>176</sup> and
- an ability to sense, remember, think, create, decide, act, and learn.<sup>177</sup>

Next, as human-machine teaming becomes standard operating procedure, it is helpful to distinguish between specialized and general intelligence. The term “specialized intelligence” describes “the ability to achieve specific goals effectively in a given environment.”<sup>178</sup> In contrast, “general intelligence” describes “the ability to achieve a wide range of different goals effectively in different environments.”<sup>179</sup> Eventually, we may see digital tools and assistants use their specialized intelligence to perform routine tasks in narrow, controlled environments. Simultaneously, humans will deploy their general intelligence to complete non-routine tasks in unpredictable environments.<sup>180</sup>

And now the emerging entanglement, because cognitive technologies are impressive and useful tools, humans should always be concerned “about putting machines in charge of decisions they don’t have the intelligence to make.”<sup>181</sup> Humans must, therefore, vigilantly supervise and control cognitive technologies and not cede decision-making authority to heartless and clueless machines that cannot think.<sup>182</sup> We should remain mindful that while AIs can be

<sup>174</sup> Steven Pinker, *Thinking Does Not Imply Subjugating*, in WHAT TO THINK ABOUT MACHINES THAT THINK 5, 7 (John Brockman ed., 2015).

<sup>175</sup> Tomaso Poggio, “Turing+” Questions, in WHAT TO THINK ABOUT MACHINES THAT THINK 47, 50 (John Brockman ed., 2015).

<sup>176</sup> Roger Schank, *Machines That Think Are In The Movies*, in WHAT TO THINK ABOUT MACHINES THAT THINK 132, 133 (John Brockman ed., 2015).

<sup>177</sup> THOMAS W. MALONE, *SUPERMINDS: THE SURPRISING POWER OF PEOPLE AND COMPUTERS THINKING TOGETHER* 82 (2018).

<sup>178</sup> *Id.* at 24.

<sup>179</sup> *Id.*

<sup>180</sup> *Id.* at 92.

<sup>181</sup> Jon Kleinberg & Sendhil Mullainathan, *We Built Them, But We Don’t Understand Them*, in WHAT TO THINK ABOUT MACHINES THAT THINK 62, 65 (John Brockman ed., 2015); W. Tecumseh Fitch, *Nano-Intentionality*, in WHAT TO THINK ABOUT MACHINES THAT THINK 89 (John Brockman ed., 2015) (“[W]e have little to fear from thinking machines, and more to fear from the increasing unthinking humans who use them.”).

<sup>182</sup> Keith Devlin, *Leveraging Human Intelligence*, in WHAT TO THINK ABOUT MACHINES THAT THINK 74, 76 (John Brockman ed., 2015) (“What worries me is the increasing degree to which we are giving up aspects of our lives to machines that *decide*, often much more effectively and reliably than people can, but definitely do not *think*.”); Daniel C. Dennett, *The Singularity—an*

useful and even impressive, such technologies can be biased, error-prone, opaque, unaccountable, and invade privacy.<sup>183</sup> In response, lawyers will need to design modern legal structures for society that “take the human into account at every stage”; for example, we should write and lobby for laws and regulations that require AIs to be transparent, traceable, accountable, interpretable, explainable, and contestable.<sup>184</sup>

Last, to survive economically, legal professionals must embrace human-machine teaming.<sup>185</sup> Because clients demand efficient, effective, and affordable legal services, emerging legal innovation technologies will disrupt “what has conventionally been considered legal work.”<sup>186</sup> As a consequence, lawyers must be thoughtful and nimble when determining which specific legal work functions should remain in the jurisdiction of human minds and those functions that can “be properly ceded to machines.”<sup>187</sup> Ultimately, lawyers unable to adapt will be left behind for the simple reason that cognitive

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*Urban Legend?*, in WHAT TO THINK ABOUT MACHINES THAT THINK 85, 88 (John Brockman ed., 2015) (“The real danger is basically clueless machines being ceded authority far beyond their competence.”).

<sup>183</sup> FRY, *supra* note 153, at 199.

<sup>184</sup> *Id.* at 201; ERNEST DAVIS & GARY MARCUS, REBOOTING AI: BUILDING ARTIFICIAL INTELLIGENCE WE CAN TRUST 191 (2019) (noting recent research into and current public policy discussions about “explainable AI”). Will Douglas Heaven, *Why Asking An AI to Explain Itself Can Make Things Worse*, MIT TECH. REV. (Jan. 29, 2020), <https://www.technologyreview.com/s/615110/why-asking-an-ai-to-explain-itself-can-make-things-worse> [<https://perma.cc/7YXS-KK9F>] (explaining some of the challenges in providing humans with the information needed for humans to understand, evaluate, agree or disagree, accept or reject, trust or distrust, and acquiesce or contest automated decisions). The article then surveys explainable AI (XAI) and the idea of “glassbox” instead of “black-box” AI systems. *Id.* The article concludes by advocating for “[e]xplanations that anyone can understand.” *Id.* See also IEEE, ETHICALLY ALIGNED DESIGN: A VISION FOR PRIORITIZING HUMAN WELL-BEING WITH AUTONOMOUS AND INTELLIGENT SYSTEMS 29 (2019), [https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/ead1e.pdf?utm\\_medium=undefined&utm\\_source=undefined&utm\\_campaign=undefined&utm\\_content=undefined&utm\\_term=undefined](https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/ead1e.pdf?utm_medium=undefined&utm_source=undefined&utm_campaign=undefined&utm_content=undefined&utm_term=undefined) [<https://perma.cc/2SP2-6NFS>] (“The term ‘transparency’ in the context of A/IS [autonomous/intelligent systems] also addresses the concepts of traceability, explainability, and interpretability.”); see also Susan C. Morse, *When Robots Make Legal Mistakes*, 72 OKLA. L. REV. 213, 217, 228, 230 (2019) (describing how intelligent automatic systems that act without human intervention need to be “sufficiently transparent and explainable” so that any actions or decisions will be legitimate which means “reasonable or nonnegligent”); see generally Ania Calderon et al., *AI/Blindspot: A Discovery Process for Spotting Unconscious Biases and Structural Inequalities in AI Systems*, MIT MEDIA (2019), <https://aiblindspot.media.mit.edu/> [<https://perma.cc/S6HG-H8NP>]; SCOTT HARTLEY, THE FUZZY AND THE TECHIE: WHY THE LIBERAL ARTS WILL RULE THE DIGITAL WORLD 129 (2017) (“[T]he technology issues facing us today—issues of identity, communication, privacy, regulation—require a humanistic perspective if we are to deal with them adequately.”).

<sup>185</sup> GROVE, *supra* note 17, at 189.

<sup>186</sup> Jonathan Askin et al., *An Automated < BLIP in MIT CLR's > Formation*, MIT (Dec. 6, 2019), <https://law.mit.edu/pub/anautomatedformation> [<https://perma.cc/S42C-38P3>].

<sup>187</sup> *Id.*; DAVIS & MARCUS, *supra* note 184, at 15 (warning that “we are ceding more and more authority to machines that are unreliable and, worse, lack any comprehension of human values”).

technologies “will be a source of awe, insight, inspiration, and yes, profit, for years to come.”<sup>188</sup>

### A. *Synthetic or Artificial Intelligence*

In his book, *The AI Delusion*, Pomona College Professor Gary Smith writes that the term “artificial intelligence” describes an evolving concept that “encompasses a variety of activities in which computers mimic things that humans do[.]”<sup>189</sup> AI systems with knowledge and perception capabilities (once possessed only by humans) currently solve narrow problems or tasks.<sup>190</sup> These cognitive technologies analyze and extract insights from data to assemble automobiles, recognize objects, translate language, trade stocks, drive cars, and play chess.<sup>191</sup> AI is also a “metatechnology” which means that it “can develop further technologies—either in conjunction with humans or perhaps even autonomously[.]”<sup>192</sup>

AI visionary Andrew Ng recently compared AI to electricity because these technologies are revolutionary when harnessed.<sup>193</sup> Comprehension of this revolutionary change begins with an understanding that AI—synthetic intelligence—technologies require three things: (1) big data,<sup>194</sup> (2) computing

<sup>188</sup> Donald D. Hoffman, *Evolving AI*, in WHAT TO THINK ABOUT MACHINES THAT THINK 128, 131 (John Brockman ed., 2015).

<sup>189</sup> SMITH, *supra* note 15, at 77.

<sup>190</sup> DAVENPORT, *supra* note 4, at 9, 99 (noting that “cognitive technologies in their current form support or automate tasks, not entire jobs or processes”).

<sup>191</sup> SMITH, *supra* note 15, at 77; DAVENPORT, *supra* note 4, at 85.

<sup>192</sup> Jaan Tallinn, *People Must Take Responsibility For Their Actions. Scientists And Technologists Are No Exception*, in WHAT TO THINK ABOUT MACHINES THAT THINK 230, 230 (John Brockman ed., 2015).

<sup>193</sup> KAI-FU LEE, *AI SUPERPOWERS: CHINA, SILICON VALLEY, AND THE NEW WORLD ORDER* 13 (2018).

<sup>194</sup> *Id.* at 14 (describing three essential components for AI). The term “data” refers to “distinct pieces of digital information” in binary digital format and transmitted in packets. *Data*, TECHOPEDIA (Dec. 15, 2016), <https://www.techopedia.com/definition/807/data> [<https://perma.cc/4VSS-96SG>]. In their book, *Big Data*, Viktor Mayer-Schönberger and Kenneth Cukier write, data “is a description of something that allows it to be recorded, analyzed, and reorganized.” VIKTOR MAYER-SCHÖNBERGER & KENNETH CUKIER, *BIG DATA: A REVOLUTION THAT WILL TRANSFORM HOW WE LIVE, WORK AND THINK* 78 (2013). Despite the current enthusiasm for all things data, readers should be skeptical of such zeal. As revealed in her book, *Artificial Unintelligence: How Computers Misunderstand the World*, New York University Professor Meredith Broussard writes “all data is dirty[.]” which means data created or generated by humans is often messy and incomplete. BROUSSARD, *supra* note 47, at 103. *See also* DU SAUTOY, *supra* note 37, at 62 (noting that “90 percent of the world’s data has been created in the last five years”). He explains that “[o]ne exabyte (equaling 10<sup>18</sup> bytes) of data is created on the internet every day. . . . Humankind now produces in two days the same amount of data it took us from the dawn of civilization until 2003 to generate.” *Id.* Professor du Sautoy also notes that questions about data ownership will “become bigger questions for society as we head into a future awash in it.” *Id.* at 83. Professor Smith cautions against over reliance on big data because “patterns are inevitable and therefore meaningless.” SMITH, *supra* note 15, at 80. He warns of the danger of

power,<sup>195</sup> and (3) algorithms.<sup>196</sup>

AI already exists using classical (binary) computers<sup>197</sup> and now emerges in quantum computers.<sup>198</sup> Most fascinatingly, or perhaps disturbingly, the

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“worship[ing] Big Data” because “[c]omputers cannot distinguish between good data and rubbish. Computers cannot distinguish between sensible conclusions and nonsense.” *Id.* at 82. Professor Smith also states, “Data without theory is a dangerous philosophy.” *Id.* He adds that “data mining may not be knowledge discovery, but noise discovery.” *Id.* at 116.

<sup>195</sup> First articulated in 1965 by Intel co-founder Gordon E. Moore, “Moore’s Law” is both a technological and economic theory that has become a “central phenomenon of the computer age.” BRYNJOLFSSON & MCAFEE, *THE SECOND MACHINE AGE*, *supra* note 173, at 40, 43. Moore’s Law posits that the number of transistors—electrical on/off switches that power microprocessors and which make computers increasingly fast and powerful—that engineers can fit onto a computer’s integrated circuit will compound every eighteen months. JAMES BARRAT, *OUR FINAL INVENTION: ARTIFICIAL INTELLIGENCE AND THE END OF THE HUMAN ERA* 139 (2013). As a result, computers will get progressively smaller, more powerful, and less expensive—unlocking powerful AI capabilities. *See also* FRIEDMAN, *supra* note 12, at 56 (quoting Intel’s senior fellow, Mark Bohr) (“Big data would not be here without Moore’s law.”).

<sup>196</sup> An algorithm is “a set of instructions for performing a task or solving a problem.” JAMIE SUSSKIND, *FUTURE POLITICS: LIVING TOGETHER IN A WORLD TRANSFORMED BY TECH* 94 (2018) [hereinafter SUSSKIND, *FUTURE POLITICS*]. PEDRO DOMINGOS, *THE MASTER ALGORITHM: HOW THE QUEST FOR THE ULTIMATE LEARNING MACHINE WILL REMAKE OUR WORLD* 1 (2015) Computer algorithms are sequences of instructions that tell a computer “what to do.” *Id.* Modern data scientists use algorithms: fixed series of steps used to sort, calculate, and organize data in an effort to identify patterns and solve problems. *Algorithm*, *TECHOPEDIA* (Mar. 27, 2020), <https://www.techopedia.com/definition/3739/algorithm> [https://perma.cc/GU5A-LZUX]. Algorithms can also be used to manipulate data (i.e., by inputting, finding, or sorting a particular item). DU SAUTOY, *supra* note 37, at 43 (observing that “algorithms have gained enormous currency in our era precisely because they are perfect fodder for computers”). He explains, “Wherever there is a discernable pattern underlying the way we solve a problem to guide us to a solution, an algorithm can exploit that discovery. It is not required of the computer that it think. It need[s] only . . . [to] pop [out] the answers we seek.” *Id.*

<sup>197</sup> Classical computing or binary computing represents the traditional approach where “information is stored in bits that are represented logically by either a 0 (off) or a 1 (on).” *Classical Computing*, *TECHTARGET.COM* (Nov. 2018), <https://whatis.techtarget.com/definition/classical-computing> [https://perma.cc/BX5M-JFAY].

<sup>198</sup> Quantum computing differs from classical computing because data can be represented in quantum bits (qubits), which can be on and off at the same time—a condition known as superposition. *Id.* Quantum computing, a fusion of mathematics, materials science, and computer science allows these new machines to “[take] advantage of the strange ability of subatomic particles to exist in more than one state at any time.” Talia Gershon, *Quantum Computing: You Know It’s Cool, Now Find Out How It Works*, IBM: RESEARCH BLOG (Sept. 11, 2017), <https://www.ibm.com/blogs/research/2017/09/qc-how-it-works/> [https://perma.cc/BT55-MAL3] (introducing the quantum computing concepts of superposition, entanglement, and interference and also providing links to explainer videos). *What Is Quantum Computing*, IBM: QUANTUM, <https://www.research.ibm.com/ibm-q/learn/what-is-quantum-computing/> [https://perma.cc/K9B9-XEXZ]. IBM’s Dr. Talia Gershon, Senior Manager, Quantum Research, explains quantum computing to a broad audience of various ages and knowledge. Wired, *Quantum Computing Expert Explain One Concepts in 5 Levels of Difficulty*, YOUTUBE (June 25, 2018), <https://www.youtube.com/watch?v=OWJCFovochA#action=share> [https://perma.cc/PF2F-PPTR]; Kevin Krewell, *Does IBM Have The Quantum Advantage?*, FORBES (Sept. 18, 2018, 1:35 AM), <https://www.forbes.com/sites/tiriasresearch/2018/09/18/does-ibm-have-the-quantum->

quantum AIs of the future may both reveal the origins of life and transform our world.<sup>199</sup>

As human-AI teaming becomes progressively common in business and legal operations, it is important to keep in mind that “AI is a prediction technology.”<sup>200</sup> In their book, *Prediction Machines*, University of Toronto Professors Ajay Agrawal, Joshua Gans, and Avi Goldfarb explain, “Prediction is the process of filling in missing information. Prediction takes information you have, often called ‘data,’ and uses it to generate information you don’t have.”<sup>201</sup> Please observe that data-driven prediction is not the same as decision making, which involves “applying judgment to a prediction and then acting.”<sup>202</sup> As machines perform more predictions, the demand for and value of emotionally intelligent, human knowledge professionals who can detect and respond to “algorithmic failures,”<sup>203</sup> process information with excellent judgment, and are capable of appropriate action will increase.<sup>204</sup> The high market value of these human workers derives from the fact that computers “do

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advantage/#43fbf45d54e8 [https://perma.cc/FYW8-CZRL] (summarizing IBM Research COO Dario Gil’s explanations of “quantum computing and how it will change the computing landscape in the near future”); Alexandre Ménard et al., *A Game Plan for Quantum Computing*, MCKINSEY Q. (Feb. 2020), <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/a-game-plan-for-quantum-computing> [https://perma.cc/23TK-LZU8].

<sup>199</sup> *An Important Quantum Algorithm May Actually be a Property of Nature*, MIT TECH. REV. (Sept. 12, 2019), <https://www.technologyreview.com/s/614259/an-important-quantum-algorithm-may-actually-be-a-property-of-nature> [https://perma.cc/4C8R-ZR8F] (noting that “an increasing body of evidence has emerged that quantum processes play an important role in a number of biological mechanisms. Photosynthesis, for example, is now thought to be an essentially quantum process”). The article also describes “Grover’s algorithm” and Apoorva Patel’s ideas and research on DNA. *Id.*

<sup>200</sup> AGRAWAL ET AL., *supra* note 27, at 2 (“Our first key insight is that the new wave of artificial intelligence does not actually bring us intelligence but instead a critical component of intelligence—*prediction*.”).

<sup>201</sup> *Id.* at 13, 24, 41 (“Recent advances in machine learning are often referred to as advances in artificial intelligence because: (1) systems predicated on this technique *learn* and improve over time; (2) these systems produce significantly more-accurate predictions than other approaches under certain conditions, and some experts argue that prediction is central to intelligence; and (3) the enhanced prediction technology accuracy of these systems enable them to perform tasks, such as translation and navigation, that were previously considered the exclusive domain of human intelligence.”).

<sup>202</sup> *Id.* at 74.

<sup>203</sup> FRY, *supra* note 153, at 140; Eric Griffith, *10 Embarrassing Algorithm Fails*, PC MAG (Sept. 23, 2017), <https://www.pcmag.com/news/10-embarrassing-algorithm-fails> [https://perma.cc/XW8C-W79G].

<sup>204</sup> Remus & Levy, *supra* note 7, at 508 (noting “virtually all of a lawyer’s tasks involve the processing of information”); AGRAWAL ET AL., *supra* note 27, at 76, 81 (“Judgment involves determining the relative payoff associated with each possible outcome of a decision, including those associated with ‘correct’ decisions as well as those associated with mistakes. Judgment requires specifying the objective you’re actually pursuing and is a necessary step in decision making. As prediction machines make predictions increasing better, faster, and cheaper, the value of human judgment will increase because we’ll need more of it.”).

not understand concepts and ideas;<sup>205</sup> cannot hypothesize, analogize, idealize, generalize, think critically and skeptically; and cannot apply wisdom and common sense to distinguish between “good data and rubbish,” recognize “stupid strategies,” or “see the big picture.”<sup>206</sup> It is worth noting, however, that if AI predictions replace human advice, such machine-for-human substitution could degrade and potentially “eliminate a core function of lawyering—counseling compliance with the law.”<sup>207</sup>

Humans must supervise synthetic intelligences because “statistical correlations are a poor substitute for expertise.”<sup>208</sup> The infamous “Dead Salmon” study provides a vivid example of data revealing ludicrous patterns and relationships—or “voodoo correlations.”<sup>209</sup> In 2009, Dartmouth graduate student, Craig Bennet, put a dead salmon into an fMRI machine.<sup>210</sup> The fMRI scan picked up data and patterns in the dead salmon’s brain.<sup>211</sup> While humans understand that this data did not indicate that the dead salmon was alive—rather, the data detected noise—synthetic intelligences would not be able to make such a conclusion.<sup>212</sup> Bottom line: junk data can create junk knowledge by revealing “worthless patterns” that may lead to silly and potentially disastrous ideas and conclusions that rational and intelligent humans would immediately recognize and reject.<sup>213</sup>

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<sup>205</sup> SMITH, *supra* note 15, at 43.

<sup>206</sup> *Id.* at 12, 31, 34, 36, 50–51, 53, 55, 71, 82, 205, 235–37; *see also* Aubrey de Grey, *When Is A Minion Not A Minion?*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 54, 55 (John Brockman ed., 2015) (defining common sense “as the ability to process highly incomplete information so as to identify a reasonably close-to-optimal method for achieving a specified goal, chosen from a parametrically prespecified set of alternative methods”).

<sup>207</sup> Remus & Levy, *supra* note 7, at 548.

<sup>208</sup> SMITH, *supra* note 15, at 130–31 (“The fundamental problem with data mining is that it is very good at finding models that fit the data, but totally useless in gauging whether the models are ludicrous.”). Professor Smith emphasizes that because it is very “easy to find coincidental patterns and relationships,” humans must be acutely aware of the possibility of “spurious correlations” and unreliable or even ridiculous computer models. *Id.*

<sup>209</sup> *Id.* at 116–17; Alexis Madrigal, *Scanning Dead Salmon in fMRI Machine Highlights Risk of Red Herring*, WIRED (Sept. 18, 2009, 5:37 PM), <https://www.wired.com/2009/09/fmrisalmon/> [<https://perma.cc/3TFU-26DT>]; Louisa Lyon, *Dead Salmon and Voodoo Correlations: Should we be Sceptical [sic] About Functional MRI?*, 140 *BRAIN: J. NEUROLOGY* 53 (2017).

<sup>210</sup> SMITH, *supra* note 15, at 116–17.

<sup>211</sup> *Id.*; Lyon, *supra* note 209, at 55 (describing how scientists need to develop ways “to reduce the risk of misinterpreting the data”).

<sup>212</sup> SMITH, *supra* note 15, at 116–17; Lyon, *supra* note 209, at 53 (“The study thus neatly illustrates the importance of appropriate statistical corrections when analysing [sic] functional MRI data.”). The “dead salmon paper” “show[s] the importance of paying careful attention to how functional MRI data are analysed [sic].” Lyon, *supra* note 209, at 53; Madrigal, *supra* note 209 (noting that “fMRI data has a lot of natural noise”).

<sup>213</sup> Lyon, *supra* note 209, at 53 (“Bad statistics lead to bad science”). SMITH, *supra* note 15, at 167 (observing how computers can efficiently discover “worthless patterns”). Professor Smith also states, “Artificial intelligence algorithms are very good at finding patterns in data, but they are very bad at assessing the reliability of the data and the plausibility of a statistical analysis.” *Id.*

Notwithstanding the dead salmon study, data-driven approaches can still uncover interesting insights for human evaluation with a caveat that these approaches often ignore factors and considerations—not easily measured—that greatly matter to humans, society, and the law.<sup>214</sup> New York University Professor Meredith Broussard wisely observes, “Because social decisions are about more than just calculations, problems will always ensue if we use data to make decisions that involve social and value judgments.”<sup>215</sup> In a time where information flows fast and free, discerning and wise humans capable of reflection, reason, empathy, and ethical judgment will, therefore, need to remain in the loop for the simple reasons that machines lack discernment and humans are responsible for their synthetic creations.<sup>216</sup>

#### i. Artificial Intelligence Taxonomies

AI represents one of the newest fields in science and engineering.<sup>217</sup> Currently, the interdisciplinary fields of mathematics, neuroscience, and philosophy underpin the continuous rapid growth of AI technologies.<sup>218</sup> AI incorporates many subfields, including broad categories such as learning and perception, and the narrower activities of game playing, poetry writing, medical diagnostics, and mathematics.<sup>219</sup> As a “truly universal field,” Professors Stuart Russell and Peter Norvig set forth a four-part taxonomy for AI: (1) acting humanly: the Turing test approach; (2) thinking humanly: the cognitive modeling approach; (3) thinking rationally: the “laws of thought” approach; and (4) acting rationally: the rational agent approach.<sup>220</sup> Because “real intelligence doesn’t break when you slightly change the requirements of the problem it’s trying to solve,” a significant AI hurdle to surmount involves fluidly adapting and responding to new situations and information.<sup>221</sup> As noted

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at 149. HADFIELD, *supra* note 24, at 218 (“The implication of lousy data is lousy knowledge.”).

<sup>214</sup> BROUSSARD, *supra* note 47, at 118–19. Broussard explains, “Part of the reason we run into problems when making social decisions with machine learning is that the numbers camouflage important social context.” *Id.*; SMITH, *supra* note 15, at 4 (“To a computer, if it can’t be measured, it isn’t important.”); *see generally* FRANK PASQUALE, *THE BLACK BOX SOCIETY: THE SECRET ALGORITHMS THAT CONTROL MONEY AND INFORMATION* (2015).

<sup>215</sup> BROUSSARD, *supra* note 47, at 119. WILSON, *supra* note 40, at 195 (observing that humans “are drowning in information and starved for wisdom”). When contemplating the potential power of AI technologies, Professor Wilson argues that scientists and humanities scholars should work together to understand and define what it means to be human and how to build the technologies of the future. *Id.* at 198. He believes that these efforts will bring forth the “third Enlightenment.” *Id.*

<sup>216</sup> BROUSSARD, *supra* note 47, at 119, 177; SMITH, *supra* note 15, at 237; MARGARET LEVI, *Human Responsibility for Machines that Think*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 91 (John Brockman ed., 2015); *see generally* SHELLEY, *supra* note 3.

<sup>217</sup> STUART RUSSELL & PETER NORVIG, *ARTIFICIAL INTELLIGENCE: A MODERN APPROACH* 1 (3d ed., 2010); *see* Escajeda, *Zero Economic Value Humans?*, *supra* note 12, at 137–38 (original publication of this artificial taxonomy text).

<sup>218</sup> SUSSKIND, *FUTURE POLITICS*, *supra* note 196, at 37.

<sup>219</sup> RUSSELL & NORVIG, *supra* note 217, at 1.

<sup>220</sup> *Id.* at 1–5.

<sup>221</sup> James Somers, *Is AI Riding A One Trick Pony?*, MIT TECH REV. (Sept. 29, 2017),

above, computer programs can produce narrow, specialized intelligence while humans naturally possess broad, general intelligence.<sup>222</sup>

## ii. Machine Learning Explainer

Although one may reasonably (but erroneously) think that the AI subfield of “machine learning” (ML) refers to a sentient digital being, ML instead describes narrow, mathematical, soulless algorithms that “derive their solutions statistically and probabilistically.”<sup>223</sup> At ML’s core sits “the idea that an algorithm can be created that will alter its approach if the result it produces come[s] up short of its objective.”<sup>224</sup> Using feedback to reveal mistakes, ML algorithms can improve the performance of routine, automated, and programmable tasks over time.<sup>225</sup> In describing how a machine “learns,” Professor Meredith Broussard explains that “it doesn’t mean that the machine has a brain out of metal. It means that the machine has become more accurate at performing a single, specific task according to a specific metric that a person has defined.”<sup>226</sup> Further, it is important to remember that the complexity of human knowledge and expertise cannot be neatly distilled into binary code—that is, 0 or 1—used by classical computers.<sup>227</sup>

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<https://www.technologyreview.com/2017/09/29/67852/is-ai-riding-a-one-trick-pony/> [<https://perma.cc/667V-BNVL>] (examining AI technology limitations); see Seth Lloyd, *Wrong, But More Relevant Than Ever*, in POSSIBLE MINDS: TWENTY-FIVE WAYS OF LOOKING AT AI 1, 10 (John Brockman ed., 2019) (noting the difference between raw, brute-force power and “sophisticated information processing power”); SMITH, *supra* note 15, at 235 (“With true intelligence, skills are portable.”).

<sup>222</sup> MALONE, *supra* note 177, at 24, 92.

<sup>223</sup> MITCHELL, *supra* note 11, at 21, 41 (noting that machine learning is an AI subfield “in which machines ‘learn’ from data or from their own ‘experiences’”); BROUSSARD, *supra* note 47, at 10–12 (noting that soulless computers lack sentience). MIT Professor Erik Brynjolfsson and Carnegie Mellon University Professor Tom Mitchell explain, “Nearly all ML algorithms derive their solutions statistically and probabilistically. As a result, it is rarely possible to train them to 100% accuracy.” Erik Brynjolfsson & Tom Mitchell, *What can Machine Learning Do? Workforce Implications*, 358 SCI. 1530, 1533 (2017).

<sup>224</sup> DU SAUTOY, *supra* note 37, at 62–63.

<sup>225</sup> *Id.* at 63; BROUSSARD, *supra* note 47, at 89; Erik Brynjolfsson et al., *Artificial Intelligence and the Modern Productivity Paradox: A Clash of Expectations and Statistics* 20 (Nat’l Bureau of Econ. Research, Working Paper No. 24001, 2017) [hereinafter Brynjolfsson et al., *AI and Modern Productivity Paradox*] (explaining that ML stands apart from previous technologies because, “[i]nstead of requiring an inventor or developer to codify, or code, each step of a process to be automated, a machine learning algorithm can discover on its own a function that connects a set of inputs X to a set of outputs Y as long as it’s given a sufficiently large set of labeled examples mapping some of the inputs to outputs”).

<sup>226</sup> BROUSSARD, *supra* note 47, at 92.

<sup>227</sup> *Id.* at 179. See Askin et al., *supra* note 186. Askin et al. write,

[i]t seems fitting that machines will perform tasks that are more readily reduced to black and white, zeros and ones, and humans will continue to perform those tasks that require subtle, nuanced legal analysis of the “gray areas”—the ambiguities of law, ethics, and philosophy that are not amenable to the speed, logic, and parsing of binary computational algorithms. *Id.*



Professors Russell and Norvig's seminal AI textbook identifies three types of ML: unsupervised, supervised, and reinforcement.<sup>228</sup> To improve their predictive accuracy, ML algorithms analyze data sets (training data) to construct and recursively refine its "black box" algorithmic models.<sup>229</sup> Access to big data is, therefore, paramount to ML performance<sup>230</sup> because lots of training data allow these ML algorithms to gain experience and tweak its models over time.<sup>231</sup> In essence, data scientists "create meta-algorithms which create new algorithms based on the data they encounter."<sup>232</sup>

In their 2017 article, "Artificial Intelligence and the Modern Productivity Paradox: A Clash of Expectations and Statistics," MIT professors Erik Brynjolfsson and Daniel Rock, along with Chad Syverson from the University of Chicago, explain ML's significance:

[m]achine learning represents a fundamental change from the first wave of computerization. Historically, most computer programs were created by meticulously codifying human knowledge, step-by-step, mapping inputs to outputs as prescribed by the programmers. In contrast, machine learning systems use categories of general algorithms (e.g., neural networks) to figure out the relevant mapping on their own, typically by being fed very large data sets of examples.<sup>233</sup>

These ML algorithms now make it possible to train more capable and accurate computer systems.<sup>234</sup> With access to large enough training data sets, ML can produce faster, more accurate, and cost-effective computer programs than can be manually coded by humans.<sup>235</sup>

In a fascinating but unsettling observation, Professor du Sautoy asserts that "Machine learning is basically a form of digital evolution,"<sup>236</sup> and we now enter a "new age of machine learning" where "dynamic algorithms" continuously learn and exhibit creativity.<sup>237</sup> He adds that "[m]achine learning

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<sup>228</sup> BROUSSARD, *supra* note 47, at 93; RUSSELL & NORVIG, *supra* note 217, at 707–08.

<sup>229</sup> BROUSSARD, *supra* note 47, at 93; SMITH, *supra* note 15, at 237 (warning of the dangers of black box inscrutability and human belief in their infallibility).

<sup>230</sup> DU SAUTOY, *supra* note 37, at 63.

<sup>231</sup> *Id.*

<sup>232</sup> *Id.*

<sup>233</sup> Brynjolfsson et al., *AI and Modern Productivity Paradox*, *supra* note 225, at 2.

<sup>234</sup> Brynjolfsson & Mitchell, *supra* note 223, at 1531.

<sup>235</sup> *Id.*

<sup>236</sup> DU SAUTOY, *supra* note 37, at 135.

<sup>237</sup> *Id.* at 31, 37, 60, 75–76 (describing the DeepMind algorithm's "beautiful" and creative move (number 37) in Game Two of the Lee Sedol versus AlphaGo challenge match in March 2016); see Cade Metz, *In Two Moves, AlphaGo and Lee Sedol Redefined the Future*, WIRED (Mar. 13, 2016, 7:00 AM), <https://www.wired.com/2016/03/two-moves-alphago-lee-sedol-redefined-future/> [<https://perma.cc/Q3QP-J36U>].

has opened up the prospect of algorithms that change and mature as we do.”<sup>238</sup>

Recent advancements demonstrate the progressive power of ML systems capable of plotting elegant new approaches.<sup>239</sup> For instance, generative design ML software can cost-effectively create models that conform to strength, weight, and performance requirements.<sup>240</sup> As seen in the heat exchanger below,<sup>241</sup> ML solutions may have a “very different look and feel” than those designed by ordinary humans.<sup>242</sup> Interestingly, this ML-designed heat exchanger looks like something that Leonardo could have sketched in one of his notebooks.

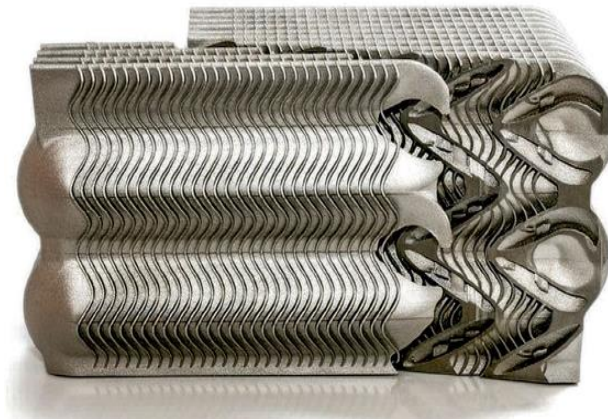


Illustration 6: ML-designed Heat Exchanger (2017)<sup>243</sup>

### iii. Human-machine Teaming

At least for the near term, the challenge for humans involves cultivating our unique human talents so that we can work in tandem with technologies—producing superior results than humans and machines working independently.<sup>244</sup> Agreeing with this assessment, MIT Sloan School of

<sup>238</sup> DU SAUTOY, *supra* note 37, at 74–75; see Sankar Das Sarma et al., *Machine Learning Meets Quantum Physics*, PHYSICS TODAY, Mar. 2019, at 48, 48 (arguing that “[t]he marriage of the two fields may give birth to a new research frontier that could transform them both”).

<sup>239</sup> Brynjolfsson & Mitchell, *supra* note 223, at 1533.

<sup>240</sup> *Id.* at 1532–33.

<sup>241</sup> *Id.* at 1532. A heat exchanger is a “device (such as an automobile radiator) for transferring heat from one fluid to another without allowing them to mix.” *Heat exchanger*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/heat%20exchanger> [https://perma.cc/ZPT3-YG4J].

<sup>242</sup> Brynjolfsson & Mitchell, *supra* note 223, at 1533.

<sup>243</sup> *Id.* at 1532. Professor Erik Brynjolfsson generously allowed the reproduction of this heat exchanger graphic.

<sup>244</sup> MITCHELL, *supra* note 11, at 272–73 (describing how human-computer teaming can generate

Management Professor Thomas W. Malone writes that people and computers working together will be “far more *collectively intelligent* than was ever possible before”<sup>245</sup>—due to the combination of humans’ general and emotional intelligence with machines’ domain-specific knowledge and computational power.<sup>246</sup> For curious, cognitively broad, and creative lawyers who can partner with synthetic intelligence, career opportunities will proliferate.<sup>247</sup>

Already, human-AI teaming has yielded impressive results in music composition. For example, American music composer and computer scientist David Cope activates his creativity with computer algorithms—a concept he calls Experiments in Musical Intelligence (EMI).<sup>248</sup> In 1987, Cope debuted his EMI-collaboration, “Cradle Falling,” and received rave reviews—with one critic calling it “a modern masterpiece.”<sup>249</sup> Similarly, after using “The Continuator: The First AI Jazz Improviser,” contemporary jazz pianist Bernard Lubat concluded that the “algorithm helped him to be more creative. The extraordinary value of the output was that it showed him new approaches to try.”<sup>250</sup> Synthetic intelligences are thus potentially helpful tools for eliminating cognitive drudgery<sup>251</sup> and extending human creativity,<sup>252</sup> provided that one heeds the words of Claude Debussy that “[w]orks of art make rules; rules don’t make works of art.”<sup>253</sup>

#### iv. AI Hype

Before turning to the topics of human emotional intelligence and how AIs may reorganize the practice of law, three memorable expert quotes merit

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creative ideas in an iterative process where the computer generates ideas and the human provides judgment); Metz, *supra* note 237 (describing the Sedol-AlphaGo match as including “transcendent moments of genius” for both humans (Game Three, Move 78—dubbed “God’s touch”) and machine (Game Two, move 37—repeatedly described as “so beautiful”)).

<sup>245</sup> MALONE, *supra* note 177, at 15.

<sup>246</sup> *Id.* at 75.

<sup>247</sup> Askin et al., *supra* note 186.

<sup>248</sup> DU SAUTOY, *supra* note 37, at 183.

<sup>249</sup> *Id.* at 184. Cope has since expanded EMI’s mission to include building composer databases that break down compositions into cells and signatures. *Id.* at 184–85. EMI’s analysis reveals strong compositional patterns in the works of Bach, Mozart, Chopin, Brahms, Gershwin, Joplin, and many others. *Id.* at 185. Cope’s algorithm now uses “recombination” to construct new compositions using cells and signatures in the composer databases. *Id.* MITCHELL, *supra* note 11, at 273 (describing EMI as using a “kind of musical ‘grammar’”); FRY, *supra* note 153, at 189–91 (describing the programming of EMI’s algorithms and comparing EMI “to the predictive text algorithms” found in smartphones).

<sup>250</sup> DU SAUTOY, *supra* note 37, at 204–06.

<sup>251</sup> Irene Pepperberg, *A Beautiful (Visionary) Mind*, in WHAT TO THINK ABOUT MACHINES THAT THINK 93–94 (John Brockman ed., 2015) (“Humans need to take advantage of the cognitive capacity that’s freed when machines take over the scut work—and be thankful for that freedom and use that freedom, channeling all that ability into the hard work of solving pressing problems that need insightful, visionary leaps.”).

<sup>252</sup> DU SAUTOY, *supra* note 37, at 285 (noting that, until machines become conscious, they will always be tools).

<sup>253</sup> *Id.* at 1.

mention because they provide some perspective in this time of AI hype.<sup>254</sup> First, Harvard Psychology Professor Steven Pinker describes AI as an “idiot savant.”<sup>255</sup> Second, Oren Etzioni, director of the Allen Institute for AI, wisecracked, “When AI can’t determine what ‘it’ refers to in a sentence, it’s hard to believe that it will take over the world.”<sup>256</sup> Third, Dr. Andrew Moore, vice president of Google and head of Google Cloud AI, reminds us that today’s most sophisticated and powerful computers are “the equivalent of really smart calculators, which solve specific problems.”<sup>257</sup> So, while computers can competently and efficiently crunch the physics equations to calculate what occurs when black holes collide, only humans can imagine, create, and extrapolate the theories driving scientific explorations.<sup>258</sup> Similarly, only human lawyers can identify legal and emotional issues, design strategies and solutions that advance client aspirations, and generate novel arguments that may shape laws.<sup>259</sup>

While most law practitioners do not intentionally explore dark matter and black holes, experienced lawyers recognize that some clients and cases can be classified as either or both. Although avoiding the client vortex of doom exceeds the scope of this Article, lawyers should regularly evaluate and update their strategies for identifying and working with—and, if necessary, firing—toxic clients.<sup>260</sup> In addition, human lawyers with successful practices possess

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<sup>254</sup> SMITH, *supra* note 15, at 236 (recommending that we “be skeptical of far-fetched science fiction scenarios” and “business hyping AI products”); DAVENPORT, *supra* note 4, at 94 (recommending caution given the current hype for cognitive technologies); KARTIK HOSANAGAR, A HUMAN’S GUIDE TO MACHINE INTELLIGENCE: HOW ALGORITHMS ARE SHAPING OUR LIVES AND HOW WE CAN STAY IN CONTROL 159 (2019) (discussing the hype about new ML algorithms “often exceeds their actual abilities”); Joe McKendrick, *Artificial Intelligence Can’t Get Here Soon Enough, Executives Say*, FORBES (Jan. 17, 2020, 11:49 PM), <https://www.forbes.com/sites/joemckendrick/2020/01/17/artificial-intelligence-cant-get-here-soon-enough-executives-say/#334a22c51f80> [<https://perma.cc/Y4ND-Q3V7>] (writing “most executives across most of the various industries agree that the hype around AI has surpassed its actual capability to deliver”).

<sup>255</sup> Steven Pinker, *Tech Prophecy and the Underappreciated Causal Power of Ideas*, in POSSIBLE MINDS: TWENTY-FIVE WAYS OF LOOKING AT AI 100, 110 (John Brockman ed., 2019) (describing an AI system as “an idiot savant, with little ability to leap to problems it was not set up to solve and a brittle mastery of those it was”).

<sup>256</sup> MITCHELL, *supra* note 11, at 228.

<sup>257</sup> MLODINOW, *supra* note 31, at 43.

<sup>258</sup> *Id.* Humans must first “set up” the “problem by deriving the equations for that particular process from the more general theory; and no computer can create the theories themselves.” *Id.*

<sup>259</sup> Remus & Levy, *supra* note 7, at 551 (noting that “the computer cannot exhibit creativity such that, at least for now, it cannot create novel legal arguments that may initiate change in the law”); Askin et al., *supra* note 186.

<sup>260</sup> See Mark Goulston, *How to Deal with a Toxic Client*, HARV. BUS. REV. (Apr. 3, 2013), <https://hbr.org/2013/04/how-to-deal-with-a-toxic-client> [<https://perma.cc/X9H7-55EP>]; Odette Pollar, *Yes, You Can—and Should—Fire Problematic Clients!*, FAM. LAW. MAG. (Mar. 5, 2015), <https://familylawyermagazine.com/articles/yes-you-can-fire-a-client/> [<https://perma.cc/2Q44-H9GH>].

soft skills, such as empathy,<sup>261</sup> connection, trust creation, and persuasion. These skills are necessary to engage and serve clients and encourage referrals. The concept of emotional intelligence broadly describes these soft social skills.

### **B. Human Emotional Intelligence**

Only humans possess the “tacit skills of emotional intelligence.”<sup>262</sup> The pairing of “emotional” with the “suitcase word”<sup>263</sup> “intelligence” may, for some readers, need unpacking. In his *Harvard Business Review* article, “What Makes a Leader?,” Dr. Daniel Goleman identifies emotional intelligence as an interplay of these uniquely human competencies: self-awareness, self-regulation or management, motivation, empathy, and social skills.<sup>264</sup> Table 1 defines and summarizes the “hallmarks” of these competencies.

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<sup>261</sup> Harvard Professor (emeritus) Edward O. Wilson argues that “the most successful member[s] of a stable society [possess] a strong sense of empathy.” WILSON, *supra* note 41, at 14. Empathy involves the ability to interpret the feelings of others and anticipate their actions. *Id.* While related to empathy, sympathy differs because it represents the “emotional concern felt for another’s plight combined with a desire to provide help and relief.” *Id.* See generally David J. Deming, *The Growing Importance of Social Skills in the Labor Market*, Q. J. ECON. 1593, 1595 (2017), [https://scholar.harvard.edu/files/ddeming/files/deming\\_socialskills\\_qje.pdf](https://scholar.harvard.edu/files/ddeming/files/deming_socialskills_qje.pdf) [<https://perma.cc/YRD6-QFMR>] (finding that “the fastest growing cognitive occupations—managers, teachers, nurses and therapists, physicians, lawyers, even economists—all require significant interpersonal interaction”).

<sup>262</sup> Remus & Levy, *supra* note 7, at 512.

<sup>263</sup> MITCHELL, *supra* note 11, at 19 (referencing Marvin Minsky’s term “‘suitcase word’” for ill-defined concepts such as “*thinking, cognition, consciousness, and emotion*”).

<sup>264</sup> Daniel Goleman, *What Makes a Leader?*, in HBR’S 10 MUST READS ON EMOTIONAL INTELLIGENCE 3 (Harvard Bus. Review ed., 2015); see generally DANIEL GOLEMAN, EMOTIONAL INTELLIGENCE: WHY IT CAN MATTER MORE THAN IQ (10th Anniversary ed., Bantam Books 2005).

	Definition	Hallmarks
Self-awareness	<ul style="list-style-type: none"> <li>Ability to understand how emotions, moods, and drives affect oneself and others</li> </ul>	<ul style="list-style-type: none"> <li>Realistic self-assessment</li> <li>Self-confidence</li> <li>Self-deprecating sense of humor</li> </ul>
Self-regulation	<ul style="list-style-type: none"> <li>Ability to think before acting and redirect or control impulses</li> </ul>	<ul style="list-style-type: none"> <li>Comfort with ambiguity</li> <li>Openness to change</li> <li>Trustworthiness and integrity</li> </ul>
Motivation	<ul style="list-style-type: none"> <li>Pursuing goals with determination and vigor</li> <li>Passion for achieving goals that go beyond money or status</li> </ul>	<ul style="list-style-type: none"> <li>Achievement-oriented</li> <li>Optimism, resilience, and grit</li> </ul>
Empathy	<ul style="list-style-type: none"> <li>Ability to recognize and respond to the emotional state of others</li> </ul>	<ul style="list-style-type: none"> <li>Cultural awareness</li> <li>Service mindset</li> </ul>
Social Skills	<ul style="list-style-type: none"> <li>Establishing and maintaining relationships</li> <li>Willingness to find commonalities and build affinities between individuals and groups</li> </ul>	<ul style="list-style-type: none"> <li>Leader/change manager</li> <li>Persuasive</li> <li>Team builder</li> </ul>

Table 1: Emotional Intelligence “Definitions and Hallmarks” (1996)<sup>265</sup>

The word empathy also benefits from closer inspection because it serves as the foundation for the “other abilities that increasingly make people valuable as technology advances.”<sup>266</sup> Harvard Professor (emeritus) Edward O. Wilson argues that “the most successful member[s] of a stable society [possess] a strong sense of empathy.”<sup>267</sup> Empathy involves the ability to interpret the feeling of others, anticipate their actions, and respond appropriately.<sup>268</sup> Sympathy slightly differs because it denotes the “emotional concern felt for another’s plight combined with a desire to provide help and relief.”<sup>269</sup>

Empathy now represents an essential skill for twenty-first-century knowledge professionals.<sup>270</sup> Interestingly, research reveals links between

<sup>265</sup> Goleman, *supra* note 264, at 4–6.

<sup>266</sup> COLVIN, *supra* note 30, at 71 (explaining that empathy “means discerning what some other person is thinking and feeling, and responding in some appropriate way”).

<sup>267</sup> WILSON, *supra* note 40, at 14.

<sup>268</sup> *Id.*; COLVIN, *supra* note 30, at 89.

<sup>269</sup> WILSON, *supra* note 40, at 14.

<sup>270</sup> COLVIN, *supra* note 30, at 73 (quoting Meg Bear) (“Empathy is the critical 21st-century skill.”). Meg Bear (@Megbear), TWITTER, <https://twitter.com/megbear?lang=en> [https://perma.cc/Y22L-X5UQ]. Her Twitter bio states, “Disruptive Technologist. Change Agent. Leader, Coach, TEDster. Adviser . . . [.]” *Id.*; Meg Bear, <https://megbear.com/keynotes-videos-and-podcasts/> [https://perma.cc/M7RG-CGTS] (providing links to Bear’s keynotes, videos, and podcasts). Bear previously worked at Oracle and now is the SVP Products at SAP

empathetic communications and litigation exposure; for example, doctors who listened to patient questions, concerns, and worries were less likely to be sued for malpractice.<sup>271</sup> As lawyers, we should similarly recognize the importance of compassion and connection because it not only increases our effectiveness and value to clients, but it may also shield us from malpractice claims.<sup>272</sup>

For lawyers, a developing downside to our embrace of digital communications may be an erosion of the effectiveness of lawyer-client relationships.<sup>273</sup> Since lawyers and clients regularly communicate digitally, it is increasingly common “to have client relationships that involve little or no real-life interaction.”<sup>274</sup> For clients seeking integrated and personalized legal and business solutions, digital relationships do not deliver the “human touch” necessary to form genuine long-term relationships.<sup>275</sup> Further, without a relationship based on human contact and earned trust, lawyers may find it difficult to “push back against clients” in terms of the wisdom of their objectives and the reasonableness of their expectations.<sup>276</sup> So, while technology brings speed, it does little to deepen the human relationships crucial for identifying and solving problems.<sup>277</sup>

Because humans often respond best to humans,<sup>278</sup> machines will not replace emotionally intelligent, knowledge professionals who can build the trust and connection necessary for forming and maintaining attorney-client relationships.<sup>279</sup> In his book, *Humans are Underrated: What High Achievers*

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SuccessFactors. *Meg Bear*, LINKEDIN, <https://www.linkedin.com/in/megbear/>. COLEMAN, *supra* note 7, at 207 (Empathy is “the essential emotional skill for the economic, political, and social systems we have created and will create. Empathy is at the core of our humanity.”).

<sup>271</sup> COLVIN, *supra* note 30, at 75. The doctors who had “scored poorly” in their empathetic communications skills “were more likely to be sued for malpractice.” *Id.*

<sup>272</sup> *Id.* (examining medical malpractice). MIKE WHELAN, JR., LAWYER FORWARD: FINDING YOUR PLACE IN THE FUTURE OF LAW 55 (2019) (discussing the importance of personal connection).

<sup>273</sup> Paul Hodkinson, *Technology Is Limiting the Depth of Lawyer-Client Relationships*, AM. LAW. (Jan. 16, 2020, 11:30 AM), <https://www.law.com/americanlawyer/2020/01/16/technology-is-limiting-the-depth-of-lawyer-client-relationships> [<https://perma.cc/ZD6T-ZYJU>].

<sup>274</sup> *Id.*

<sup>275</sup> *Id.*

<sup>276</sup> Remus & Levy, *supra* note 7, at 526–27 (noting that lawyers may need to “push back against a client’s proposed course of action and counsel compliance” and the need to develop attorney-client relationships based on trust). Hodkinson, *supra* note 273. Hodkinson similarly writes,

One veteran partner says he would often spend time explaining to clients that they could not have documentation as quickly as they wanted it because it was important to take the time to get it right. The clients listened to him because they knew him well enough to trust him and value his opinion. Without that depth of relationship, though, such conversations are likely to be a lot more awkward and the work done on deals more perfunctory. *Id.*

<sup>277</sup> *Id.*

<sup>278</sup> *Id.*

<sup>279</sup> COLVIN, *supra* note 30, at 89; Cohen, *Lawyers with IQ/EQ*, *supra* note 30; see generally RANDALL KISER, *SOFT SKILLS FOR THE EFFECTIVE LAWYER* (2017); but see ROBIN MURDOCH ET AL., *GETTING EMOTIONAL: HOW PLATFORMS, TECHNOLOGY, AND COMMUNICATIONS*

*Know that Brilliant Machines Never Will*, Geoff Colvin writes, “Skills of interaction are becoming the keys to success.”<sup>280</sup> Lawyers who will succeed in the decades ahead are not only smart, but they can also engage with others on a deeply human level in unstructured interactions and conversations.<sup>281</sup> These lawyers understand irrational clients, form emotional bonds necessary to guide prudent action, and relate to their clients as they navigate stressful situations and make difficult decisions.<sup>282</sup> Lawyers with high emotional intelligence—often called “people skills”—will be in demand because they “combine intellectual agility with an ability to read people”<sup>283</sup> and may potentially negotiate solutions to conflicts.<sup>284</sup> In the courtroom, these lawyers seamlessly combine their legal knowledge and emotional intelligence when advocating for their clients before judges and juries.<sup>285</sup>

The pairing of human emotional intelligence with synthetic intelligence will progressively reshape the client experience and the practice of law. Attorney and legal innovation expert Mark A. Cohen explains that modern lawyers who merge these intelligences begin by teaming with technology to

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COMPANIES CAN BUILD A RESPONSIBLE FUTURE FOR EMOTIONAL AI (2020), [https://www.accenture.com/\\_acnmedia/PDF-114/Accenture-Responsible-Use-Of-Emotional-AI-Final.pdf#zoom=40](https://www.accenture.com/_acnmedia/PDF-114/Accenture-Responsible-Use-Of-Emotional-AI-Final.pdf#zoom=40) [<https://perma.cc/CM56-EF3T>] (describing some promises and perils of recent developments in “Emotional AI” or “Emotion AI”); *see also* Mark Purdy et al., *The Risks of Using AI to Interpret Human Emotions*, HARV. BUS. REV. (Nov. 18, 2019), <https://hbr.org/2019/11/the-risks-of-using-ai-to-interpret-human-emotions> [<https://perma.cc/F8MZ-WT8V>] (“Now, emotional AI technology can help businesses capture the emotional reactions in real time—by decoding facial expressions, analyzing voice patterns, monitoring eye movements, and measuring neurological immersion levels, for example. The ultimate outcome is a much better understanding of their customers—and even their employees.”).

<sup>280</sup> COLVIN, *supra* note 30, at 47; *see also* Ed Hess, *In the AI Age, “Being Smart” Will Mean Something Completely Different*, HARV. BUS. REV. (June 19, 2017), <https://hbr.org/2017/06/in-the-ai-age-being-smart-will-mean-something-completely-different> [<https://perma.cc/3VX5-62YD>] (arguing that the new definition of smart (1) “promotes higher levels of human thinking and emotional engagement” and (2) will be based on “the quality” of one’s “thinking, listening, relating, collaborating, and learning”).

<sup>281</sup> COLVIN, *supra* note 30, at 49; Remus & Levy, *supra* note 7, at 532 (observing that “unstructured human interaction . . . is a part of lawyering tasks at every level”).

<sup>282</sup> COLVIN, *supra* note 30, at 49 (“The most valuable people are increasingly relationship workers.”).

<sup>283</sup> *Id.*

<sup>284</sup> LESLIE, *supra* note 35, at 156–61 (describing how empathetic curiosity, asking “why,” and understanding how intangible considerations (respect, pride, and face) can uncover paths for resolving disputes); *see generally* DEEPAK MALHOTRA & MAX H. BAZERMAN, *NEGOTIATION GENIUS: HOW TO OVERCOME OBSTACLES AND ACHIEVE BRILLIANT RESULTS AT THE BARGAINING TABLE AND BEYOND* (2007); *but see* Remus & Levy, *supra* note 7, at 527–28 (observing that while successful negotiation has historically “required personal interaction and effective use of emotion,” some e-commerce companies now use digital dispute resolution technologies to resolve customer disputes—thereby rendering unnecessary lawyer-led negotiations).

<sup>285</sup> Remus & Levy, *supra* note 7, at 529–30.



perform “rote chores” such as document review, statistical analysis, and legal research.<sup>286</sup> They will then synthesize the results, design strategies, and communicate client options for moving forward.<sup>287</sup> Further, as professional problem solvers, lawyers routinely combine their creativity and emotional intelligence skills to persuade clients, opposing counsel, and adjudicators of the soundness of their position and proposed resolution.<sup>288</sup> Because such persuasiveness requires knowledge and charisma to imbue the facts and legal arguments with trust and reason, these competencies remain outside the reach of sterile silicon machines.<sup>289</sup> Lawyers who perfect this human-machine fusion will solve client problems, earn trust and confidence, and may even receive feedback such as “I am sure glad she’s my lawyer.”<sup>290</sup>

In a nutshell, the emotionally intelligent legal professionals who will thrive in a digital (eventually quantum) economy are those who will effectively use cognitive intelligence tools to serve their clients compassionately and solve their legal problems ethically and humanely.<sup>291</sup>

We next consider how AIs will restructure the practice of law.

### C. *AIs and the Practice of Law*

#### i. **AIs Outperform Humans in Narrow Domains**

AI algorithms currently redefine and reshape the performance of knowledge work, including legal work.<sup>292</sup> For instance, a 2018 LawGeex study pitted 20 licensed U.S. attorneys against LawGeex’s AI algorithm to review five non-disclosure agreements (NDAs) containing thirty legal issues, 153 paragraphs, and 3,213 clauses.<sup>293</sup> The attorneys who participated in the

<sup>286</sup> Cohen, *Lawyers with IQ/EQ*, *supra* note 30.

<sup>287</sup> *Id.*

<sup>288</sup> *Id.*; COLVIN, *supra* note 30, at 176 (“Creativity plus empathy is valuable.”).

<sup>289</sup> Cohen, *Lawyers with IQ/EQ*, *supra* note 30.

<sup>290</sup> *Id.*

<sup>291</sup> COLVIN, *supra* note 30, at 41–42 (“[A] better strategy is to ask: What are the activities that we humans, driven by our deepest nature or by the realities of daily life, will simply insist be performed by other humans, regardless of what computers can do?”).

<sup>292</sup> See KAPLAN, *supra* note 11, at 145–49 (discussing how synthetic intellects/AI will transform the legal industry in terms of decreasing needs for human involvement and expertise necessary to perform legal work (e.g., machine learning used for research, document review, etc.), and increasing opportunities for customers to choose cost-effective digital legal services). DAVENPORT, *supra* note 4, at 81 (describing how “cognitive tools can largely automate such tasks as legal research in a few domains of law, rapid review of documents, and extraction of contract provisions”). Professor Davenport notes that these automated tasks are typically performed by junior attorneys or other relatively low-paid employees. *Id.* See MARK MURO ET AL., AUTOMATION AND ARTIFICIAL INTELLIGENCE: HOW MACHINES ARE AFFECTING PEOPLE AND PLACES (Jan. 24, 2019), <https://www.brookings.edu/research/automation-and-artificial-intelligence-how-machines-affect-people-and-places> (“Almost no occupation will be unaffected by [automation].”) [hereinafter MURO ET AL., AUTOMATION AND AI].

<sup>293</sup> *AI v. Human Lawyers: The Ultimate Showdown*, LAWGEEX, <https://www.lawgeex.com/resources/whitepapers/aivslawyer/> [<https://perma.cc/GPP6-WBAA>].

experiment had decades of contract review experience.<sup>294</sup> To prepare for the competition, the LawGeex AI trained on “tens of thousands of NDAs using machine-learning and deep-learning techniques.”<sup>295</sup> The results of the LawGeex human-AI competition are summarized in Table 2.

Measurement	20 Attorneys	LawGeex AI
Accuracy: Legal issue spotting	Average Atty: 85% Highest Atty: 94% Lowest Atty: 67%	94%
Time: Review 5 NDAs	Average: 92 minutes Fastest Atty: 51 minutes Slowest Atty: 156 minutes	26 seconds

Table 2: LawGeex Human Lawyer-AI Competition (2018)<sup>296</sup>

If AI continues to deliver time, process, and accuracy results such as these, AI legal assistants will be everyday digital partners in the performance of legal work, especially in the review of basic contracts such as NDAs, wills, and operating agreements.<sup>297</sup> As an example of such human-AI partnering, the international law firm White & Case recently announced its deployment of LawGeex’s Contract Review Automation tool in its transaction business.<sup>298</sup> According to White & Case leaders, such lawyer-machine coaction will yield consistent, timely, and cost-effective work products.<sup>299</sup>

For litigators, Casetext’s newly launched “Compose” automation tool to draft motions and briefs merits monitoring.<sup>300</sup> According to early reviews, the

<sup>294</sup> *Id.*; LAWGEEX, COMPARING THE PERFORMANCE OF ARTIFICIAL INTELLIGENCE TO HUMAN LAWYERS IN THE REVIEW OF STANDARD BUSINESS CONTRACTS 2 (2018), <https://images.law.com/contrib/content/uploads/documents/397/5408/lawgeex.pdf> [<https://perma.cc/K6L4-Z78C>].

<sup>295</sup> *Id.*

<sup>296</sup> *Id.* at 14–15.

<sup>297</sup> *Id.* at 22–23 (noting that additional benefits of AI assistants include consistent application of pre-approved legal rules in the contract review process and that AIs do not need sleep or caffeine); see Monica Chin, *An AI Just Beat Top Lawyers at Their Own Game*, MASHABLE (Feb. 25, 2018), <https://mashable.com/2018/02/26/ai-beats-humans-at-contracts/> [<https://perma.cc/24X9-X8ZK>]; John Markoff, *Armies of Expensive Lawyers, Replaced by Cheaper Software*, N.Y. TIMES (Mar. 4, 2011), <https://www.nytimes.com/2011/03/05/science/05legal.html> [<https://perma.cc/TGM4-KWML>]; see also AI100 STANDING COMMITTEE, STANFORD U., ARTIFICIAL INTELLIGENCE AND LIFE 2030 38 (2016) (explaining that legal jobs may be reduced and eventually eliminated as AI continues to be used for legal information extraction and topic modeling), [https://ai100.stanford.edu/sites/default/files/ai100report10032016fnl\\_singles.pdf](https://ai100.stanford.edu/sites/default/files/ai100report10032016fnl_singles.pdf) [<https://perma.cc/A4W4-SVFN>].

<sup>298</sup> White & Case *Whitelabels LawGeex For Client Contract Review Needs*, ARTIFICIAL LAW. (Jan. 28, 2020), <https://www.artificiallawyer.com/2020/01/28/white-case-whitelabels-lawgeex-for-client-contract-review-needs/> [<https://perma.cc/CNH7-SP8L>].

<sup>299</sup> *Id.*

<sup>300</sup> Victoria Hudgins, *Casetext Launches New Brief-Writing Automation Platform Compose*,

Compose legal brief drafting system “auto-generates a list of all arguments and related legal research data that will be relevant to writing a certain type of legal brief.”<sup>301</sup> Users can then efficiently review and select the specific items to be included in the draft brief.<sup>302</sup> In a recent demonstration, Casetext’s CEO Jake Heller created a “first draft of a brief in five minutes.”<sup>303</sup> To prepare an initial document using the Compose system, lawyers provide basic information such as jurisdiction, motion type, and whether the document should argue for or against the motion.<sup>304</sup> The Compose tool then generates an editable draft, complete with citations.<sup>305</sup> Heller claims that Casetext will enable lawyers to write quality briefs in “one-tenth” of the time it would take human lawyers to create and at a fraction of the cost.<sup>306</sup> For instance, under Casetext’s individual per document pricing model, the first brief costs \$99, followed by \$1,499 for each brief thereafter.<sup>307</sup> According to Ali Shahidi, chief innovation and client solutions officer, at the law firm Sheppard, Mullin, Richter & Hampton, his firm will use Compose to create consistent work products, streamline processes, reduce client costs, and as a training tool for new associates.<sup>308</sup> He anticipates that the Compose tool “will be a great benefit to both the firm and our clients.”<sup>309</sup>

Before panicking at the prospect of being replaced by AI systems that can review five NDAs in 26 seconds and draft motions in minutes,<sup>310</sup> lawyers should bear in mind that the LawGeex AI and other narrow AIs have “brittle”

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LAW.COM (Feb. 25, 2020, 5:00 AM), <https://www.law.com/legaltechnews/2020/02/25/casetext-launches-new-brief-writing-automation-platform-compose/> [https://perma.cc/K7VF-JEKD].

<sup>301</sup> *Id.*

<sup>302</sup> *Id.*

<sup>303</sup> Bob Ambrogi, *Notable New Casetext Product Drafts Your Litigation Briefs for You*, LAWSITES (Feb. 25, 2020), <https://www.lawsitesblog.com/2020/02/notable-new-casetext-product-drafts-your-litigation-briefs-for-you.html> [https://perma.cc/37S7-R5QF].

<sup>304</sup> *Id.* The motion types include motion for preliminary injunction, motion to dismiss for failure to state a claim, motion for protective order, motion to exclude expert testimony, motion to quash or modify a subpoena, and motion to compel discovery or disclosure. *Id.*

<sup>305</sup> *Id.*

<sup>306</sup> *Id.*

<sup>307</sup> *Id.*

<sup>308</sup> Lyle Moran, *Casetext Launches Automated Brief-Writing Product*, A.B.A. J. (Feb. 25, 2020, 8:00 AM), <https://www.abajournal.com/news/article/casetext-launches-automated-brief-writing-product> [https://perma.cc/6Y2N-2442].

<sup>309</sup> *Id.*

<sup>310</sup> It should be noted that the LawGeex AI competition appears to follow a common hype-generation recipe of (1) defining a narrow useful task, (2) collecting a large data set to test machine performance of task, (3) performing a limited measure of human ability on the data set, and (4) pitting humans against AI in a high profile competition. MITCHELL, *supra* note 11, at 223–24. As per the recipe, an ensuing press release reports on the “genuinely impressive and useful achievement” and dubiously asserts that “the winning AIs have human-level performance on a more general task (for example, ‘reading comprehension’).” *Id.* at 224. Reading comprehension requires interpreting between the lines which includes analyzing ideas, connecting concepts, and understanding implied meaning. *Id.*

intelligence, meaning their rule-bound processing capabilities are “error-prone” and do not transfer easily to situations that involve different data and require a new rule.<sup>311</sup> Further, AI systems do not read or understand; they only process text.<sup>312</sup>

AI technologies perform well in structured situations where there are clear rules, right answers, and semi-formal or formal processes, and large data sets.<sup>313</sup> In controlled environments, narrow AI systems can deliver impressive outputs.<sup>314</sup> AI technologies, however, stumble and fail in “gray areas”<sup>315</sup> or unstructured situations that require an ability to: think abstractly and conceptually; make value and policy assessments or ethical and moral judgments;<sup>316</sup> consider and respond to social norms and constructs; apply intuition or common sense;<sup>317</sup> and engage in persuasion or conversation.<sup>318</sup> These technologies can, however, be deployed for a “first pass” analysis and basic document drafts, followed by human review, supervision,<sup>319</sup> and tailoring for special, stupid, and strange client situations.

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<sup>311</sup> *Id.* at 40.

<sup>312</sup> *Id.* at 220, 227.

<sup>313</sup> Harry Surden, *Artificial Intelligence and Law: An Overview*, 35 GA. ST. U. L. REV. 1305, 1322 (2019) [hereinafter Surden, *Artificial Intelligence and Law*].

<sup>314</sup> *Id.* at 1337 (“AI is neither magic nor is it intelligent in the human-cognitive sense of the word. Rather, today’s AI technology is able to produce intelligent results without intelligence by harnessing patterns, rules, and heuristic proxies that allow it to make useful decisions in certain, narrow contexts.”).

<sup>315</sup> Askin et al., *supra* note 186.

<sup>316</sup> AGRAWAL ET AL., *supra* note 27, at 76, 81–83 (discussing judgment and the value of human judgment); Marar, *supra* note 32, at 275 (“To tackle wicked problems requires peculiarly human judgment, even if these judgments are illogical in some sense—especially in the moral sphere.”); Richard Binder, *Welcome to the Machine: How an Education in Tech Can Prepare the Next Generation of Law Students*, LAW.COM (Aug. 3, 2017), <https://www.law.com/sites/almstaff/2017/08/03/welcome-to-the-machine-how-an-education-in-tech-can-prepare-the-next-generation-of-law-students/> [https://perma.cc/AF77-DRQY] (noting that humans are well suited for considering complex issues, taking into account different perspectives, mediating conflicts, identifying creative solutions, and evaluating ethical/moral considerations).

<sup>317</sup> MARCUS & DAVIS, *supra* note 184, at 94; MURO ET AL., *AUTOMATION AND AI*, *supra* note 292, at 18 (intuition).

<sup>318</sup> MURO ET AL., *AUTOMATION AND AI*, *supra* note 292, at 18 (persuasion). Surden, *Artificial Intelligence and Law*, *supra* note 313, at 1322–23. Surden identifies several AI limitations such as “it is not very good at dealing with abstractions, understanding meaning, transferring knowledge from one activity to another, and handling completely unstructured or open-ended tasks.” *Id.* at 1337. While AI writing technologies can produce structured reports using standard formats, such technologies perform poorly on persuasive writing that involves unstructured analysis such as characterizing the contours of legal precedent and distinguishing the unique facts of the factual situation at issue. Remus & Levy, *supra* note 7, at 519; MARCUS & DAVIS, *supra* note 184, at 122 (discussing how “abstraction and generalization play an essential role in cognition”).

<sup>319</sup> DAVENPORT, *supra* note 4, at 126; McKendrick, *supra* note 254 (quoting Traci Gusher, principal with KPMG) (“True business value only emerges when AI implementation has been tightly linked to business strategy and when AI-powered output has progressed into normal business-as-usual operations far enough to yield substantive value.”).

## ii. Human Lawyers Needed for Special, Stupid, and Strange Scenarios

Lawyers now work in a time where human-AI teaming will progressively be standard operating procedure because human-AI teaming outperforms both humans and machines working independently.<sup>320</sup> For instance, the future division of human-machine labor will likely involve human lawyers interviewing witnesses and developing strategies, and ML systems identifying and classifying documents.<sup>321</sup>

Lawyers will also use AI tools to generate predictions.<sup>322</sup> They will then evaluate these AI predictions when (1) weighing outcomes, making judgments, and finessing delicate or special situations;<sup>323</sup> (2) employing knowledge and critical thinking skills<sup>324</sup> in nonroutine situations<sup>325</sup> and “edge cases”;<sup>326</sup> (3) incorporating tacit knowledge;<sup>327</sup> (4) exercising common sense and moral reasoning;<sup>328</sup> (5) applying logic and common sense to “stupid strategies” generated by AI systems;<sup>329</sup> and (6) responding to surprises and the “weird stuff [that] happens all of the time.”<sup>330</sup> Until computers have tacit knowledge,

<sup>320</sup> BROUSSARD, *supra* note 47, at 175. In 2016, billionaire Paul Tudor Jones (head of Tudor Investment Corporation) famously quipped to his hedge fund employees, “No man is better than a machine, and no machine is better than a man with a machine.” *Id.* at 188.

<sup>321</sup> Brynjolfsson & Mitchell, *supra* note 223, at 1533.

<sup>322</sup> AGRAWAL ET AL., *supra* note 27, at 53–54, 65–69.

<sup>323</sup> *Id.* at 94.

<sup>324</sup> SMITH, *supra* note 15, at 34 (“[Critical thinking] includes evaluating, understanding, analyzing, and applying information.”).

<sup>325</sup> AGRAWAL ET AL., *supra* note 27, at 102. The authors explain,

Machines are bad at prediction for rare events. Managers make decisions on mergers, innovation, and partnerships without data on similar past events for their firms. Humans use analogies and models to make decisions in such unusual situations. Machines cannot predict judgment when a situation has not occurred many times in the past. *Id.*

<sup>326</sup> BROUSSARD, *supra* note 47, at 176–77 (“Automation will handle a lot of the mundane work; it won’t handle the edge cases. The edge cases require hand curation. You need to build in human effort for the edge cases, or they won’t get done.”).

<sup>327</sup> MICHAEL POLANYI, THE TACIT DIMENSION 4 (1966) (writing “*we can know more than we can tell*”); see David Autor, *Polyani’s Paradox and the Shape of Employment Growth* 8 (Nat’l Bureau of Econ. Research, Working Paper No. 20485, 2014), <https://www.nber.org/papers/w20485.pdf> [<https://perma.cc/8LYD-3PRZ>] (describing Polyani’s paradox and how tacit knowledge complicates machine substitution for human workers); but see HOSANAGAR, *supra* note 254, at 113–14 (suggesting that “learning from data can tap into tacit knowledge that people have but cannot easily articulate”).

<sup>328</sup> MITCHELL, *supra* note 11, at 104 (stating that AI does not have common sense). Professor Mitchell explains that “[r]easoning about morality requires one to recognize cause-and-effect relationships, to imagine different possible futures, to have a sense of the beliefs and goals of others, and to predict the likely outcomes of one’s actions in whatever situation one finds oneself.” *Id.* at 129. She writes, “A prerequisite to trustworthy moral reasoning is general common sense[.]” which “is missing in even the best of today’s AI systems.” *Id.*

<sup>329</sup> SMITH, *supra* note 15, at 12 (“Computers analyze stupid strategies because they do not have logic or common sense.”).

<sup>330</sup> BROUSSARD, *supra* note 47, at 135 (“One drawback to data is that there’s no weirdness built

common sense, and can counter weirdness, it appears likely that humans will remain in the loop.<sup>331</sup> By working together, humans and AIs will deliver clients with the best of both worlds: fast data processing and machine predictions paired with slower human reflection, creativity, judgment, weirdness-mitigation, and action.<sup>332</sup>

### iii. Legal Career Outlook: Challenges and Opportunities

While AI technologies deliver “intelligent results without intelligence,”<sup>333</sup> the incorporation of AI technologies “does not necessarily imply full automation” of such tasks or wholesale elimination of jobs.<sup>334</sup> But AI will change the division of labor between humans and machines with AI systems performing routine functions and humans addressing the “exceptions” and “outliers” presented in unusual or non-routine situations.<sup>335</sup> AI technologies will also restructure human labor in the workforce, leading to downward wage pressure on some jobs and upward pressure for others.<sup>336</sup>

However, before human lawyers get comfy thinking that they will remain valued knowledge professionals, we must consider two wrinkles: (1) the “good enough” conundrum where AI does not need to be perfect, it just needs to be faster and cheaper than humans,<sup>337</sup> and (2) the uneven career prospects of new

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in, and the algorithms can’t predict what isn’t built in.”). Broussard adds, “People have intelligence; they can accommodate weirdness. Computers aren’t intelligent; they can’t.” *Id.*

<sup>331</sup> *Id.* at 119, 177.

<sup>332</sup> JOHN NAISBITT, MEGATRENDS: TEN NEW DIRECTIONS TRANSFORMING OUR LIVES 52 (1982) (describing the combination of “high tech” and “high touch”).

<sup>333</sup> Harry Surden, *Machine Learning and Law*, 89 WASH. L. REV. 87, 95 (2014) [hereinafter Surden, *Machine Learning and Law*] (“[N]on-cognitive computer algorithms can sometimes produce ‘intelligent’ results in complex tasks without human-level cognition.”).

<sup>334</sup> AGRAWAL ET AL., *supra* note 27, at 118. The authors explain, “AI tools can change workflows in two ways. First, they can render tasks obsolete and therefore remove them from workflows. Second, they can add new tasks.” *Id.* at 126–27. *But see* DAVENPORT, *supra* note 4, at 196 (concluding that “people won’t do all of the work in the future, and machines won’t either”); Remus & Levy, *supra* note 7, at 536 (finding “[i]f all the technology above were implemented at one time, it would result in an estimated thirteen percent reduction in [lawyer work] hours”); *see also* *US Employment by Automation Potential and Hourly Wage*, MCKINSEY GLOBAL INST.: TABLEAU PUB. (Feb. 25, 2016), <https://public.tableau.com/profile/mckinsey.analytics#!/vizhome/AutomationandUSjobs/Technicalpotentialforautomation> [<https://perma.cc/HR57-ESEY>] (finding that twenty-three percent of lawyer work may be automated).

<sup>335</sup> Professor Davenport explains, “The details of how humans and machines collaborate to accomplish key tasks will have to be discovered, negotiated, and revisited on a case-by-case basis.” DAVENPORT, *supra* note 4, at 196; AGRAWAL ET AL., *supra* note 27, at 102 (noting how machine flounder when they encounter rare events or unusual situations); BROUSSARD, *supra* note 47, at 176–77 (describing how AI can handle the mundane, but not the unusual or borderline/edge cases); MARCUS & DAVIS, *supra* note 185, at 17 (explaining that the word outliers describes those “circumstances for which [we] have little or no direct data”).

<sup>336</sup> NICK POLSON & JAMES SCOTT, AIQ: HOW PEOPLE AND MACHINES ARE SMARTER TOGETHER 9 (2018).

<sup>337</sup> ELLEN RUPPEL SHELL, THE JOB: WORK AND ITS FUTURE IN A TIME OF RADICAL CHANGE 80–81 (2018) (noting that “robots need not be perfect, only equal to—or a tad better than—

lawyers entering practice. We turn first to the “good enough” conundrum articulated by the University of Colorado Law Professor Harry Surden; he observed, “that for many tasks, algorithmic approaches like machine learning may sometimes produce useful, automated approaches that are ‘good enough’ for particular tasks.”<sup>338</sup> Good enough may thus upend the practices for some practitioners as clients demand fast and cost-efficient legal services.<sup>339</sup> For example, legal apps now promote access to justice<sup>340</sup> by streamlining some court operations and assisting *pro se* parties with navigating government and corporate bureaucracies.<sup>341</sup> A good enough solution will always beat no solution at all.<sup>342</sup>

The second wrinkle that may snag the career trajectories of new lawyers is that cognitive technologies can now do some of the basic work tasks that junior associates historically performed—thereby complicating the process by which they gain the experience required for advancing to more senior roles.<sup>343</sup>

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complicated and expensive humans”); see Ellen Ruppel Shell, *AI and Automation Will Replace Most Human Workers Because They Don’t Have to Be Perfect—Just Better Than You*, NEWSWEEK MAG. (Nov. 20, 2018, 5:04 PM), <https://www.newsweek.com/2018/11/30/ai-and-automation-will-replace-most-human-workers-because-they-dont-have-be-1225552.html> [https://perma.cc/NZR6-XAU2].

<sup>338</sup> Surden, *Machine Learning and Law*, *supra* note 333, at 99.

<sup>339</sup> See, e.g., Webb, *supra* note 9, at 40 (reporting that “paralegals and administrative law judges are much more exposed to AI than lawyers themselves”). In support of his conclusion, he explains that “[a]dministrative law judges, similarly, spend most of their time making judgments on cases that are highly standardized and for which the law is settled.” *Id.* He then contrasts administrative law judges to lawyers performing a wide range of legal work, such as “conferring with clients and colleagues, representing clients in negotiations and court cases, and working on cases for which sufficient precedent does not exist for an algorithm to be trained successfully.” *Id.*

<sup>340</sup> Dyane L. O’Leary, *License to Hack*, 94 N.Y.U. L. REV. Online 56, 69 (2019) (“Access to justice is the notion that as a basic principle of the rule of law, all people (not just those with financial means) should have an equal opportunity to exercise legal rights.”).

<sup>341</sup> See, e.g., *DoNotPay Honored with ABA Brown Award for Access to Justice Efforts*, A.B.A. NEWS (Jan. 23, 2020), <https://www.americanbar.org/news/abanews/aba-news-archives/2020/01/donotpay-honored-with-aba-brown-award-for-access-to-justice-effo/> [https://perma.cc/9AWL-6M27]; see also *The World’s First Robot Lawyer*, DONOTPAY, [www.DoNotPay.com](http://www.DoNotPay.com) [https://perma.cc/PQD8-JNXJ] (describing the legal app as “the world’s first robot lawyer”); see generally Mark A. Cohen, *The Golden Age of the Legal Entrepreneur—Why Now and Why It Matters*, FORBES (June 1, 2018, 5:57 AM), <https://www.forbes.com/sites/markcohen1/2018/06/01/the-golden-age-of-the-legal-entrepreneur-why-now-and-why-it-matters/#69b797ed7803> [https://perma.cc/UU92-XLWM] [hereinafter Cohen, *Golden Age of the Legal Entrepreneur*]; RICHARD SUSSKIND, *ONLINE COURTS AND THE FUTURE OF JUSTICE* (2019).

<sup>342</sup> See generally CLAYTON M. CHRISTENSEN, *THE INNOVATOR’S DILEMMA: THE REVOLUTIONARY BOOK THAT WILL CHANGE THE WAY YOU DO BUSINESS* (1997); CLAYTON M. CHRISTENSEN, *THE INNOVATOR’S DILEMMA: WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL* (2016).

<sup>343</sup> MURO ET AL., *WHAT JOBS ARE AFFECTED BY AI?*, *supra* note 8, at 23 (observing how AI technologies now substitute human labor). The authors explain,

While lawyers may still make the ultimate decisions, lower-level researchers and paralegals may see their ranks dwindle as AI saves firms time and improves accuracy.

Fortunately, an open path forward appears on the horizon; it involves the integration of legal training, an understanding of cognitive technologies, a commitment to lifelong learning, and consistent intellectual curiosity.<sup>344</sup> Professor of Information Technology and Management, Thomas H. Davenport identifies six essential skills for modern knowledge professionals: (1) “being conversant with how machines think”; (2) “having an understanding of analytics and data structures”; (3) “becoming familiar with different types of AI”; (4) “having domain knowledge of the business and industry”; (5) “possessing a strong ability to communicate”; and (6) “having high levels of emotional intelligence.”<sup>345</sup> Early and mid-career lawyers should keep this checklist handy as they sketch and steer their career paths because first movers are best positioned for new opportunities. As former Intel CEO, Andrew Grove writes, “the early bird gets the worm; latecomers will only get the leftovers.”<sup>346</sup>

In a nutshell, cognitive technologies will create new work opportunities for technology-adept lawyers.<sup>347</sup> Because new technology both solves and creates unforeseen problems, technology-competent lawyers will be needed to resolve a myriad of issues—including machines that break the law.<sup>348</sup> Further, because of the exponential proliferation of digital information, synthetic intelligences will create new work opportunities for lawyers who can think elastically and see beyond “existing order” in their work as professional problem solvers.<sup>349</sup> Lawyers who will thrive in a human-AI economy are those who deliver beneficial skills outside the scope of synthetic intellects.<sup>350</sup> As will

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And yet, while the net substitution of AI for some legal work seems likely, improved speed, volume, and accuracy could expand the industry enough to offset some of the aggregate employment losses. *Id.*

DAVENPORT, *supra* note 4, at 143. AI and the Work of the Future Congress, 2017: *AI Ethics Law and Policy*, YOUTUBE (Jan. 27, 2020), <https://www.youtube.com/watch?v=fJ7RIT8poCs&t=14s> [<https://perma.cc/L7WR-TT5Z>] (running from approximately minute 27:00 to 29:15) (featuring Todd Solomon, Head of Employee Benefits, Compensation & Employment Practice Group at McDermott Will & Emery, describe how AI has and will continue to change the work of junior-level attorneys).

<sup>344</sup> DAVENPORT, *supra* note 4, at 145.

<sup>345</sup> *Id.* at 144–45.

<sup>346</sup> GROVE, *supra* note 17, at 194.

<sup>347</sup> DAVENPORT, *supra* note 4, at 136–137.

<sup>348</sup> *Id.* Bruce Schneier, *When Thinking Machines Break the Law*, in WHAT TO THINK ABOUT MACHINES THAT THINK 311, 313 (John Brockman ed., 2015) (“No matter how much we try to avoid it, we’ll have machines that break the law.”). He adds that thinking machines will present problems that we have not yet imagined and “[t]he social and legal systems that have dealt so effectively with human rulebreakers of all sorts will fail in unexpected ways in the face of thinking machines.” *Id.*

<sup>349</sup> MLODINOW, *supra* note 31, at 16–17; WILSON, *supra* note 40, at 192 (“Because most scientific knowledge is growing exponentially, doubling every ten to twenty years according to subject, specialties within disciplines multiply—while at the same time narrowing in scope.”).

<sup>350</sup> SCHWAB, *supra* note 4, at 40 (“In the foreseeable future, low-risk jobs in terms of automation will be those that require social and creative skills; in particular, decision making under uncertainty and the development of new ideas.”).



be discussed in Parts IV and V, smart, creative lawyers capable of solving complicated problems will cultivate T-shaped skills and emulate Leonardo's curiosity, cognitive range, creativity, and entrepreneurial spirit on their journey to become a Vitruvian lawyer.

#### IV. T-SHAPED THINKERS

*"In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed."*

— Unknown<sup>351</sup>

##### A. Knowledge and Thought Biodiversity

Contemporary theoretical physicist and mathematician Freeman Dyson argues that because the world is deep and broad, "We need birds and frogs working together."<sup>352</sup> He explains that "[b]irds fly high in the air and survey broad vistas of mathematics out to the far horizon."<sup>353</sup> Dyson describes birds as delighting "in concepts that unify our thinking and bring together diverse problems from different parts of the landscape."<sup>354</sup> Frogs, in contrast, "live in the mud below and see only the flowers that grow nearby. They delight in the details of particular objects, and they solve problems one at a time."<sup>355</sup> Dyson asserts, "It is stupid to claim that birds are better than frogs because they see farther, or that frogs are better than birds because they see deeper."<sup>356</sup> Recognizing the hazards of narrow specialization, Dyson emphasizes the importance of both birds and frogs to identify, frame, and solve scientific and other complex problems.<sup>357</sup> Like healthy ecosystems that require biodiversity, effective problem solving requires thought diversity that brings together bird's-eye and frog's-eye views.<sup>358</sup> The word "range" encapsulates such thought biodiversity.<sup>359</sup>

<sup>351</sup> COLEMAN, *supra* note 6, at 221 (citing Charles Darwin). Cambridge University researchers argue that this quote "definitely isn't [from] Darwin." *Six Things Darwin Never Said – and One He Did*, U. CAMBRIDGE, <https://www.darwinproject.ac.uk/people/about-darwin/six-things-darwin-never-said#quote3> [<https://perma.cc/Z3Y6-K7YL#quote3>] ("Supposedly [this quote is] from *Descent of Man*. So far no one has found where it really comes from—but it definitely isn't Darwin.").

<sup>352</sup> EPSTEIN, *supra* note 27, at 201.

<sup>353</sup> *Id.* at 200.

<sup>354</sup> *Id.*

<sup>355</sup> *Id.*

<sup>356</sup> *Id.* at 200–01.

<sup>357</sup> *Id.* at 201.

<sup>358</sup> EPSTEIN, *supra* note 27, at 267.

<sup>359</sup> *Id.* at 47 (explaining that range encompasses the ability to "make connections across far-flung domains and ideas").

### B. T-Shaped People and Teams

The term “T-shaped person” describes thinkers with range because they can cogitate both broadly and deeply.<sup>360</sup> An understanding of T-shaped thinkers begins by imagining the letter “T,” where the horizontal stroke encompasses broad and diverse knowledge and human skills, and the vertical central-stroke of the “T” includes narrow and uniform knowledge and skills, potentially within the grasp of AI technologies.<sup>361</sup> In contrast, an “I-shaped person” possesses narrow and deep knowledge.<sup>362</sup>

In his 2016 *TEDx Talk*, “Turning Innovation From Luck to Skill,” Dr. Andy Ouderkirk, 3M Senior Scientist, describes “T-shaped People and Teams,” as those people and teams who have: (1) mastery and depth (expertise); (2) range,<sup>363</sup> which includes curiosity, breadth, and making creative connections; (3) abilities for domain-specific, critical, and wide systems thinking; and (4) commitment to personal goals and team/organizational outcomes.<sup>364</sup> He then describes a T-shaped person as having wide-stretched arms indicating breadth, curiosity, and systems thinking on a body where the legs represent deep domain expertise and critical thinking skills.<sup>365</sup>

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<sup>360</sup> *Id.* at 207; see generally Hilary G. Escajeda, *Legal Education: A New Growth Vision, Part I—The Issue: Sustainable Growth or Dead Cat Bounce? A Strategic Inflection Point Analysis*, 97 NEB. L. REV. 628 (2019) [hereinafter Escajeda, *Legal Education: A New Growth Vision, Part I*] (crediting David Guest with originating the T-shaped model concept); PETER ROGERS & RICHARD J. FREULER, THE “T-SHAPED ENGINEER” 5 (2015), [https://www.asee.org/file\\_server/papers/attachment/file/0005/4534/The\\_T-Shaped\\_Engineer.pdf](https://www.asee.org/file_server/papers/attachment/file/0005/4534/The_T-Shaped_Engineer.pdf).

<sup>361</sup> Escajeda, *Legal Education: A New Growth Vision, Part I*, *supra* note 360, at 747, 750 (positing “T-shaped Skills for Knowledge Professionals”).

<sup>362</sup> EPSTEIN, *supra* note 27, at 207.

<sup>363</sup> Andy Ouderkirk, *Turning Innovation From Luck to Skill*, YOUTUBE (Dec. 14, 2016), <https://www.youtube.com/watch?v=yy6rVrYeT0A> [<https://perma.cc/533M-BH5Y>] (lasting approximately 22 minutes). While Dr. Ouderkirk does not use the word “range,” as explained in Part II, the skills he describes constitute range.

<sup>364</sup> *Id.* Dr. Ouderkirk uses the label “affiliation” to describe an individual’s commitment to achieving team and organizational goals. *Id.*

<sup>365</sup> *Id.* (starting at approximately minute 14:00).

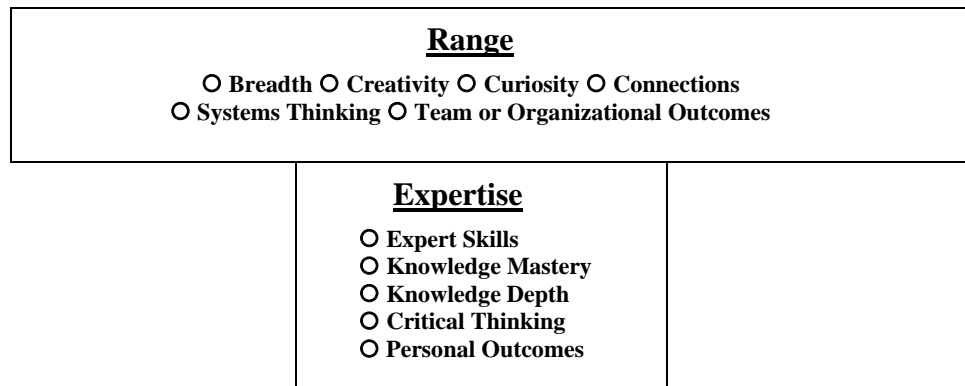


Figure 1: Dr. Ouder Kirk's T-Shaped People (2016)<sup>366</sup>

For over a decade, IBM thought-leaders have also recognized the value of T-shaped professionals who holistically fuse “traditional left-brain analytical capabilities with right-brain synthesis skills.”<sup>367</sup> In a 2009 article describing “IBM’s Role in Creating the Workforce of the Future,” IBM leaders emphasized the importance of being “interdisciplinary, rather than narrowly-focused specialists.”<sup>368</sup> Specifically, T-shaped thinkers possess deep subject-matter expertise (vertical axis of the T) paired with broad understandings of complementary disciplines (horizontal axis).<sup>369</sup> These T-shaped thinkers can then synthesize their knowledge depth and cognitive range to: identify “contextual linkages,” effectively collaborate with members of cross-disciplinary teams, continuously adapt and adjust their visions and goals, rapidly respond to change, and break down thought silos.<sup>370</sup> T-shaped thinkers

<sup>366</sup> *Id.* Figure 1 represents the Author’s illustration of Dr. Ouder Kirk’s T-Shaped Person.

<sup>367</sup> BEYOND IT, IBM, IBM’S ROLE IN CREATING THE WORKFORCE OF THE FUTURE 2, 5 (2009), <https://www.ibm.com/developerworks/community/wikis/form/anonymous/api/wiki/ad5cdad0-33a1-46bc-8cba-2102de0279ff/page/4c6bbe0b-577d-4eef-af47-5d62a83a3ad4/attachment/e39763a8-3733-40c4-a39b-d638255f070c/media/2009ibmworkforce.pdf> [https://perma.cc/L6XR-SK8E].

<sup>368</sup> *Id.* (referencing the “Executive Summary”).

<sup>369</sup> *Id.*

<sup>370</sup> *Id.* Because solving complex problems in an increasingly connected global world requires critical thinking, creativity, innovation, leadership, and technology skills, IBM deploys its business leadership position as an “academic catalyst” to work with more than 250 universities worldwide to breakdown thought silos and support “integrated courses of study.” *Id.* at 5–6. Such cross-disciplinary coursework includes “computer science, operations research, engineering, management science, business strategy, and social and cognitive sciences.” *Id.* at 6. Professor Wilson also warns about the dangers of narrow specialization and working in thought silos. WILSON, *supra* note 40, at 191–92. See generally TETT, *supra* note 73 (examining hazards of thought silos).

have been labeled “the most valuable twenty-first century workers.”<sup>371</sup>

### C. *T-Shaped Lawyer*

In 2014, R. Amani Smathers recognized the value and applicability of the T-shaped model to the legal profession in her article, “The 21<sup>st</sup> Century T-Shaped Lawyer.”<sup>372</sup> Smathers asserts that modern lawyers should unite legal expertise with cross-disciplinary business and technology tools and skills (e.g., design, data analytics, process management, or project improvement methodologies) to solve client problems effectively and efficiently.<sup>373</sup>

Smathers distinguishes between traditional “I-shaped” lawyers (those with “deep legal knowledge and skills”) and modern T-shaped lawyers (those possessing both extensive legal knowledge and a general understanding of complementary disciplines). Smathers then describes how T-shaped thinkers can work with colleagues to “connect ideas across disciplines”—making them “adaptive innovators.”<sup>374</sup> She emphasizes that T-shaped lawyers “do not necessarily need *deep* expertise in any field besides law,” but they need “a breadth of knowledge and skills” to collaborate dexterously with other subject matter experts.<sup>375</sup>

Without using the T-shaped descriptor, University of Toronto Professor Gillian K. Hadfield articulates what she calls the “information paradox” to describe the sometimes tense relationship between experts with deep knowledge and thinkers with wide knowledge.<sup>376</sup> Because specialization can “hobble innovation,” she argues that getting past “the same—exhausted—solution” requires a combination of thinkers who possess both “deep knowledge” and “fresh eyes” capable of imagining and designing original ways forward.<sup>377</sup> Professor Hadfield writes, “New solutions bubble up when there are diverse perspectives brought to bear, different experience developed

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<sup>371</sup> LESLIE, *supra* note 35, at 152 (referencing IBM’s “T-shaped knowledge” model and identifying such skills as the “most valuable” in the modern workplace). See *infra* Part IV.E., for additional discussion of T-shaped skills using the fox-hedgehog analogy.

<sup>372</sup> Natalie Runyon et al., *The Delta Model: Simple, Accurate, Versatile* (125), LEGAL EVOLUTION (Nov. 10, 2019), <https://www.legalevolution.org/2019/11/the-delta-model-simple-accurate-versatile-125/> [<https://perma.cc/9QHH-FXE3>]; R. Amani Smathers, *The T Shaped 21st Century Lawyer*, VIMEO (Apr. 13, 2014), <https://vimeo.com/91864405> [<https://perma.cc/Z3DJ-SL64>]; R. Amani Smathers, *The 21st Century T-Shaped Lawyer*, LAW PRACTICE, Jul.–Aug. 2014, at 32, <http://dashboard.mazsystems.com/webreader/31892?key=c53ab308>. Ms. Smathers currently works as a Senior Practice Innovations Specialist at Chapman and Cutler, LLP (Chicago, IL).

<sup>373</sup> Smathers, *The T-Shaped 21st Century Lawyer*, *supra* note 372, at 33.

<sup>374</sup> *Id.* at 37.

<sup>375</sup> *Id.* Smathers also references Richard Susskind’s concept of “legal knowledge engineer.” RICHARD SUSSKIND, TOMORROW’S LAWYERS: AN INTRODUCTION TO YOUR FUTURE 128, 135–36 (2d ed. 2017).

<sup>376</sup> HADFIELD, *supra* note 24, at 223.

<sup>377</sup> *Id.* at 223.

in a variety of contexts.”<sup>378</sup> She adds that, in unpredictable, shifting, and complex situations, productive ideas have a better chance of emerging when there is “a mix of people and worldviews pitching in” to assess the situation and design remedies.<sup>379</sup>

#### D. Delta Competency Models

The development of new models for lawyers continues to inspire legal thought leaders in the United States and abroad.<sup>380</sup> As an example, in 2018, a team of future-focused lawyers, educators, and law students formed a working group,<sup>381</sup> which recently launched its dynamic Delta Models ( $\Delta$  means change) to imagine the future of law<sup>382</sup> and assist lawyers in designing and mapping their careers.<sup>383</sup>

The two Delta Model prototypes considered here distinguish between general practice and specific personal competencies that, when put together, holistically illustrate the interrelated personal and professional dimensions of emotionally, intellectually, and economically thriving lawyers.<sup>384</sup> The Delta Model v. 3 (Figure 2) identifies the general practice competencies for modern lawyers: (1) “The Law,” (2) “Business & Operations,” and (3) “Personal

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<sup>378</sup> *Id.*

<sup>379</sup> *Id.* at 224.

<sup>380</sup> ELAINE MAK, THE T-SHAPED LAWYER AND BEYOND 33 (2017) (noting that “the image of the T-shaped legal professional might be useful for now, but not necessarily for the long term”).

<sup>381</sup> The Delta Working Group members include Alyson Carrel, Natalie Runyon, Shellie Reid, Cat Moon, and Gabe Teninbaum. *See generally The Delta Model Research*, THOMSON REUTERS, <https://lawschool.thomsonreuters.com/delta-model> [<https://perma.cc/3Y93-6URB>].

<sup>382</sup> Runyon et al., *supra* note 372; Alyson Carrel, *Legal Intelligence Through Artificial Intelligence Requires Emotional Intelligence: A New Competency Model for the 21<sup>st</sup> Century Legal Professional*, 35 GA. ST. U. L. REV. 1153 (2019) [hereinafter Carrel, *Legal Intelligence Through AI*]; *Delta*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/delta> [<https://perma.cc/8BZY-66A6>] (explaining the Greek letter delta ( $\Delta$ ) is used in mathematics to symbolize “an increment of a variable”). The  $\Delta$  symbol represents “something that is variable” or is “a factor in scientific experiment that may be subject to change.” *Variable*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/variable#h2> [<https://perma.cc/RUQ4-RT9R>].

<sup>383</sup> These models can assist new and mid-career lawyers to develop personalized roadmaps for career planning and lifelong learning. Carrel, *Legal Intelligence Through AI*, *supra* note 383, at 1178–81. Greg Lambert & Marlene Gebauer, *Alyson Carrel and Cat Moon on The Delta Model*, LEXBLOG (Nov. 12, 2019), <https://www.lexblog.com/2019/11/12/the-geek-in-review-ep-59-alyson-carrel-and-cat-moon-on-the-delta-model/> [<https://perma.cc/S7A4-J4J3>] (running from approximately minute 49:20 to 56:18).

<sup>384</sup> Alyson Carrel: *How Law Schools Can Align Their Educational Offerings with Delta Model Competencies*, THOMSON REUTERS, <https://lawschool.thomsonreuters.com/delta-model> [<https://perma.cc/37LG-PCKS>] (describing how law students and practicing lawyers can use the dynamic and holistic Delta Model to imagine and design their careers). Professor Carrel describes how law schools can use the Delta Model to update its curriculum so that it aligns with the modern practice of law. *Id.*

Effectiveness.”<sup>385</sup> The base of the triangular  $\Delta$  model identifies the traditional law functions of subject matter expertise, legal analysis, legal research, and legal writing.<sup>386</sup> The “Business and Operations” side covers fundamental business skills, data analytics, and project management.<sup>387</sup> The third side, “Personal Effectiveness,” includes character, entrepreneurial mindset, communication, relationship management skills, and emotional intelligence.<sup>388</sup>



Figure 2: Delta Competency Model v.3: Personal Effectiveness, Business & Operations, and The Law (2019)<sup>390</sup>

A subsequent iteration of the Delta Model (Figure 3) focuses on the specific personal competencies of modern legal professionals: People, Process, and Practice.<sup>391</sup> First, “The People” side of the triangle includes the soft skills

<sup>385</sup> Alyson Carrel, *What is the Delta Model?*, <https://www.alysoncarrel.com/delta-competency-model> [https://perma.cc/HCV9-SA9D]; Runyon et al., *supra* note 372 (explaining that personal effectiveness skills encompass emotional intelligence, relationship management, communication skills, entrepreneurial mindsets, and character).

<sup>386</sup> Carrel, *What is the Delta Model?*, *supra* note 386.

<sup>387</sup> *Id.*

<sup>388</sup> Natalie Runyon, *Key Future Insights from the Top Performing Talent Articles from 2019*, LEGAL EXECUTIVE INST. (Jan. 23, 2020), <http://www.legalexecutiveinstitute.com/talent-top-performing-articles-2019/> [https://perma.cc/B8BJ-4UHA] (describing the entrepreneurial mindset as a willingness to identify a problem followed by taking the initiative to solve such problem).

<sup>389</sup> Runyon et al., *supra* note 372; Carrel, *Legal Intelligence Through AI*, *supra* note 382, at 1175; See *supra* Part III.B., for discussion on emotional intelligence.

<sup>390</sup> © 2020 Alyson Carrel. *Delta Model*, ALYSON CARREL, <https://www.alysoncarrel.com/delta-competency-model> [https://perma.cc/M6NV-JDTF]. Thanks to Professor Alyson Carrel for graciously providing the Delta Models included in this Section. Cat Moon (@inspiredcat), TWITTER (Feb. 27, 2020, 3:08 PM), <https://twitter.com/inspiredcat/status/1233136729273405440> [https://perma.cc/2ADP-3YL2] [hereinafter Moon (@inspiredcat)].

<sup>391</sup> Cat Moon, *Iterating on the Delta Model: Practice, Process, People*, ALT JD BLOG (Jan. 25, 2020), <https://www.altjd.org/2020/01/25/iterating-on-the-delta-model-practice-process-people/> [https://perma.cc/W27S-6LWR] [Moon, *Iterating on the Delta Model*].

of “Entrepreneurial Mindset, Emotional Intelligence, Problem Solving, and Self-Regulation.”<sup>392</sup> Lawyers exhibit this dimension when they listen, understand, relate, and communicate with clients to identify and solve legal matters.<sup>393</sup> Next, “The Process” competency incorporates the technical skills of “Data Analysis, Technology Fluency, Project Management, Process Improvement, and Design & Selection.”<sup>394</sup> Lawyers exercise these technical skills when delivering legal services.<sup>395</sup> Last, “The Practice” side of the  $\Delta$  describes the traditional base of legal skills such as “Issue Spotting, Case Analysis, Case Framing, and Drafting.”<sup>396</sup> In their work, lawyers demonstrate these core competencies by interacting with clients and witnesses to gather information, researching the law and analyzing facts, explaining to clients possible pathways for resolution, devising strategies to move forward, and working with clients to solve their legal matters.<sup>397</sup>

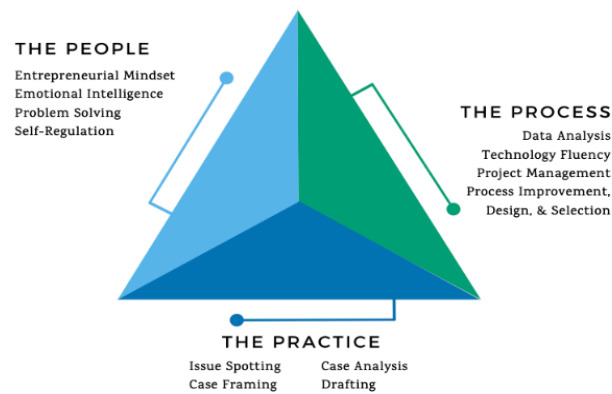


Figure 3: Delta Personal Competency Model: People, Process, and Practice (2020)<sup>398</sup>

Together, these dynamic Delta Models offer valuable insights into how to think about our careers, design our law practices, develop lifelong learning plans, and support our wellbeing.<sup>399</sup> Even in the midst of continuous legal

<sup>392</sup> *Id.*

<sup>393</sup> *Id.*

<sup>394</sup> *Id.*

<sup>395</sup> *Id.*

<sup>396</sup> *Id.*

<sup>397</sup> Moon, *Iterating on the Delta Model*, *supra* note 392.

<sup>398</sup> Moon (@inspiredcat), *supra* note 391. © 2020 Alyson Carrel & @DeltaModelLawyr.

<sup>399</sup> *Cat Moon: How Meeting the Needs of Innovation Can Help Drive a Law Career*, THOMSON REUTERS, <https://lawschool.thomsonreuters.com/delta-model> [https://perma.cc/6D4K-FXXT] (emphasizing the importance of personal and professional wellbeing).

industry change,<sup>400</sup> we can better serve clients—and thrive emotionally, economically, and intellectually—when we integrate the Delta Model competencies of people and personal effectiveness, law and practice, and business processes and operations.

Let us pause briefly to imagine a few of these competencies in action with a particular focus on how to integrate synthetic and emotional intelligences into our daily work.<sup>401</sup> For example, when counseling clients on tax issues of concern, we may use AI tools to identify patterns, run simulations, generate options for novel problem-solving approaches—and eventually provide clients with real-time planning advice.<sup>402</sup> We will then apply our expertise, which may include collaborations with colleagues, to develop and refine strategies that address or mitigate such concerns.<sup>403</sup> By combining our professional expertise with AI insights, we can then employ our emotional intelligence to devise strategies and recommendations based on the client's specific needs and the context presented.<sup>404</sup> Such assessment may, for instance, take into account the client's unique situation and the interpersonal dynamics (e.g., personal or business) that may facilitate or frustrate resolution. As human-machine teaming becomes commonplace for law firms and government agencies, such as the Internal Revenue Service,<sup>405</sup> successful human lawyers will be those who can critically evaluate and incorporate AI predictions into client

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<sup>400</sup> Cohen, *Getting Beyond The Tech*, *supra* note 46 (noting how the combination of technology and new delivery models will reshape the legal industry).

<sup>401</sup> Carrel, *Legal Intelligence Through AI*, *supra* note 383, at 1176.

<sup>402</sup> Michael Hatfield, *Professionally Responsible Artificial Intelligence*, 51 ARIZ. ST. L.J. 1057, 1089 (2019) (“An impressive feat of AI is its ability to detect patterns and identify relevance by searching for connections in data provided to it by human users—patterns and connections not previously identified, or perhaps even noticed by, the human users.”). Professor Hatfield anticipates that in the future tax attorneys will use AI to facilitate “continuous, even real-time tax minimization planning” for clients. *Id.* at 1091. *See* LINNA, JR., *supra* note 43 (“AI and pattern matching technologies can help catalyze the development of proactive approaches to identify potential legal problems and prevent them from arising, or at least mitigate their risk.”); *see supra* text accompanying note 251 (noting how “The Continuator: The First Jazz Improviser” sparked pianist Bernard Lubat’s creativity when composing music).

<sup>403</sup> *See* Stephen M. Kosslyn, *Are You Developing Skills That Won’t Be Automated?*, HARV. BUS. REV. (Sept. 25, 2019), <https://hbr.org/2019/09/are-you-developing-skills-that-wont-be-automated> [<https://perma.cc/6KFL-7TFU>].

<sup>404</sup> *Id.*

<sup>405</sup> Richard Rubin, *AI Comes to the Tax Code*, WALL ST. J. (Feb. 26, 2020, 5:30 AM), <https://www.wsj.com/articles/ai-comes-to-the-tax-code-11582713000> [<https://perma.cc/E8XA-5VPS>] (describing the IRS’s increasing use of AI to analyze its immense troves of taxpayer data to detect tax evaders, answer taxpayer questions, and improve efficiency). The article notes how “[t]he IRS scours data from inside and outside the agency for its compliance initiatives, such as a recent effort to identify thousands of high-income individuals who didn’t file returns. The government is now sending tax collectors to knock on their doors.” *Id.* *See generally* Joshua D. Blank & Leigh Ososky, *Automated Legal Guidance*, 106 CORNELL L. REV. (forthcoming 2021) (evaluating the IRS’s “Interactive Tax Assistant” online system and offering constructive recommendations to policymakers).



recommendations; knowledgeably explain to clients how the technology-derived predictions inform possible strategies; design creative and empathetic solutions for client problems; and work cooperatively toward resolution.<sup>406</sup>

Another approach worth considering moves away from “T” and  $\Delta$  models to the natural world, where the habits of foxes and hedgehogs may uncover insights about our thought and work processes, and whether tinkers and adjustments may prove professionally beneficial.

### E. *Foxes, Hedgehogs, and Foxhogs*

In their book *Superforecasting: The Art and Science of Prediction*, Professor Philip E. Tetlock and journalist Dan Gardner borrow philosopher Isaiah Berlin’s nicknames “hedgehogs” and “foxes”<sup>407</sup> to describe the characteristics and styles of various experts.<sup>408</sup> Hedgehog describes someone who specializes in one “big thing” and often has deep and narrow views.<sup>409</sup> In contrast, a fox knows “many things” since it integrates many ideas and inputs because it sees value in information diversity and “accept[s] ambiguity and contradiction.”<sup>410</sup> The fox also synthesizes ideas and information from many disparate sources, thus enabling it to “aggregate perspectives.”<sup>411</sup> In short, hedgehogs represent narrowness; foxes embody breadth.<sup>412</sup>

Ian Leslie expands this discussion by asserting that “[t]he thinkers best positioned to thrive today and in the future will be a hybrid of these two animals”—that is, a “foxhog” or T-shaped thinker.<sup>413</sup> He argues that foxhogs will thrive in a competitive, technology-driven, and information-saturated marketplace because they: have deep knowledge in one or two domains; think eclectically and elastically; have an ability to see and incorporate diverse

<sup>406</sup> Kosslyn, *supra* note 404 (“Our ability to manage and utilize emotion and to take into account the effects of context are key ingredients of critical thinking, creative problem solving, effective communication, adaptive learning, and good judgment.”).

<sup>407</sup> TETLOCK & GARDNER, *supra* note 34, at 69 (explaining that Berlin based his observations from the 2,500-year-old Greek poet Archilochus, “The fox knows many things but the hedgehog knows one big thing”). “Hedgehogs” represented the “big idea experts” and “foxes” describe more “eclectic experts.” *Id.*

<sup>408</sup> EPSTEIN, *supra* note 27, at 221 (describing experts in the fields of psychology and intelligence gathering).

<sup>409</sup> *Id.*

<sup>410</sup> *Id.*

<sup>411</sup> TETLOCK & GARDNER, *supra* note 34, at 74, 77.

<sup>412</sup> EPSTEIN, *supra* note 27, at 221. The “fox/hedgehog model is not a dichotomy. It is a spectrum.” TETLOCK & GARDNER, *supra* note 34, at 79. Some people may be “hybrids” in that they are closer to one end of the spectrum than the other, for example “fox-hedgehogs” and “hedgehog-foxes.” *Id.* The authors then quote statistician George Box who said, “[a]ll models are wrong, but some are useful.” *Id.* They note that “[t]he fox/hedgehog model is a starting point, not the end.” *Id.* at 80.

<sup>413</sup> LESLIE, *supra* note 35, at 151–53. Leslie specifically cites IBM’s T-shaped knowledge concept. *Id.* See *supra* Part IV.B, for additional discussion of T-shaped skills.

perspectives, and can collaborate with colleagues in other disciplines.<sup>414</sup> In an increasingly digital (eventually quantum) and global world, lawyers need to be foxhogs.<sup>415</sup> These intellectually dexterous thinkers employ their conceptual reasoning skills to dance lyrically across knowledge domains and far-reaching ideas when discovering connections, making abstract associations, applying emotional intelligence, and identifying novel solutions to wicked problems.<sup>416</sup>

The models described in this Section offer insights into how modern knowledge professionals can thrive in a dynamic digital economy where human-machine teaming will be standard. The competencies identified in many of these models spring forth from unique human combinations of curiosity, cognitive range (depth and breadth), creativity, and elastic thinking. With Leonardo as our artistic and intellectual focal point,<sup>417</sup> we journey forward on our path to become a Vitruvian Lawyer.

## V. THE VITRUVIAN LAWYER

*“One of the most urgent questions for all of us will be how to manage our relationships with these intelligent creations, to which we are offloading many of our cognitive tasks.”*

— Flynn Coleman, Esq., *A Human Algorithm*<sup>418</sup>

In addition to articulating the question above, Professor Coleman provocatively predicts that in the future, humans will not be “at the center of the universe with limitless potential,” rather, a machine will “ultimately embody the whole of human knowledge.”<sup>419</sup> While the long-term capabilities

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<sup>414</sup> LESLIE, *supra* note 35, at 152.

<sup>415</sup> *Id.* at 154–55.

<sup>416</sup> EPSTEIN, *supra* note 27, at 47. Referencing the perspectives of Professor James Flynn, Epstein writes “everyone needs habits of mind that allow them to dance across disciplines.” *Id.* at 49. Conceptual reasoning skills include the ability to “connect new ideas and work across contexts.” *Id.* at 53. Further, Columbia University computer science Professor Jeanette Wing asserts that “computational thinking” functions as the “mental Swiss Army knife.” *Id.* at 50. Professor Wing explains, “Computational thinking is using abstraction and decomposition when attacking a large complex task. It is choosing an appropriate representation for a problem.” *Id.* See MLODINOW, *supra* note 31, at 120–21 (describing how humans can make “abstract associations” and connections between disparate concepts and human experiences). Human capacity for abstract thought serves as the source of our “inventiveness.” *Id.* at 121. Mlodinow explains that “breakthrough ideas, like mundane ideas, often arise from the association and recombination of what is already lying around in the corners of our minds.” *Id.*

<sup>417</sup> A focal point is the “area in a composition to which the viewer’s eye is naturally drawn.” *Focal point*, ARTISTSNETWORK, <https://www.artistsnetwork.com/art-terms/focal-point/> [https://perma.cc/94Y7-7Z7B]; Phil Hansen, *Focal Point – Art Vocab Definition*, YOUTUBE (Jul. 21, 2017), <https://www.youtube.com/watch?v=Dp8OwKiCKd0> [https://perma.cc/4VVJ-EH5S].

<sup>418</sup> COLEMAN, *supra* note 6, at 115.

<sup>419</sup> *Id.* at xxiv (noting that “the quest to build a fully intelligent machine has historical precedent in the idea of creating the ideal and universal man, the uomo universal, the Renaissance Man, a self-

of quantum computing may prove her prediction correct, we are fortunate that our natural capacity to imagine, exhibit curiosity, build cognitive range, and express creativity remains—at least foreseeably—outside the reach of AI that can only duplicate and imitate intelligence.<sup>420</sup> Thus, for lawyers, the task at hand begins by nurturing these uniquely human skills, so we can effectively team with cognitive technologies. In so doing, we will continuously demonstrate our professional value by uniting organic and synthetic intelligences to design modern legal infrastructure,<sup>421</sup> expand access to justice,<sup>422</sup> and shape a future where humans, smart machines, and legal structures work in harmony. Importantly, because only human lawyers can seamlessly combine and deploy the emotional intelligence and problem-solving skills required to serve clients humanely and ethically, our social and professional value appears generally secure.<sup>423</sup>

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aware polymath at the center of the universe with limitless potential”).

<sup>420</sup> James Croak, *Fear Of A God, The Redux*, in WHAT TO THINK ABOUT MACHINES THAT THINK 499 (John Brockman ed., 2015) (stating that machines duplicate not create). He explains, “A machine could have a database of which has been done in the past but cannot free-associate the myriad irrational influences of our inherited and layered brain, which the variations that form from environmental insult in daily living. They can duplicate but not initiate.” *Id.* RUSSELL & NORVIG, *supra* note 218, at 1020 (distinguishing between simulating and actually thinking).

<sup>421</sup> LINNA, JR., *supra* note 43 (stating that lawyers can demonstrate their value by “updating laws, regulations, and governance frameworks for new technologies and our rapidly emerging digital society”). HADFIELD, *supra* note 24, at 133 (noting how technologies will continue to transform what clients and communities need and expect from legal infrastructure). Professor Hadfield provides an example of how to improve worker safety in India presents more than drafting safety policies and rules, rather it involves “deeply knowledgeable cross-border understanding of the legal environment in the context of all the things that affect how rules on paper do, or do not, add up to changes in behavior.” *Id.* at 147.

<sup>422</sup> MOON, DELTA MODEL LAWYER, *supra* note 23 (“Most legal needs go unmet by current legal systems – current data suggest 80% or more people with civil legal problems receive no formal legal assistance and 86% or more of civil matters never enter a legal system for resolution.”); *see, e.g.*, Emily S. Taylor Poppe, *The Future is Bright Complicated: AI, Apps & Access to Justice*, 72 OKLA. L. REV. 185, 187 (2019) (surveying some benefits and detriments of legal digital disruption and encouraging policymakers “to consider persistent social and economic realities as they make predictions about the future access to justice”); Lisa R. Pruitt et al., *Legal Deserts: A Multi-State Perspective on Rural Access to Justice*, 13 HARV. L. & POL’Y REV. 15 (2018) (advocating for thoughtful and data-informed collaborations between lawyers, judges, law schools, and technology experts to address the current “rural access-to-justice crisis”); O’Leary, *supra* note 340, at 234 (discussing how hackathons can potentially tackle access to justice challenges).

<sup>423</sup> HADFIELD, *supra* note 24, at 147 (“Legal infrastructure is not just a matter of laws on the books. It’s a matter of the nature of legal expertise and advice available on the ground.”). She adds, “It’s a question of how rules and regulations are managed and implemented in practice, how responsive they are to the interests of a local trade group or company, to this political agenda, or those cultural pressures.” *Id.* MARCUS & DAVIS, *supra* note 184, at 195–96 (“Any AI that interacts with humans in open-ended ways should be required, by law, to understand and respect a core set of human values.”). They argue that AI technologies need to be built with human values which “must also be reflected in the people and companies that create and operate them, and the social structures and incentives that surround them.” *Id.* at 196.

Since we live in a time of transformative technological change, this Part sketches some preliminary pathways that lawyers may find worth exploring. Because clients “demand demonstrable efficiency, quality, and better outcomes,”<sup>424</sup> it begins with a discussion of how lawyers can identify and meet client preferences and market demands. To do this, we must be attuned to the often silent and imperceptible indicators that reveal the “human-provided” services that clients subconsciously crave—and are willing to pay for—in a digital (eventually quantum) legal marketplace.<sup>425</sup> Like Leonardo, we must engage our senses to spot opportunities obscured by noise and shadow. After identifying these market clues, we can then orient ourselves to meet the tacit preferences of our human clients. Such positioning employs both our legal imagination and emotional intelligence to augment the unique portfolio of services that we sell to clients. This purposeful alignment also requires a startup mindset where we imagine, design, develop, test, and iterate our human-provided legal services portfolio so that it generates clients and referrals.

### A. Legal Imagination

As elegantly stated in U.S. Supreme Court Justice Felix Frankfurter’s 1954 letter to a student contemplating a law career,<sup>426</sup> “‘cultivation of the imaginative faculties’ is integral to a lawyer’s job; ‘[n]o one can be a truly competent lawyer’ without developing the imagination.”<sup>427</sup> Growing such “imaginative faculties” requires “legal imagination.”<sup>428</sup>

Michigan Law Professor James Boyd White defines “legal imagination” as the synthesis of analysis, rhetoric, and writing.<sup>429</sup> This Article updates the definition of legal imagination for an era where imaginative humans and synthetic intellects work together to understand and then resolve problems. Specifically, modern legal imagination should encompass the traditional synthesis of analysis, rhetoric, and writing, coupled with digital technology

<sup>424</sup> LINNA, JR., *supra* note 43.

<sup>425</sup> MURO ET AL., AUTOMATION AND AI, *supra* note 293, at 55 (stating that “the age of brilliant machines means that humans must focus on ‘what we are that computers aren’t,’ as Andrew McAfee and Erik Brynjolfsson write”). Muro et al. adds that “[t]his is going to require a new, more rigorous focus on the ‘soft’ or ‘human’ skills.” *Id.* See ANDREW MCAFEE & ERIK BRYNJOLFSSON, MACHINE PLATFORM CROWD: HARNESSING OUR DIGITAL FUTURE 119 (2017).

<sup>426</sup> Thomas DC Bennett, *Privacy, Corrective Justice, and Incrementalism: Legal Imagination and the Recognition of a Privacy Tort in Ontario*, 59 MCGILL L.J. 49, 62 (2013) (citing Letter from Felix Frankfurter to Paul Claussen, Jr. (May 1954), in THE LAW AS LITERATURE, at 725 (Ephraim London ed., 1960), <https://www.erudit.org/en/journals/mlj/2013-v59-n1-mlj0861/1018985ar.pdf> [<https://perma.cc/B5L4-ZNCQ>]).

<sup>427</sup> *Id.*

<sup>428</sup> *Id.*; see generally JAMES BOYD WHITE, THE LEGAL IMAGINATION 3–80 (45th Anniversary ed., 2018) (emphasizing the importance of legal imagination and using literature to illustrate how legal advocacy unites analysis, rhetoric, synthesis, persuasion, and artistry).

<sup>429</sup> WHITE, *supra* note 428.

competencies, cognitive range and flexibility, and entrepreneurial skills for a shifting economy. These digital competencies and cognitive capacities include a general understanding of artificial intelligence technologies (e.g., data, binary and quantum computing, and algorithms); use of data analytics to assess case outcomes, gain insights on judges, opposing counsel and parties, and evaluate various strategies;<sup>430</sup> curiosity, cognitive range (depth and breadth), creativity, and openness to experience;<sup>431</sup> elastic,<sup>432</sup> analogical,<sup>433</sup> heterodox,<sup>434</sup> and “kaleidoscope thinking”;<sup>435</sup> and emotional intelligence.<sup>436</sup> Importantly, lawyers

<sup>430</sup> ALM INTELLIGENCE & LEXISNEXIS, 2020 LEGAL ANALYTICS STUDY: BRINGING VALUE INTO FOCUS 6–7 (2020), <https://www.lexisnexis.com/supp/largelaw/no-index/lexisnexis-alm-legal-analytics-study.pdf> [<https://perma.cc/5T74-8CBK>]; see Stephen Embry, *Is It Malpractice to Not Use Legal Analytics?*, TECHLAW CROSSROADS (Feb. 18, 2020), <https://www.techlawcrossroads.com/2020/02/is-it-malpractice-to-not-use-legal-analytics/> [<https://perma.cc/3CC9-E5DP>] (arguing that effective and competent lawyering will integrate human knowledge and data analytics).

<sup>431</sup> The personality trait “openness to experience” deserves brief mention because its “most commonly associated with creativity.” SCHILLING, *supra* note 31, at 113. New York University Professor Melissa Schilling explains that “[o]penness to experience reflects an individual’s use of active imagination, aesthetic sensitivity (they appreciate art and literature, for example), attentiveness to emotion, a preference for variety, and intellectual curiosity.” *Id.* at 113–114. Further, smart creatives seem comfortable with ambiguity and find unusual and complex ideas fascinating. *Id.* at 114. Professor Schilling also observes “openness to experience is associated with divergent thinking and creativity.” An openness to experience paired with “active open-mindedness” manifests in Leonardo’s artistic and scientific explorations nourish creative insights.

<sup>432</sup> MLODINOW, *supra* note 31, at 16–17 (describing elastic thinking). Elastic thinking exhibits the following characteristics:

An ability to “let go of comfortable ideas and become accustomed to ambiguity and contradiction”;

“The capability to rise above conventional mind-sets and to reframe the questions we ask”;

An “ability to abandon ingrained assumptions and open ourselves to new paradigms”;

“The propensity to rely on imagination as much as logic and to generate and integrate a wide variety of ideas”; and

A “willingness to experiment and be tolerant of failure.” *Id.*

<sup>433</sup> “Deep analogical thinking is the practice of recognizing conceptual similarities in multiple domains or scenarios that may seem to have little in common on the surface.” EPSTEIN, *supra* note 27, at 102–03. In a brutish world, disentangling and tackling wicked problems requires an ability to (1) think creatively and relationally, (2) consider both inside and outside views, and (3) devise and execute new strategies. *Id.* at 104, 108.

<sup>434</sup> SCHILLING, *supra* note 31, at 114 (positing that heterodox thinking may be linked to individuals’ who can tolerate ambiguity and complexity).

<sup>435</sup> ROSABETH MOSS KANTER, THINK OUTSIDE THE BUILDING: HOW ADVANCED LEADERS CAN CHANGE THE WORLD ONE SMART INNOVATION AT A TIME 97 (2020) (“Innovators shake up their thinking as though their brains are a kaleidoscope, permitting an array of different patterns out of the same bits of reality.”). She explains,

[k]aleidoscope thinking is a way of constructing new patterns from the fragments of data available, patterns that no one else has yet imagined, because they challenge conventional assumptions about how the pieces of the organization, the marketplace, or the community can fit together. Kaleidoscope thinking is systems thinking with a new twist. *Id.* at 97–98.

See Rosabeth Moss Kanter, *The Enduring Skills of Change Leaders*, NHRD J., Nov. 2017, at 53,

who grow such “imaginative faculties” should be well-positioned to seize entrepreneurial opportunities in a dynamic economy because their diverse portfolio of knowledge and skills complements the constrained capabilities of synthetic intellects.<sup>437</sup> By doing this, these modern, imaginative Vitruvian Lawyers will “race with” instead of against the machines in their work as professional problem solvers.<sup>438</sup>

With Leonardo as our model, this Article next explores how curiosity, cognitive range, and creativity can support the continuous upgrade and expansion of our legal minds—with the destination of apex imaginator status.

### B. Curiosity, Cognitive Range, and Creativity

“The human brain is a thought machine”<sup>439</sup> that becomes more powerful when fueled by curiosity, cognitive range, and creativity. Unlike machines, the human brain can form original ideas and reach conclusions by exercising common sense; mixing and matching disparate facts, concepts and principles; asking meaningful questions; and merging intuition, empathy, and cultural experience.<sup>440</sup> Again, using Leonardo as our guide, we now consider how curiosity augments our brains’ thinking capacities.

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56, [https://mumbai.nationalhrd.org/sites/default/files/1107\\_0.pdf#page=53](https://mumbai.nationalhrd.org/sites/default/files/1107_0.pdf#page=53) [<https://perma.cc/WK3Y-V6YX>] (“Leaders need to develop what I call kaleidoscope thinking — a way of constructing patterns from the fragments of data available, and then manipulating them to form different patterns.”); see also Laura Seargeant Richardson, *The Kaleidoscope Mind: Some Easy Ways to Teach Creativity*, ATLANTIC (Nov. 26, 2011), <https://www.theatlantic.com/entertainment/archive/2011/11/the-kaleidoscope-mind-some-easy-ways-to-teach-creativity/248790/> [<https://perma.cc/37RV-47SV>] (explaining a “kaleidoscope mind” is “a type of mind that is agile, flexible, self-aware, and informed by a diversity of experiences”). Such mind is “able to perceive any given situation from a multitude of perspectives” and can “see patterns, connections, and relationships that more rigid minds miss.” *Id.*

<sup>436</sup> See *supra* Part III.B., for a discussion of emotional intelligence.

<sup>437</sup> Askin et al., *supra* note 186 (“[T]ruly effective legal counsel involves being familiar with the rapidly changing legal landscape, especially where it intersects with technology, being able to detect and effectively address the client’s legal issues, and being capable of keeping the client’s aspirations in mind every step of the way.”).

<sup>438</sup> BRYNJOLFSSON & MCAFEE, *THE SECOND MACHINE AGE*, *supra* note 173, at 187; BRYNJOLFSSON & MCAFEE, *RACE AGAINST THE MACHINE*, *supra* note 173, at 36.

<sup>439</sup> Michael McCollough, *A Universal Basis For Human Dignity*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 430, 430 (John Brockman ed., 2015) (“‘The human brain is a thought machine’ is one of the truest scientific truisms that you can utter about human beings, right up there with ‘The heart is a blood pump’ or ‘The eye is a camera.’”). Professor McCollough explains that viewing the brain as a thought machine “does nothing to strip humanity of its dignity,” rather it enables us to understand better ourselves and others. *Id.* at 430–33.

<sup>440</sup> Haim Harari, *Thinking About People Who Think Like Machines*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 434, 434–35 (John Brockman ed., 2015) (cautioning against devaluing our unique human thinking in favor of over-valuing machine thinking).

### i. Curiosity: The Human Brain Expander

Art historian Kenneth Clark called Leonardo “the most relentlessly curious man in history.”<sup>441</sup> Leonardo glamorized curiosity by flamboyantly exploring the prohibited, unexamined, and unknown.<sup>442</sup> In his book, *Curious: The Desire to Know and Why Your Future Depends On It*, Ian Leslie describes the “knowledge emotion” of curiosity as an unruly and deviant human drive that seeks understanding.<sup>443</sup> Curiosity pursues mystery and the insoluble.<sup>444</sup> Curiosity chases new possibilities and continually questions why and why not?<sup>445</sup> Curiosity not only queries traditional thoughts and ways of doing things, but it also seeks original approaches for solving problems and making discoveries.<sup>446</sup>

Curiosity serves as the chief differentiator between human and machine intelligence. Vitruvian Lawyers are curious; computers are not.<sup>447</sup>

#### a. Curiosity: An Augmented Reality that Pursues the Impossible

Leslie describes highly curious people as “liv[ing] in a kind of augmented reality; everything they see is overlaid with additional layers of meaning and possibility, unavailable to ordinary observers.”<sup>448</sup> Again, confirming his vision and genius, Leonardo imagined and described the capabilities of modern augmented (AR), virtual (VR), and mixed reality (MR) technologies more than five hundred years ago.<sup>449</sup> In his perpetual pursuit of knowledge, Leonardo’s

<sup>441</sup> ISAACSON, *supra* note 41, at 5 (quoting art historian Kenneth Clark).

<sup>442</sup> LESLIE, *supra* note 35, at 17, 61. Leslie cites Benjamin Franklin as another example of a “flamboyantly curious and highly entrepreneurial” thinker who made “curiosity cool.” *Id.* at 65.

<sup>443</sup> *Id.* at xiv (asserting curiosity as the fourth human drive; the other human drives include sex, food, and shelter). Leslie calls curiosity the “knowledge emotion” that feels like an itch that needs to be scratched. *Id.* at 41. He explains, “A curious person knows that she won’t feel emotionally fulfilled until she finds the information or the understanding she seeks. So, she keeps reading or questioning until the [information] gap is closed.” *Id.* Both Freeman Dyson (physicist) and Albert Einstein recognized the importance of exploring mysteries. *Id.* at 49. Einstein stated, “The most beautiful thing we can experience is the mysterious. It is the source of all true art and science.” *Id.*

<sup>444</sup> LESLIE, *supra* note 35, at 181.

<sup>445</sup> Douglas A. Ready, *In Praise of the Incurably Curious Leader*, MIT SLOAN MGMT. REV. (Jul. 18, 2019), <https://sloanreview.mit.edu/article/in-praise-of-the-incurably-curious-leader/> [https://perma.cc/M9HS-ZM2P].

<sup>446</sup> *Id.*

<sup>447</sup> COLEMAN, *supra* note 6, at 196 (“Some AI experts believe that curiosity is the quintessential human trait that a truly intelligent machine must have to be more like us.”); MARCUS & DAVIS, *supra* note 184, at 29.

<sup>448</sup> LESLIE, *supra* note 35, at 145.

<sup>449</sup> ISAACSON, *supra* note 41, at 215 (describing how Leonardo imagined modern augmented (AR), virtual (VR), and mixed reality (MR) technologies). Leonardo wrote,

[e]very part will be drawn, using all means of demonstrations, from three different points of view; for when you have seen a limb from the front, with any muscles, sinews, or veins which take their rise from the opposite side, the same limb will be shown to you in a side view or from behind, exactly as if you had that same limb in your hand and were turning it from side to side until you had acquired a full comprehension of all you wished to know. *Id.* at 215–16.

augmented mind made it possible for him to see beyond what others could see. As explored in Section II, Leonardo's augmented mind melded his detailed artistic renderings with evolving understandings of nature, machines, and movement. Building on these studies, he imagined and sketched futuristic designs for flying and diving technologies.<sup>450</sup> In his augmented reality, Leonardo imagined the (then) impossible technologies of helicopters and scuba equipment.<sup>451</sup>

**b. *Questioning Remains Indispensable in Spite of Google Upsetting the Value of Knowledge***

According to MIT's Nicholas Negroponte, the Internet increasingly makes "knowing" obsolete; consequently, we need a "radical new conception of human cognition" because humans no longer need to store facts and information in our minds.<sup>452</sup> Fortunately for lawyers, a wide gap exists between having information and being able to use such information when identifying and effectively resolving legal matters.<sup>453</sup> As we know, our work does not involve merely answering questions. Instead, it requires: (1) identifying the issues presented; (2) completing legal research; (3) interviewing clients and witnesses; (4) gathering documents, information, and data; (5) analyzing the issues presented and information gathered under applicable laws and regulations; (6) evaluating potential strategies; (7) hypothesizing potential second- and third-order consequences of any actions under consideration;<sup>454</sup> (8) counseling and advising clients; and (9) doing all of the above while taking into account the client's unique circumstances.<sup>455</sup>

While Google enables instant access to infinite information, it also thwarts human curiosity because the search engine eliminates the friction involved in bridging mind gaps.<sup>456</sup> Specifically, Google removes uncertainty, strips away mystery, and provides a temporary knowledge jolt that obscures the human searchers' "awareness of [their] ignorance."<sup>457</sup> For example, Google searches and Internet forms may fail to advise users about tax and legal issues

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<sup>450</sup> See also *supra* Part II.F.

<sup>451</sup> *Id.*

<sup>452</sup> LESLIE, *supra* note 35, at 108.

<sup>453</sup> Westfahl & Wilkins, *supra* note 39, at 1698.

<sup>454</sup> Julian Hayes, II, *I Powerful But Simple Technique Ray Dalio Uses to Make Better Decisions*, INC. (Sept. 29, 2018), <https://www.inc.com/julian-hayes-ii/ray-dalios-technique-to-instantly-becoming-a-better-decision-maker-boils-down-to-8-words.html> [<https://perma.cc/AP5B-N5NY>] (explaining that better decision making involves asking "[w]hat are the second and third order consequences?"). This process involves (1) thinking several steps ahead and focusing on long-term goals and (2) rejecting short-term satisfying actions that may undermine the achievement of such long-term goals. *Id.*; RAY DALIO, *PRINCIPLES: LIFE AND WORK* 155–56 (2017).

<sup>455</sup> Benjamin Alarie et al., *How Artificial Intelligence Will Affect the Practice of Law*, 68 U. TORONTO L.J. 106, 120 (2018) (distinguishing between legal information technology tools and the sophisticated work performed by human lawyers); Remus & Levy, *supra* note 7, at 525–26.

<sup>456</sup> LESLIE, *supra* note 35, at 56, 108.

<sup>457</sup> *Id.* at 56.



such as “83(b) elections, foreign qualification, intellectual property protections, or the like.”<sup>458</sup>

Further, reliance on auto-populated searches stunts the seekers’ ability to frame and ask provocative questions.<sup>459</sup> As synthetic intellects further penetrate into all aspects of modern life, the wise words of Kevin Kelly ring true: “[m]achines are for answers; humans are for questions.”<sup>460</sup> Likewise, anthropologist Claude Lévi-Strauss’s long-ago observation continues to resonate—he wisely noted that “the scientist [or other knowledge professional] is not a person who gives the right answers, he’s the one who asks the right questions.”<sup>461</sup> Vitruvian Lawyers ask questions.

### c. Curiosity Dividend

Curiosity has economic value.<sup>462</sup> In a Google-permeated world where big data and fast answers flow freely, curious, and emotionally intelligent humans who can generate great questions will have high value because “a really good question can unleash new questions.”<sup>463</sup> Google is not all bad; it can be a propeller for intellectual inquiry if one uses it to advance continued exploration.<sup>464</sup> Lawyers who capitalize on the shrewd pairing of digital

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<sup>458</sup> Askin et al., *supra* note 187.

<sup>459</sup> *Id.*; see HARTLEY, *supra* note 185, at 40 (describing how Plato “emphasized that knowledge is more than just information or data; that it comes from ‘knowing how to ask and answer questions’”).

<sup>460</sup> *A Conversation with Kevin Kelly*, TECHIUM (Feb. 3, 2014), [https://www.edge.org/conversation/kevin\\_kelly-the-technium](https://www.edge.org/conversation/kevin_kelly-the-technium) [<https://perma.cc/Q3Y9-27CD>].

<sup>461</sup> FUENTES, *supra* note 37, at 249. Fuentes explains that “[e]ngaging in science requires a deep desire to know how and why, and the persistence to try to figure out the answers to those questions, regardless of the frustration and failure we encounter.” *Id.* at 250. He adds, “Doing science relies deeply on a driving curiosity and a capacity to imagine, innovate, to experiment and create.” *Id.* See Brynjolfsson & Mitchell, *supra* note 223, at 1533 (emphasizing the important skill of being able to ask the right questions); COLEMAN, *supra* note 6, at 159 (describing how asking “beautiful questions” can “shift our perspective[s], spark inner expansion, and reveal new possibilities”).

<sup>462</sup> LESLIE, *supra* note 35, at xvi (“The truly curious will be increasingly in demand. Employers are looking for people who can do more than follow procedures competently or respond to requests, who have a strong, intrinsic desire to learn, solve problems, and ask penetrating questions.”); see COLVIN, *supra* note 30, at 175 (observing that “intrinsic motivation stimulates creativity far better than extrinsic motivation does”).

<sup>463</sup> *Id.* Kelly explains, “One of the things that science does is a really curious thing. Every time we use science to try to answer a question, to give us some insight, invariably that insight or answer provokes two or three other new questions. Anybody who works in science knows that they’re constantly finding out new things that they don’t know.” *Id.* Leslie identifies concerns about how big data can displace the unique human abilities to be curious (intellectual and empathetic) and ask why. LESLIE, *supra* note 35, at 163. He cites the example of the origins of the 2012 Arab Spring, which could only be understood by a human who had a deep understanding how the combination of the region’s politics and history and unrelenting human suffering that sparked the collapse of multiple nation states. *Id.*

<sup>464</sup> LESLIE, *supra* note 35, at 88. Leslie rejects the notion that the “[i]nternet is making us stupid.” *Id.* He writes, “The only person or thing that can make you stupid, or incurious, is you.” *Id.* Ross Anderson, *He Who Pays The AI, Calls The Tune*, in WHAT TO THINK ABOUT MACHINES THAT

technology with human curiosity will be well-positioned to navigate the cognitive divide between the incurious and curious.<sup>465</sup> These lawyers can thus “reap the growing curiosity dividend” since computers do not (yet) have the capacity to be curious.<sup>466</sup>

In summation, during a time of continuous digital transformation and economic restructuring, curiosity yields both personal and economic value.<sup>467</sup> Humans with curious minds and cognitive range recognize that something they learn today may be useful later when they encounter challenges in fast-moving social, legal, and economic environments.<sup>468</sup>

Before moving onto the topic of cognitive range, it should be noted that teaching a student to be a lawyer, programmer, or engineer differs from teaching them to be curious learners.<sup>469</sup> Epistemically curious learners seek new knowledge and experiences in “a directed attempt to build understanding.”<sup>470</sup> To construct such understanding, epistemic curiosity demands work and “sustained cognitive *effort*.”<sup>471</sup> Fortunately, the pursuit of curiosity can build virtuous cycles of learning and understanding because “[c]uriosity rises in tandem with knowledge.”<sup>472</sup>

## ii. Cognitive Range: The Thought Generator

Recall that thinking represents our human superpower.<sup>473</sup> Because more knowledge produces better thinking,<sup>474</sup> our greatest strength stems from our organic abilities to think and “integrate broadly” facts, circumstances,

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THINK 201, 202 (John Brockman ed., 2015) (describing how Google serves as our “memory prostheses” and predicting that “we’ll be using AI systems that draw on millions of machines and sensors as perceptual prostheses”).

<sup>465</sup> LESLIE, *supra* note 35, at 86 (asserting that have entered an age of “cognitive polarization—a division between the curious and the incurious”).

<sup>466</sup> *Id.* at xvi, 88 (“Computers are smart. But no computer, however sophisticated, can yet be said to be curious.”).

<sup>467</sup> *Id.* at 83.

<sup>468</sup> *Id.* at 17 (“[W]e now live in larger, more varied, faster-changing societies than ever before, curiosity is important—and more rewarding that it has ever been.”).

<sup>469</sup> *Id.* at xxii.

<sup>470</sup> *Id.* at 11.

<sup>471</sup> Leslie later observes that easy access to information via the Internet eliminates the “productive frustration” essential for nurturing curiosity. *Id.* at 51. Recent research on leadership reveals that curious people better navigate times of flux. Ready, *supra* note 445. According to Dan Shapero, Vice President, Global Solutions, LinkedIn, “I don’t know where curiosity comes from, but if you could bottle it, I’d buy it. It is so valuable, when things are changing so quickly, to have people on your team who are trying every day to better understand the world around them.” *Id.* Rejecting the idea that curiosity is a fixed personality trait, David Schmittlein, the dean of MIT’s Sloan School of Management, asserts that curiosity can be learned. *Id.* To build one’s curiosity muscles requires intentionality and persistence. Dean Schmittlein explains, developing curiosity involves a long-term process of valuing and modeling the quest for knowledge, along with supporting fellow travelers on their wanderers in a world of wonder. *Id.*

<sup>472</sup> LESLIE, *supra* note 35, at 38.

<sup>473</sup> Anderson, *supra* note 20, at 282.

<sup>474</sup> LESLIE, *supra* note 35, at 118.

emotions, and other inputs.<sup>475</sup> Further, our wet, dynamic brains constantly synthesize information to seek both cognitive homeostasis and long-term survival.<sup>476</sup>

Cognitive range turbo-charges our problem-solving capabilities. According to New York University psychology professor Gary Marcus, broad integration represents the inverse of narrow specialization.<sup>477</sup> Marcus asserts that in limited and controlled situations where AI systems can perform routine analysis and predictions, human contributions may become redundant.<sup>478</sup> Humans, however, outperform machines when it comes to solving big picture, open-ended, interconnected, and emotionally entangled situations—in other words, real-world problems.<sup>479</sup>

**a. Cognitive Range: Information Integrator and Problem Solver**

As more information becomes digitized,<sup>480</sup> the challenge ahead for legal professionals involves how to use and integrate “all [of] the knowledge of humanity on their phone” to develop solutions to complex problems.<sup>481</sup> When

<sup>475</sup> EPSTEIN, *supra* note 27, at 29.

<sup>476</sup> David Christian, *Is Anyone In Charge of This Thing?*, in WHAT TO THINK ABOUT MACHINES THAT THINK 37, 37–38 (John Brockman ed., 2015) (describing thinking, purpose, and choice as a fluid process of “constant adjustment homeostasis” designed to survive and reproduce); Brian Knutson, *The Robot With A Hidden Agenda*, in WHAT TO THINK ABOUT MACHINES THAT THINK 163, 164 (John Brockman ed., 2015) (“Humans aren’t mere information processors. They’re survival processors.”).

<sup>477</sup> EPSTEIN, *supra* note 27, at 29.

<sup>478</sup> *Id.* Surden, *Machine Learning and Law*, *supra* note 333, at 102 (noting that predictions of legal outcomes “may be increasingly subject to automated, computer-based analysis”). For example, Surden anticipates that lawyers will “leverage data from past client scenarios and other relevant public and private data to build machine learning predictive models about future likely outcomes on particular legal issues that could complement legal counseling.” *Id.* at 104. He writes that such process “would be formalizing statistically to some extent what lawyers do intuitively today.” *Id.* See generally Escajeda, *Zero Economic Value Humans?*, *supra* note 12, at 152–55 (discussing the global potential for substantial un- or underemployment of human workers).

<sup>479</sup> EPSTEIN, *supra* note 27, at 29. Epstein contrasts how IBM’s Watson performed brilliantly on *Jeopardy!* but disastrously in cancer care. *Id.* Despite being touted as “a revolution in cancer care,” IBM’s Watson “flopped so spectacularly that several AI researchers” expressed concerns that it would “taint AI research in health-related fields.” *Id.* According to one oncologist, “The difference between winning at *Jeopardy!* and curing cancer is that we know the answer to the *Jeopardy!* questions.” With cancer, researchers are still trying to figure out the right questions to ask. *Id.*

<sup>480</sup> HADFIELD, *supra* note 24, at 130 (describing digitization). Professor Hadfield writes,

[m]ass digitization—the conversion of everything from phone calls, stock trades, movies, and documents to identities, social networks, geographic locations, and generic information into flat sequences of zeroes and ones that can race along fiber optic cables and over wireless networks—has made it possible to convert a vast array of our economic interactions from ones embodied in physical objects and fixed locations to disembodied ones that exist both nowhere and everywhere at the same time. *Id.*

Essentially, the process of digitization “takes objects and actions, voices and images, and converts them all into single-dimensional strings of ones and zeroes.” *Id.* at 152.

<sup>481</sup> EPSTEIN, *supra* note 27, at 277 (quoting Arturo Casadevall, MD, Ph.D.’s views on

AI algorithms can effortlessly crunch through zettabytes—eventually yottabytes and brontobytes—of data, our unique human ability to think, relate, reason, imagine, and create becomes even more essential for our long-term, professional opportunities and career success.<sup>482</sup>

When untangling and resolving wicked problems,<sup>483</sup> psychologist and creativity researcher Professor (emeritus) Dean Keith Simonton observes that instead of having an obsessive narrow focus, successful problem solvers tend to have wide-ranging and varied interests.<sup>484</sup> By having “range,” these high-functioning problem solvers tend to find new approaches and answers by (1) avoiding “cognitive retrenchment,”<sup>485</sup> (2) thinking laterally<sup>486</sup> to adapt “knowledge from one pursuit and applying it creatively to another,” and (3) rejecting fixed patterns.<sup>487</sup>

**b. Lawyer’s Dilemma: Generalize or Specialize**

It should be noted, however, that the concept of lawyers with range

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modernizing medical education) (“Do we really need to go through courses with very specialized knowledge that often provides a huge amount of stuff that is very detailed, very specialized, very arcane, and will be totally forgotten in a few weeks?”). Dr. Casadevall adds, “Especially now, when all the information is on your phone. You have people walking around with all the knowledge of humanity on their phone, but they have no idea how to integrate it. We don’t train people in thinking or reasoning.” *Id.*

<sup>482</sup> *Id.*; Bernard Marr, *Big Data: What is a Brontobyte?*, WORLD ECON. F. (Feb. 12, 2015), <https://www.weforum.org/agenda/2015/02/big-data-what-is-a-brontobyte/> [<https://perma.cc/C7N2-H9L2>].

<sup>483</sup> EPSTEIN, *supra* note 27, at 102–03. Epstein emphasizes that, “[i]n a wicked world, relying upon experience from a single domain is not only limiting, it can be disastrous.” *Id.* Epstein emphasizes the difference between kind versus wicked problems. He highlights how solving familiar pattern-based “kind” problems profoundly differs from “[g]enerating new ideas of facing novel problems with high uncertainty.” *Id.* at 112. He concludes, “Evaluating an array of options before letting intuition reign is a trick for the wicked world.” *Id.*

<sup>484</sup> *Id.* at 33. Epstein also notes that “Nobel laureates are at least twenty-two times more likely” to participate in aesthetic and artistic pursuits in their free time (e.g., dance, drama, painting, sculpture, magic, etc.). *Id.* The research shows that the most creative and successful experts often infuse perspectives and insights from their avocation into their vocation because they “belong to the wider world.” *Id.*

<sup>485</sup> Highly specialized experts may “offer advice that is sullied by ‘cognitive retrenchment[.]’” which involves “framing strategic challenges following current orthodoxy and underappreciating emerging changes in their company’s operating environment.” Brook Manville, *How to Manage Know-It-Alls Who Sometimes Don’t Know It All*, FORBES (Sept. 19, 2016, 4:44 PM), <https://www.forbes.com/sites/brookmanville/2016/09/19/how-to-manage-know-it-alls-who-sometimes-dont-know-it-all> [<https://perma.cc/88LR-876V>]. In addition, experts can be overconfident in their analyses and conclusions and also act as “prima donnas who shut down challenges to their views by others.” *Id.*

<sup>486</sup> EPSTEIN, *supra* note 27, at 193 (“Lateral thinking is a term coined in the 1960s for the reimagining of information in new contexts, including the drawing together of seemingly disparate concepts or domains that can give old ideas new uses.”).

<sup>487</sup> *Id.* at 34 (citing the work of Christopher Connolly, Ph.D. who studies sports psychology); *see generally Our Team: Christopher Connolly, PhD*, TRANSITIONEXPERTISE, <http://transitionexpertise.com/about-us/our-team/> [<https://perma.cc/EBN8-4AE4>].

counters the legal industry's specialization trend,<sup>488</sup> where specialty lawyers—like Russian nesting dolls—become increasingly narrower and more limited in their expertise<sup>489</sup> and may devise overly complicated solutions.<sup>490</sup> Over-specialization may, therefore, stymie the resolution of wicked problems.<sup>491</sup> Echoing this concern, University of Washington Computer Science and Engineering Professor Pedro Domingos observes, “knowledge is a double-edged sword. It allows you to do somethings, but it also makes you blind to other things that you could do.”<sup>492</sup>

To prevent such blindness, escape thought silos,<sup>493</sup> and maximize economic opportunities, lawyers should emulate Leonardo and become Vitruvian Lawyers. Like Leonardo, these forward-focused lawyers seek opportunities to engage in collaborations with diverse thinkers in other professions to widen their cognitive range and deepen their expertise.<sup>494</sup> Such curious and cognitively diverse legal problem-solvers will thus remain valued knowledge professionals because their elastic and creative minds outperform machines with narrow and brittle intelligence.

Instead of completing limited, stable, simple, and routine functions, the practice of law will increasingly demand the performance of a wide range of “lawyerly tasks” required for resolving broad, dynamic, complex, and non-routine challenges. Modern lawyers must, therefore, be able to develop big picture strategies, incorporate human emotions into client counseling and legal recommendations (emotional intelligence), perform abstract thinking, and

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<sup>488</sup> LAW FIRM ACCOUNTING AND FINANCIAL MANAGEMENT § 27.01 (6th ed. 2020) (describing changes in law firm business development and management).

<sup>489</sup> EPSTEIN, *supra* note 27, at 177.

<sup>490</sup> Westfahl & Wilkins, *supra* note 39, at 1685 (describing how law firms require “associates to specialize immediately so as to make themselves productive as early as possible”); HADFIELD, *supra* note 24, at 208 (“Greater specialization in knowledge produces more complex understandings of problems—and leads to more complex solutions.”).

<sup>491</sup> Ziyad Marar explains that “wicked problems” are those problems that “don’t have right or wrong answers. . . . They’re uniquely contextual and have complex overlapping causes . . . [that] don’t suit narrow computational thinking well.” Marar, *supra* note 32, at 275. David Epstein writes,

Facing uncertain environments and wicked problems, breadth of experience is invaluable. Facing kind problems, narrow specialization can be remarkably efficient. The problem is that we often expect the hyper specialist, because of their expertise in a narrow area, to magically be able to extend their skill to wicked problems. The results can be disastrous. EPSTEIN, *supra* note 27, at 213.

*Id.* (warning about being overly devoted to a particular tool or interventional process because unquestioning reliance on tried and tested tools/processes can result in “disastrous myopia”). *Id.* at 265–67 (describing potentially overused medical procedures). Instead of a single tool or process, problem solvers must collect a range of helpful tools and processes. *Id.* at 267.

<sup>492</sup> EPSTEIN, *supra* note 27, at 179.

<sup>493</sup> See generally TETT, *supra* note 73.

<sup>494</sup> WHELAN, JR., *supra* note 272, at xxv (asserting that the combination of specialization and collaboration opens opportunities).

consider policy issues—all the while advocating for their client.<sup>495</sup> For example, attorneys who counsel terminally-ill clients on end of life decisions and estate disposition serve clients well when they unite their legal expertise, empathy, compassion, and nuance when crafting tailored estate plans. These compassion-centered client services will foreseeably remain in the human realm since AI technologies do not have emotional intelligence.<sup>496</sup> In standard and routine “easy-cases,” human-AI teaming will enable the attorney to focus on tasks that require “higher order legal skills.”<sup>497</sup>

Having considered the compounding powers of curiosity and cognitive range, we now consider how creativity capitalizes on these powers to stoke legal imagination.

### iii. Creativity: The Boundary Pusher

Creativity is a human birthright.<sup>498</sup> Cultivating creativity involves a forward-leaning process that works like a muscle producing art, music, and science.<sup>499</sup> In *The Creative Spark: How Imagination Made Humans Exceptional*, Notre Dame Professor and Chair of Anthropology Agustín Fuentes explains that “[c]reativity is built on interconnections of ideas, experiences, and imagination.”<sup>500</sup> These interconnections can reveal fresh pathways for productive inquiry.<sup>501</sup> Archaeologist Ian Hodder describes creativity as “that space between the material reality and our imagination where intelligence, adaptability, agency, interpretation, and problem solving all come together.”<sup>502</sup> David Cope, the musician, composer, and creator and patent-holder of Experiments in Musical Intelligence (EMI) Recombinant Music Composition Algorithm,<sup>503</sup> offers this simple definition, “Creativity is just finding an association between two things which ordinarily would not

<sup>495</sup> Surden, *Artificial Intelligence and Law*, *supra* note 313, at 1332. In Surden’s 2014 article, he explains that “many complicated problems—particularly those that routinely confront attorneys—may not be amenable to such heuristic-based technique.” Surden, *Machine Learning and Law*, *supra* note 333, at 97.

<sup>496</sup> See generally COLVIN, *supra* note 30; Cohen, *Lawyers with IQ/EQ*, *supra* note 30.

<sup>497</sup> Surden, *Machine Learning and Law*, *supra* note 333, at 101.

<sup>498</sup> COLEMAN, *supra* note 6, at 61.

<sup>499</sup> FUENTES, *supra* note 37, at 67, 222, 242–43 (asserting that art creation is storytelling, and “our creative spark” is “at the root of science”); DU SAUTOY, *supra* note 37, at 11 (adding that “[c]reativity is not an absolute but a relative process. We are creative within our culture and frame of reference”); AUSTIN, *supra* note 44, at 16 (asserting that “the posture of creativity is forward-leaning.”).

<sup>500</sup> FUENTES, *supra* note 37, at 1. In *The Origins of Creativity*, Harvard Professor (emeritus) Edward O. Wilson describes creativity as “the innate quest for originality” that is judged “by the magnitude of the emotional response it evokes.” WILSON, *supra* note 40, at 3, 39. Wilson observes, “Originality and style are everything, measured by the degree to which the innovations attract imitation.”

<sup>501</sup> AUSTIN, *supra* note 44, at 189.

<sup>502</sup> FUENTES, *supra* note 37, at 1.

<sup>503</sup> U.S. Patent No. 7,696,426 B2 (issued Apr. 13, 2010); see also *supra* Part III.A.3 (discussing Human-machine Teaming).

seem related.”<sup>504</sup>

The process of cultivating creativity starts with an understanding of its different varieties.

**a. Creativity Categories: Exploratory, Combinatory, and Transformational**

Oxford University Professor Marcus du Sautoy’s book, *The Creativity Code: Art and Innovation in the Age of AI*, identifies three types of creativity: exploratory, combinatory, and transformational.<sup>505</sup> As to be expected, exploratory creativity searches and combinatory creativity assembles.<sup>506</sup> The term transformational creativity, however, calls for further scrutiny. Professor du Sautoy explains that “transformational moments hinge on changing the rules of the game or dropping a long-held assumption.”<sup>507</sup> Truly transformative acts involve creating new realities by moving past tradition and rejecting familiar systems or constructs.<sup>508</sup> “It is the mark of the creative thinker to break with traditional rules.”<sup>509</sup> As noted in Part II, Leonardo’s *modus operandi* was to explore and combine the arts and sciences—frequently breaking the rules along the way.<sup>510</sup> Applying Professor du Sautoy’s creativity framework suggests that Leonardo’s masterworks, scientific studies, and futuristic designs exhibit the trifecta of exploratory, combinatory, and transformational creativity. Further, as we observed in Leonardo, creativity thrives in an elastic mind open to new experiences and risk.

**b. Creativity Components: Dreams, Collaborations, and Failures**

Creativity represents the ability of the human mind to shift back and forth between “what is” and “what could be.”<sup>511</sup> Using our imaginations, we can “dream big” and then work toward making our dreams a reality.<sup>512</sup> However, dreamers should be prepared that creativity often encounters resistance and frequently involves failure.<sup>513</sup>

<sup>504</sup> FRY, *supra* note 153, at 193; *see also* DU SAUTOY, *supra* note 37.

<sup>505</sup> DU SAUTOY, *supra* note 37, at 8–9. “Exploratory creativity takes what is already there and exploring its outer edges, extending the limits of what is possible while remaining bound by the rules. Combinatorial creativity involves “an article taking two completely different constructs and finding a way to combine them.” *Id.* at 8. Transformational creativity represents “complete game changers” that are “phase changes, like when water suddenly goes from liquid to gas or solid.” *Id.* at 9.

<sup>506</sup> *Id.* at 8.

<sup>507</sup> *Id.* at 10 (“The meta rule for this type of creativity: start by dropping constraints and see what emerges. The creative act is to choose what to drop—or what new constraint to introduce—such that you end up with a new thing of value.”).

<sup>508</sup> *Id.*

<sup>509</sup> *Id.* at 195.

<sup>510</sup> ISAACSON, *supra* note 41, at 117 (Leonardo’s “creativity came from his combinatory imagination”).

<sup>511</sup> FUENTES, *supra* note 37, at 2.

<sup>512</sup> *Id.* at 273.

<sup>513</sup> TOM KELLEY & DAVID KELLEY, CREATIVE CONFIDENCE: UNLEASHING THE CREATIVE POTENTIAL WITHIN US ALL 9–10, 40, 76 (2013) (describing relationship between self-efficacy

As we observed with Leonardo's collaborations with experts, peers, and his workshop apprentices,<sup>514</sup> more often than not, creativity represents a "social process"<sup>515</sup> that involves the import and export of ideas.<sup>516</sup> American author Joyce Carol Oates writes, "Creative work, like scientific work, should be greeted as a communal effort—an attempt by an individual to give voice to many voices, and attempt to synthesize and explore and analyze."<sup>517</sup>

Last, a hard link exists between creativity, risk, discovery, and failure. Discoveries occur when we take the personal and economic risks to venture into uncharted—and often uncomfortable—territory.<sup>518</sup> Entrepreneurs understand that such risks can yield both sweet discoveries and bitter disappointments.<sup>519</sup> Innovation emerges from combining ideas and following "hunches, gut feelings, and leaps of faith. It involves trial and error, dead ends, and failed attempts."<sup>520</sup> When they occur, fruitful discoveries can lead to new products, services, or markets.<sup>521</sup> According to journalist Hannah Bloch, "without the sting of failure to spur us to reassess and rethink, progress would be impossible."<sup>522</sup> So, when lawyers embark on creative endeavors, we should heed Irish novelist's Samuel Beckett's call to, "Try. Fail. Fail again. Fail better."<sup>523</sup>

### C. Lawyers: Professional Problem Solvers

According to Austrian-born British philosopher and Professor Karl Popper, "all life is problem solving."<sup>524</sup> When pursuing solutions to problems, we integrate our thoughts, emotions, and senses to see the previously unseen and figure out new ways of doing.<sup>525</sup> This Section begins with an overview of problem-solving, followed by a survey of how problem-solving at hyper-speed can create both career opportunities and personal challenges for human

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and "creative confidence" and noting that creativity often includes failure); SCHILLING, *supra* note 31, at 18, 84, 254 (examining self-efficacy and failure).

<sup>514</sup> See *supra* Part II.D.3.

<sup>515</sup> FUENTES, *supra* note 37, at 1, 78–79. Fuentes describes the importance of "creative collaboration" in how our *Homo* ancestors survived and evolved over time.

<sup>516</sup> ZUCKERMAN, *supra* note 39, at 182.

<sup>517</sup> DU SAUTOY, *supra* note 37, at 12.

<sup>518</sup> HADFIELD, *supra* note 24, at 227, 233. Professor Hadfield also emphasizes the importance of having access to "risk capital" that is needed "to support game-changing innovation to develop the new models no one has even thought of yet." *Id.* at 233.

<sup>519</sup> *Id.* at 227 ("Failure means risk. Serious risk.").

<sup>520</sup> *Id.*

<sup>521</sup> *Id.* at 229. Modern legal markets need the following "key ingredients" for innovation: "diversity, feedback, and risk-taking."

<sup>522</sup> FUENTES, *supra* note 37, at 275.

<sup>523</sup> DU SAUTOY, *supra* note 37, at 14.

<sup>524</sup> MLODINOW, *supra* note 31, at 33; Karl Popper, WIKIPEDIA, [https://en.wikipedia.org/wiki/Karl\\_Popper](https://en.wikipedia.org/wiki/Karl_Popper) [<https://perma.cc/PPM9-YSTX>]; see generally KARL POPPER, ALL LIFE IS PROBLEM SOLVING (1999).

<sup>525</sup> HADFIELD, *supra* note 24, at 149.



lawyers.

### i. Problem Solving Overview

Solving problems requires thinking.<sup>526</sup> Thinking includes “evaluating circumstances and making a meaningful response by *generating ideas*.”<sup>527</sup> “[I]maginative problem-solving is part of human nature.”<sup>528</sup> This fluid process involves active interplays between ideation, innovation, insight, and invention.<sup>529</sup> Coupling lifelong learning with critical thinking further reinforces our problem-solving capabilities.<sup>530</sup>

Creative problem solving often consists of the “augmentation of existing solutions” which means we “build on previous knowledge to develop more complex and multilevel explanations and understandings.”<sup>531</sup> The human desire and ability to “tweak things” can also lead to improvements and new inventions.<sup>532</sup> Effective solutions may emerge from continuous cycles of studying, building, testing, learning from failure, and incorporating lessons learned into the next prototype.<sup>533</sup> As we saw with Leonardo’s sketches, careful and detailed study served as a prerequisite for his knowledge, understanding, and creative insights.<sup>534</sup> Astonishingly, Leonardo’s curiosity, cognitive range, and creativity enabled him to imagine futuristic technologies that only became technically feasible many centuries later.<sup>535</sup>

### ii. Problem Solving at Hyper Speed: Career Opportunities

The triple-threat of technology speed, novelty, and complexity continues to transform the demand for lawyers and legal services.<sup>536</sup> AI expert and

<sup>526</sup> Cf. *id.* at 59 (“Every organizing is a little problem-solving machine.”); Rodney A. Brooks, *Mistaking Performance For Competence*, in WHAT TO THINK ABOUT MACHINES THAT THINK 108 (John Brockman ed., 2015) (observing that the word “think” is another Marvin Minsky “suitcase word,” (along with intelligence discussed *supra* in Part III.B.) which is a word “into which we pack so many meanings so we can talk about complex issues in shorthand”).

<sup>527</sup> MLODINOW, *supra* note 31, at 34 (citing a neuroscience textbook definition of thinking as “[t]hought is the act of attending to, identifying, and making meaningful responses to stimuli . . . characterized by the ability to generate strings of ideas, many of which are novel”).

<sup>528</sup> Richard Straub & Julia Kirby, *Meaningful Work Should Not Be a Privilege of the Elite*, HARV. BUS. REV. (Apr. 3, 2017), <https://hbr.org/2017/04/meaningful-work-should-not-be-a-privilege-of-the-elite> [<https://perma.cc/2KNR-P665>].

<sup>529</sup> MLODINOW, *supra* note 31, at 138 (distinguishing between ideas and insight); Hilary G. Escajeda, *Legal Education: A New Growth Vision, Part II—The Groundwork: Building a Customer Satisfying Innovation Ecosystem*, 97 NEB. L. REV. 935, 970 (2019).

<sup>530</sup> AUSTIN, *supra* note 44, at 149.

<sup>531</sup> FUENTES, *supra* note 37, at 252.

<sup>532</sup> *Id.* at 252, 254. Fuentes explains that “[h]umans have the capacity to invent, but they also have the desire to take the invention and the information that comes from using the invention and revisit basic concepts and designs.” *Id.*

<sup>533</sup> ZUCKERMAN, *supra* note 39, at 131; Sutton, *supra* note 42; Martin, *supra* note 42; HADFIELD, *supra* note 24, at 223 (explaining that prototypes can be used for “feedback” and “innovation”).

<sup>534</sup> See *supra* Part II.D.

<sup>535</sup> See *supra* Part II.F.

<sup>536</sup> HADFIELD, *supra* note 24, at 150.

former President of Google China, Kai-Fu Lee, calls AI the “defining technology of the twenty-first century”<sup>537</sup> and predicts that it will increasingly “become part and parcel of problem-solving across our lives.”<sup>538</sup> If Lee’s prediction is correct, AI technologies will fundamentally change the practice of law. The phrase “strategic inflection point” describes this time of destabilization, where some people and businesses will thrive, and others will flounder.<sup>539</sup>

When facing career or industry strategic inflection points, former Intel CEO Andrew Grove explains that surviving such upheaval requires clarity on where you are heading, conviction and determination to meet your goals, and resolute forward movement to seize the next opportunity.<sup>540</sup> Taking Grove’s advice, modern lawyers need to look and move forward, identify and achieve personal and professional goals, and be ready to seize career opportunities.

Multiple productive paths presently exist for agile, knowledgeable, and emotionally intelligent professionals ready to capitalize on the opportunities created by career and industry strategic inflection points.<sup>541</sup> For example, they can (1) design and build modern legal infrastructure and promote access to justice for all; (2) serve as legal-business collaborators and strategists; (3) design new legal service delivery models; and (4) solve the problems of impulsive and irrational humans. New and mid-career lawyers may thus find it worthwhile to focus their energies on building the knowledge and skills that align with these opportunities.

First, as cognitive technologies shift problem-solving into hyper-speed, there will be a need for nimble legal “multidisciplinary problem solvers”<sup>542</sup> capable of imagining new models and processes, designing flexible and adaptable business models, and building responsive legal infrastructure and markets that can support rapid technological, social, and economic change.<sup>543</sup>

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<sup>537</sup> LEE, *supra* note 194, at 80.

<sup>538</sup> Kai-Fu Lee, *AI’s Real Impact? Freeing Us from The Tyranny of Repetitive Tasks*, WIRED UK (Dec. 12, 2019), <https://www.wired.co.uk/article/artificial-intelligence-repetitive-tasks> [<https://perma.cc/7JPB-LDJR>].

<sup>539</sup> GROVE, *supra* note 17, at 3 (defining a strategic inflection point as “[a] point in the life of a business when its fundamentals are about to change”). Escajeda, *Legal Education: A New Growth Vision, Part I*, *supra* note 361, at 675–76. It should be noted that strategic inflection points “are often long in the making and mostly invisible.” *Id.*

<sup>540</sup> GROVE, *supra* note 17, at 189, 194–96. The Delta Models discussed *infra* in Part IV.D. may be useful in this process.

<sup>541</sup> HADFIELD, *supra* note 24, at 59 (“We are at an inflection point in the evolution of legal systems, facing the need to reinvent how we do law.”); GROVE, *supra* note 17, at 3 (defining a strategic inflection point as “[a] point in time in the life of a business [industry or career] when the fundamentals are about to change”).

<sup>542</sup> Westfahl & Wilkins, *supra* note 39, at 1671.

<sup>543</sup> HADFIELD, *supra* note 24, at 152, 155–59. Mark A. Cohen, *Business Models—Not Technology—Will Transform the Legal Industry*, FORBES (Nov. 8, 2018, 7:14 AM), <https://www.forbes.com/sites/markcohen1/2018/11/08/new-business-models-not-technology-will->

Already we can see how fast-moving technologies often do not jibe with current laws and regulations<sup>544</sup>—thus, creating exciting opportunities for industrious lawyers.<sup>545</sup> Lawmakers and regulators will need lawyers with technology expertise to consider the social, ethical, and economic consequences of new products and services.<sup>546</sup> Curious and creative lawyers who can bridge the disparate disciplines of science, technology, and the humanities will be prepared to perform the important work of modernizing our laws and legal infrastructure to accommodate emerging technologies.<sup>547</sup> Such up-to-date legal infrastructure will make sure that AI technologies benefit humans and improve our quality of life,<sup>548</sup> “provide a stable and useful platform for making things and coordinating economic life,”<sup>549</sup> address

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transform-the-legal-industry/#7fc9b3518cc [https://perma.cc/3KC8-9B2K] [hereinafter Cohen, *Business Models—Not Tech*] (discussing Mark Johnson’s book, *REINVENT YOUR BUSINESS MODEL* (2018), and advocating for “customer-centric” legal business paradigms). Attorney Cohen argues that “[t]ech alone will not drive legal transformation; new business models will.” *Id.*

<sup>544</sup> Gina Passarella Cipriani, *Ross Founder on Why Law Needs to be ‘Re-Regulated’*, AM. LAW. (Jan. 16, 2020, 9:53 AM), <https://www.law.com/americanlawyer/2020/01/16/ross-founder-on-why-law-needs-to-be-re-regulated/> [https://perma.cc/DQM8-Y3TN] (discussing the importance of (1) integrating legal technology, modern business and ownership models, (2) authorizing non-JDs to provision some limited legal services, and (3) updating attorneys regulations in ways that provide all clients with access to effective legal services). Ross founder Andrew Arruda states, “I hope [the conclusion] folks leave the session with is that legal technology, along with re-regulation, are both healthy and constructive influences that not only are here to stay but which should be embraced and applied, rather than resisted.” *Id.* HADFIELD, *supra* note 24, at 244, 270 (describing the need for the “right regulation[,]” which means “putting in place intelligent regulations that ensure the markets for legal [and other] goods and services are functional and competitive”). She adds that “market-induced innovation in regulatory design is much-improved understanding of the relationship between the complexity of a regulatory setting and the complexity of regulation.” *Id.* at 270. *See generally* *Unlocking Legal Regulation Knowledge Center*, U. DENV., <https://iaals.du.edu/knowledge-center> [https://perma.cc/46UU-HYGX] (tracking legal regulation developments across the United States).

<sup>545</sup> HADFIELD, *supra* note 24, at 151 (“Legal analysis can’t exist off in a specialized corner by itself. It needs to be deeply integrated with business and policy thinking.”).

<sup>546</sup> COLEMAN, *supra* note 6, at 66; Jessi Hempel, *Fei-Fei Li’s Quest to Make AI Better for Humanity*, WIRED (Nov. 11, 2018, 6:00 AM), <https://www.wired.com/story/fei-fei-li-artificial-intelligence-humanity/> [https://perma.cc/4U4Q-JTBV] (describing Fei-Fei Li’s work to ensure that human values guide AI technologies and benefit humanity).

<sup>547</sup> *See* Transcript of Oral Argument at 32, *Hughes v. United States*, 584 U.S. \_\_ (2018) (No. 17-155), [https://www.supremecourt.gov/oral\\_arguments/argument\\_transcripts/2017/17-155\\_g314.pdf](https://www.supremecourt.gov/oral_arguments/argument_transcripts/2017/17-155_g314.pdf) [https://perma.cc/WCM5-Z5GZ] (quoting U.S. Supreme Court Justice Breyer) (“I think law is part art and part science. And you learn in law school and thereafter how to read an opinion. There are no absolute rules.”).

<sup>548</sup> James Manyika, *How to Ensure Artificial Intelligence Benefits Society: A Conversation with Stuart Russell and James Manyika*, MCKINSEY GLOBAL INST. (Jan. 31, 2020), <https://www.mckinsey.com/featured-insights/artificial-intelligence/how-to-ensure-artificial-intelligence-benefits-society-a-conversation-with-stuart-russell-and-james-manyika> [https://perma.cc/S484-TALQ].

<sup>549</sup> HADFIELD, *supra* note 24, at 248.

“machines [that] will break the law,”<sup>550</sup> and secure access to justice for all.<sup>551</sup> This contemporary legal infrastructure will also ensure that efficient markets solve problems and legal systems work for everyone.<sup>552</sup>

Second, opportunities exist for lawyers who can engage in multidisciplinary collaborations on diverse legal issues and business objectives, including strategy, project management, ethical analysis and reflection about emerging technologies, and how to respond to machines that break the law.<sup>553</sup> In times of flux, clients may find the distinction between legal challenges and business opportunities blurry, but lawyers may be able to bridge this gap with creative and strategic thinking. For instance, while some business obstacles present legal or regulatory “dimensions,” careful scrutiny of such challenges may reveal intertwined market, financial, or engineering-product design elements that may yield opportunities when reimaged or recombined.<sup>554</sup> Here, curious, cognitively broad, and creative lawyers will be best positioned to collaborate with colleagues and “integrate across all the dimensions of a problem”<sup>555</sup>—thereby potentially solving legal issues and finding forward pathways for business clients.

Third, myriad market opportunities exist for creative lawyers capable of imagining new paradigms, disrupting outdated legal service and business models, and harnessing technology to create human-digital bridges that serve clients.<sup>556</sup> By combining new technologies, agile processes, and smart and compassionate humans, legal innovators can reinvent the legal industry, create new business models, streamline access to legal services, and timely resolve disputes.<sup>557</sup> For those of us in practices serving small businesses and individual

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<sup>550</sup> Schneier, *supra* note 348, at 313 (discussing machines that break the law).

<sup>551</sup> HADFIELD, *supra* note 24, at 207 (describing the more modernized “legal rules and practices [that] meet the new economic demands of our complex global [and digital] economy”); O’Leary, *supra* note 340, at 247 (“Access to justice is the notion that as a basic principle of the rule of law, all people (not just those with financial means) should have an equal opportunity to exercise legal rights.”).

<sup>552</sup> HADFIELD, *supra* note 24, at 257. Professor Hadfield notes how markets that work efficiently and are appropriately regulated can meet economic demands and solve problems. *Id.* at 223.

<sup>553</sup> Westfahl & Wilkins, *supra* note 39, at 1697; *see generally* AVANADE, TRENDLINES: DIGITAL ETHICS 7 (2019), <https://www.avanade.com/~media/asset/brochure/digital-ethics-practical-guide.pdf?rev=2&la=en> [<https://perma.cc/TVK8-H2EF>] (explaining that “digital ethics” includes compliance, risk management, product development, marketing, brand and reputation management, corporate citizenship and more).

<sup>554</sup> HADFIELD, *supra* note 24, at 194.

<sup>555</sup> *Id.* (“A major complaint from corporate clients, however, is that their lawyers don’t play well on teams—that is they don’t bring the skill set that is necessary to collaborate on solutions that integrate across all the dimensions of a problem.”).

<sup>556</sup> *See, e.g.,* Emily Paton Davies, *Lyft Off*, DENVER L., Summer/Fall 2015, at 31, 31, <https://www.law.du.edu/images/uploads/library/scolhist/alumnimag/summer2015.pdf> [<https://perma.cc/G4EV-ADDQ>]; Cohen, *Business Models—Not Tech*, *supra* note 544.

<sup>557</sup> *See, e.g.,* Frederick Daso, *ArbiLex, A Harvard Law School Legal Tech Startup, Uses AI to Settle Arbitrations*, FORBES (Feb. 4, 2020, 9:07 AM), <https://www.forbes.com/sites/frederickdaso>

clients, we will need to rethink and regularly update our career and business strategies for the simple reason that Google has democratized access to all types of information.<sup>558</sup> While Google provides lots of information, much of it is confusing, incomplete, or wrong. Overwhelmed by search results, clients frequently find it difficult to translate Google results into effective and actionable solutions—thereby creating opportunities for lawyers. As attorney Mike Whelan, Jr., writes, “Knowledge is everywhere; expertise is rare. And rarity makes experts valuable.”<sup>559</sup> To profit from such expertise, knowledge entrepreneurs will use their trio of thinking superpowers—curiosity, cognitive diversity, and creativity—to imagine, design, and construct seamless digital and in-person connections between Google-inspired clients and seasoned legal experts. When building these legal service bridges, knowledge entrepreneurs will integrate human and machine intelligences to solve client problems ethically and efficiently.

Fourth, impulsive and irrational humans still need human lawyers.<sup>560</sup> Because clients are “buggy” and complicated—they fail to act or act unwisely—smart, creative lawyers with emotional intelligence will have plenty of problems to solve.<sup>561</sup> Although most lawyers’ work will (hopefully) not generate headlines such as “Celebrity Estate Planning Misfires of the Rich and Famous,”<sup>562</sup> our work may involve navigating volatile psychological dynamics to resolve complex legal claims. For example, we may need to address the

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/2020/02/04/arbilex-a-harvard-law-school-legal-tech-startup-uses-ai-to-settle-arbitrations/#33b2a10e52c5 [https://perma.cc/WNW6-4UJR] (applying Bayesian machine learning to assist lawyers in resolving international arbitration cases); Cohen, *Golden Age of the Legal Entrepreneur*, *supra* note 342 (discussing new technologies in the legal market); HADFIELD, *supra* note 24, at 177, 181, 227, 232, 234 (referencing Clayton Christensen’s disruptive innovation theory and how the legal profession needs to embrace imagination, hunches, risk, trial and error, and failure to transform the cost and delivery of legal services); *see generally* CHRISTENSEN, *supra* note 342.

<sup>558</sup> WHELAN, JR. *supra* note 272, at 138; Cohen, *Getting Beyond The Tech*, *supra* note 46 (highlighting Harvard Law School’s “Free the law” initiative which provides free digital access to 40 million pages of case law); *see generally* RICHARD SUSSKIND & DANIEL SUSSKIND, *THE FUTURE OF THE PROFESSIONS: HOW TECHNOLOGY WILL TRANSFORM THE WORK OF HUMAN EXPERTS* (2015).

<sup>559</sup> WHELAN, JR. *supra* note 272, at 140.

<sup>560</sup> *See* FRY, *supra* note 153, at 61. *See also* Natalie Wolchover & Quanta, *Our Instructions for AI Will Never Be Specific Enough*, ATLANTIC (Feb. 1, 2020), <https://www.theatlantic.com/technology/archive/2020/02/real-danger-artificial-intelligence/605914/> [https://perma.cc/4F2G-EATX] (reflecting on Stuart Russell’s 2019 book *Human Compatible* and his concerns about AI working with humans who (1) do not know what they want, (2) behave irrationally, and (3) have changing preferences).

<sup>561</sup> Michael I. Norton, *Not Buggy Enough*, in *WHAT TO THINK ABOUT MACHINES THAT THINK* 475, 475–76 (John Brockman ed., 2015) (concluding that “it’s the bugs that make us—and any form of intelligence—human”).

<sup>562</sup> Jessica Galligan Goldsmith et al., *Celebrity Estate Planning: Misfires of the Rich and Famous II*, A.B.A.: PROB. & PROP. MAG., May–June 2019, at 50, [https://www.americanbar.org/groups/real\\_property\\_trust\\_estate/publications/probate-property-magazine/2019/may-june/celebrity-estate-planning/](https://www.americanbar.org/groups/real_property_trust_estate/publications/probate-property-magazine/2019/may-june/celebrity-estate-planning/) [https://perma.cc/V39V-XFVD].

explosive emotions of spouses, former spouses, and hidden lovers; advise on the disposition of property and the disinheritance of family members; and shepherd the decedent's estate through beneficiary, disinherited party, and other asset litigation.<sup>563</sup>

As human-AI teaming becomes standard operating procedure, lawyers with emotional intelligence and agility<sup>564</sup> will remain valued professionals because they can understand, interact with, guide, persuade, and motivate clients in the collaborative process of maneuvering through and resolving emotionally-charged and complex legal issues.<sup>565</sup>

AI technologies will continue to reconfigure how lawyers work. As we envision, build, and steer our professional practices, "the most powerful revelation that one can have is that circumstances have changed."<sup>566</sup> Once we understand that the old rules no longer apply, we can liberate our thoughts to question traditional assumptions, reject or restructure established patterns, and imagine new possibilities.<sup>567</sup>

While the reconfiguration of the legal industry presents opportunities, we find that it exacerbates and complicates our efforts to achieve a work-life balance. Again, Leonardo serves as our role model.

### iii. Problem-Solving at Hyper Speed: Personal Challenges

As digital technologies transform the legal profession, clients accustomed to instant gratification now expect us to be constantly available to answer their questions.<sup>568</sup> Lawyering at hyper-speed is not a sustainable life and career strategy. Like Leonardo, we need time for rest and to daydream. Such rest and daydreams provide space for reflection and consolidation of our legal expertise with our other curious and creative explorations.<sup>569</sup> If we allow time for

<sup>563</sup> *Id.*; see, e.g., Danielle Mayoras & Andy Mayoras, *An Estate Fight May Be Coming Over Ric Ocasek's Estate*, FORBES (Nov. 13, 2019, 11:12 AM), <https://www.forbes.com/sites/trialandheirs/2019/11/13/an-estate-fight-may-be-coming-over-ric-ocaseks-estate/#48fc27281b91> [https://perma.cc/3B5A-L2NF] (describing how a pending divorce proceeding, a new will executed shortly before death, and spousal elective share claims under state law can complicate the administration of the decedent's estate).

<sup>564</sup> Susan David & Christina Congleton, *Emotional Agility: How Effective Leaders Manage Their Negative Thoughts and Feelings*, in HBR'S 10 MUST READS ON EMOTIONAL INTELLIGENCE 119, 120 (2015) (explaining that individuals with "emotional agility" approach their inner experiences in "mindful, values-driven, and productive way").

<sup>565</sup> Megan Beck & Barry Libert, *The Rise of AI Makes Emotional Intelligence More Important*, HARV. BUS. REV. (Feb. 15, 2017), <https://hbr.org/2017/02/the-rise-of-ai-makes-emotional-intelligence-more-important> [https://perma.cc/5ZEP-FNCX].

<sup>566</sup> MLODINOW, *supra* note 31, at 130.

<sup>567</sup> *Id.*

<sup>568</sup> Jonathan Ringel, *As Legal Business Moves Faster, Lawyers Aim to Manage Client Expectations*, LAW.COM (Sept. 17, 2019, 5:00 AM), <https://www.law.com/2019/09/17/as-legal-business-moves-faster-lawyers-aim-to-manage-client-expectations/> [https://perma.cc/5Z4X-CFBL].

<sup>569</sup> ISAACSON, *supra* note 41, at 280; MLODINOW, *supra* note 31, at 126–27 (describing the constructive powers of daydreaming to creativity and problem solving); SCHWAB, *supra* note 4,

reflection and daydreams, we lawyers—like Leonardo—may uncover unusual relationships, find previously unknown connections, and discover different structures that may ignite original ideas for resolving client legal issues and designing innovative products or services.<sup>570</sup>

Should lawyers need permission or scientific justification to daydream, modern neuroscience research shows that daydreaming—also known as “constructive internal reflection”—promotes “learning, problem solving, and goal setting.”<sup>571</sup> Other studies find that “mental breaks increase productivity, replenish attention, solidify memories, and encourage creativity.”<sup>572</sup> As we know, finding time to unplug and recharge ranks highly among our personal challenges since achieving a work-life balance often proves elusive for knowledge professionals.<sup>573</sup>

Besides being always available, career uncertainty, substantial student loan debt, and loneliness further compound personal stress.<sup>574</sup> Simply put, to produce our best ideas and legal work, we need to be mindful of our wellbeing and carve out time for rest, reflection, and personal relationships.<sup>575</sup>

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at 101 (stating that humans need time away from technology to rest, reflect, and connect with family and friends).

<sup>570</sup> HADFIELD, *supra* note 24, at 149.

<sup>571</sup> David Brendel, *The Heretic's Guide to Getting More Done*, HARV. BUS. REV. (Mar. 24, 2014), <https://hbr.org/2014/03/the-heretics-guide-to-getting-more-done> [<https://perma.cc/B3JB-LQHE>] (citing Mary Helen Immordino-Yang et al., *Rest Is Not Idleness: Implications of the Brain's Default Mode for Human Development and Education*, 7 PERSP. PSYCHOL. SCI. 352, 352–64 (2012)).

<sup>572</sup> *Id.* (citing studies reported in Ferris Jabr, *Why Your Brain Needs More Downtime*, SCI. AM. (Oct. 15, 2013), <https://www.scientificamerican.com/article/mental-downtime/> [<https://perma.cc/V543-53ZS>]).

<sup>573</sup> Janna Koretz, *What Happens When Your Career Becomes Your Whole Identity*, HARV. BUS. REV. (Dec. 26, 2019), <https://hbr.org/2019/12/what-happens-when-your-career-becomes-your-whole-identity> [<https://perma.cc/3KCY-DMWZ>] (describing the dangers of work-life imbalance and strategies for achieving work-life balance in the legal profession).

<sup>574</sup> See, e.g., ADAM LOONEY & CONSTANTINE YANNELIS, BORROWERS WITH LARGE BALANCES: RISING STUDENT DEBT AND FALLING REPAYMENT RATES (2018), [https://www.brookings.edu/wp-content/uploads/2018/02/es\\_20180216\\_looneylargebalances.pdf](https://www.brookings.edu/wp-content/uploads/2018/02/es_20180216_looneylargebalances.pdf) [<https://perma.cc/XPU6-QAXD>] (discussing student loan debt); Staci Zaretsky, *Will You Ever be Able to Pay Off Your Law School Debt?*, ABOVE L. (Sept. 26, 2017, 12:08 PM), <https://abovethelaw.com/2017/09/will-you-ever-be-able-to-pay-off-your-law-school-debt/> [<https://perma.cc/S8C4-XN7R>] (“[T]he average law school graduate borrowed \$112,776 to finance their degree.”); Robert Farrington, *Law School and Student Loan Debt: Be Careful*, FORBES (Dec. 18, 2014, 8:46 AM), <https://www.forbes.com/sites/robertfarrington/2014/12/18/law-school-and-student-loan-debt-be-careful/#2eac244811f9> [<https://perma.cc/58UV-SUYW>] (discussing law school student loan debt and difficulty in paying off debt). See Shawn Achor et al., *America's Loneliest Workers, According to Research*, HARV. BUS. REV. (Mar. 19, 2018), <https://hbr.org/2018/03/americas-loneliest-workers-according-to-research> [<https://perma.cc/FK2F-79A2>] (finding that “legal practice was the loneliest kind of work”).

<sup>575</sup> MLODINOW, *supra* note 31, at 125; LESLIE, *supra* note 35, at 176 (“Curiosity is likely lead to better work, but only if it's allowed time to breathe.”); Patrick Krill, *There's (Not) an App for That: Solving the Legal Profession's Mental Health Problem*, LAW.COM (Oct. 31, 2019, 11:04

Finding relief for these personal challenges will not be easy; it requires developing emotional support systems, identifying clear career goals and objectives that provide possibilities for creative and meaningful work, and moving forward with conviction and determination to achieve these goals.<sup>576</sup> To construct a sustainable career and achieve work-life balance, we should also embrace knowledge entrepreneurship. By doing so, we can imagine, design, and build digital and real-life systems and solutions that serve clients and support our wellbeing.<sup>577</sup> Leonardo again serves as our guide.

#### D. Knowledge Entrepreneurship Essentials

The practice of law is “a human capital business.”<sup>578</sup> Like Leonardo, we sell our cognitive services to clients—or to Popes and Dukes in Leonardo’s case.<sup>579</sup> In her book, *Rules For A Flat World*, University of Toronto Professor Gillian K. Hadfield challenges lawyers to “think[] about law as something that is produced in response to economic demand.”<sup>580</sup> For some, her idea of law as a “response to economic demand” may be shocking and distasteful since we may view our roles as protecting the constitution, holding wrong-doers

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AM), <https://www.law.com/therecorder/2019/10/31/theres-not-an-app-for-that-solving-the-legal-professions-mental-health-problem/> [https://perma.cc/7688-5EKK] (“Lawyers do not need additional incentive to spend increasing time with their phones . . . they do need is more time and encouragement to connect with other human beings whether they are co-workers, colleagues, family, friends, or therapists.”).

<sup>576</sup> GROVE, *supra* note 17, at 189, 194–96 (discussing the importance of determining goals, cultivating professional connections, and finding role models and mentors); WHELAN, JR. *supra* note 272, at 45 (“Lawyers can avoid stagnation by doing more creative work.”).

<sup>577</sup> See, e.g., Martin Zwillig, *The E-Myth Principle is Still Alive and Flourishing*, FORBES (Apr. 24, 2013, 6:28 PM), <https://www.forbes.com/sites/martinzwillig/2013/04/25/the-e-myth-principle-is-still-alive-and-flourishing> [https://perma.cc/587A-4QDD]; MICHAEL E. GERBER, *THE E-MYTH REVISITED: WHY MOST SMALL BUSINESSES DON’T WORK AND WHAT TO DO ABOUT IT* (1996); see also Carolyn Elefant, *Why Startups Fail Is Also Why Solo and Small Law Firms Fail*, ABOVE L. (Apr. 10, 2018, 1:50 PM), <https://abovethelaw.com/2018/04/why-startups-fail-is-also-why-solo-and-small-law-firms-fail/> [https://perma.cc/96QR-ZTXV]; *Why Do Law Firms Fail? The Lawyer E-Myth*, LAWSOME (Nov. 27, 2018), <https://www.thelawsomepodcast.com/podcast/ep-47-why-do-law-firms-fail-the-lawyer-e-myth/> [https://perma.cc/82VC-38PL].

<sup>578</sup> Westfahl & Wilkins, *supra* note 39, at 1670. They argue to succeed in the future, lawyers “will need to be technically capable; professionally nimble; and able to use broad interdisciplinary networks to solve problems.” *Id.* at 1702.

<sup>579</sup> As an artist and entrepreneur during a time of rapid change and uncertainty, Leonardo understood the market value of his knowledge, ideas, and talents since he earned his living in “service to potentates.” Leonardo, for example, produced designs for armed military assault vehicles for the Duke of Milan, Ludovico Sforza, designed a self-supporting bridge and a detailed military map of the town of Imola for Cesare Borgia, and painted iconic portraits of the Duke of Milan’s mistresses. *Leonardo Da Vinci, Last Years (1513-19)*, ENCYCLOPAEDIA BRITANNICA, <https://www.britannica.com/biography/Leonardo-da-Vinci/Last-years-1513-19> [https://perma.cc/88FJ-RTGF] (describing his residence in the Vatican under Pope Leo X); ISAACSON, *supra* note 41, at 101, 239–45, 280, 341–44 (featuring paintings *Lady with an Ermine* and *La belle feronnière*).

<sup>580</sup> HADFIELD, *supra* note 24, at 91.



accountable, and defending the vulnerable<sup>581</sup>—which for some lawyers represent apt career descriptions. For many lawyers, however, the practice of law involves the prosaic tasks of tax planning, drafting and enforcing contracts, and resolving legal issues—often emotionally driven—between bickering spouses, family members, and business partners. Because humans are complicated and regularly make dubious decisions, there will always be economic demand for curious, creative, and emotionally intelligent problem-solving lawyers.<sup>582</sup>

Now, as we conclude our Leonardo study, we see how the combination of curiosity, cognitive range and flexibility, creativity, and collaboration fueled and sustained Leonardo's genius. Through deliberate choice and consistent action, we too can become more curious, expand our cognitive range, and build our creative muscles. We can become Vitruvian Lawyers.

An essential part of this transformation involves the embrace of a self-employment mindset.<sup>583</sup> Instead of thinking of ourselves as employees, we must think of ourselves as knowledge entrepreneurs who hustle to spot and fill unmet market opportunities<sup>584</sup> in a digital (eventually quantum) economy.

#### **i. Transformation of Knowledge Work: Employee to Entrepreneur**

For knowledge workers, the concept of a safe, stable, and predictable career increasingly appears to be a cruel antiquated fallacy, as human-machine teaming becomes standard.<sup>585</sup> In big law firms, entering associates may find themselves with “significantly less job security” and narrower opportunities for promotion and partnership.<sup>586</sup> In 1959, Peter Drucker first coined the label “knowledge workers” in his book, *Landmarks of Tomorrow*.<sup>587</sup> Knowledge workers who thrived in this twentieth-century economy demonstrated “deep expertise in a narrow set of skills.”<sup>588</sup> In the decades ahead, Drucker's

<sup>581</sup> *Id.*

<sup>582</sup> See generally Reid Hoffman et al., *Tours of Duty: The New Employer-Employee Compact*, HARV. BUS. REV., June 2013, at 49 (distinguishing between “lifetime employment” and “lifetime employability”). This ability to identify, create, and deliver value promotes “employability” and helps to build “lifelong affiliation[s]” and “opportunity-creating networks.” *Id.*; Westfahl & Wilkins, *supra* note 39, at 1689; CHIDEYA, *supra* note 13, at 168 (describing how to find opportunities).

<sup>583</sup> CHIDEYA, *supra* note 13, at 48–49 (describing “psychological self-employment”). Professor Chideya emphasizes the importance of identifying and acquiring valuable skills, anticipating changes to your field, and proactively adapting. *Id.* See also Runyon, *supra* note 389 (discussing the related entrepreneurial mindset).

<sup>584</sup> Heidi Grant, *How to Get Better at Spotting Opportunities*, HARV. BUS. REV. (May 23, 2013), <https://hbr.org/2013/05/how-to-get-better-at-spotting> [<https://perma.cc/FZX2-N8B7>] (“To be a successful entrepreneur—or really, a successful anything—you need to be able to recognize an opportunity when you see one. Specifically, you need to be able to identify a problem or gap, and come up with an innovative solution.”).

<sup>585</sup> Escajeda, *Zero Economic Value Humans?*, *supra* note 12, at 151.

<sup>586</sup> Westfahl & Wilkins, *supra* note 39, at 1686.

<sup>587</sup> SCHMIDT & ROSENBERG, *supra* note 31, at 17.

<sup>588</sup> *Id.*

“knowledge worker” may be deemed economically redundant as AI continues to outperform humans in routine tasks involving narrow expertise.<sup>589</sup>

Now contrast Drucker’s 1959 concept of a “knowledge worker” with how Eric Schmidt, former CEO and Chair of Google, now Alphabet, Inc., describes modern “smart creatives.”<sup>590</sup> Schmidt explains that these multi-dimensional workers: perform a broad range of tasks and jobs, have access to information and computing power, vocalize dissent and explore divergent ideas, take risks, and bounce back when their initiatives fail.<sup>591</sup>

Forty years later, Peter Drucker updated his ideas about knowledge workers by articulating a durable and salient truth: “[k]nowledge workers outlive organizations, and they are mobile. The need to manage oneself is, therefore, creating a revolution in human affairs.”<sup>592</sup> A related and pertinent insight from attorney Whelan, therefore, deserves serious reflection; Whelan writes, “your career is yours to manage. An employer cannot guarantee your value in the labor market.”<sup>593</sup> He also reminds us that “evaluating problems and imagining solutions” is our lawyer superpower.<sup>594</sup> So, as we reflect upon our career trajectories, we should ask: What does it mean to be a knowledge entrepreneur? And what steps should we take to maximize our career opportunities? Answering these questions involves realigning our portfolio of cognitive services and building new capacities.

#### **a. Cognitive Service Portfolio Realignment**

An entrepreneur is “someone who moves resources from areas of lower productivity and yield to areas of higher productivity and yield.”<sup>595</sup> By strategically building and selling our cognitive services, lawyers = knowledge entrepreneurs. As entrepreneurs, we, therefore, need to shift our time, energy, resources from areas of lower to higher productivity. This realignment involves embracing emerging technologies, reimagining our portfolio of cognitive services that we sell, managing our financial resources, and exploring new business models.<sup>596</sup>

As discussed throughout this Article, technology will reinvent the legal

<sup>589</sup> Escajeda, *Zero Economic Value Humans?*, *supra* note 12, at 135–47, 153–55 (describing how smart machines excel in routine and predictable situations, but also noting how these technologies flounder in non-routine and unpredictable situations that require broad and flexible intelligence).

<sup>590</sup> SCHMIDT & ROSENBERG, *supra* note 31, at 17.

<sup>591</sup> *Id.*

<sup>592</sup> Peter F. Drucker, *Managing Oneself*, HARV. BUS. REV., Jan. 2005, at 100, 108.

<sup>593</sup> WHELAN, JR. *supra* note 272, at 79.

<sup>594</sup> *Id.* at 229.

<sup>595</sup> GROVE, *supra* note 17, at 111.

<sup>596</sup> See, e.g., Cohen, *Getting Beyond The Tech*, *supra* note 46; Cohen, *New Business Models—Not Tech*, *supra* note 544; Mark A. Cohen, *Law is Lagging Digital Transformation—Why it Matters*, FORBES (Dec. 20, 2018, 5:40 AM), <https://www.forbes.com/sites/markcohen1/2018/12/20/law-is-lagging-digital-transformation-why-it-matters/#5bac8699515c> [https://perma.cc/XB5D-CDYT] [hereinafter Cohen, *Law is Lagging Digital Transformation*] (“Digital transformation is a holistic business paradigm shift that impacts a company’s people, activity, process, and culture.”).

industry—making lawyer-machine teaming standard. While such teaming may eliminate some low level, routine legal functions, and upend the traditional career training path for new lawyers, human-machine teaming could, on-balance, produce multiple positive “synergistic results.”<sup>597</sup> Some examples: (1) the quality of legal work can improve when human lawyers incorporate machine predictions into their analysis and advice, (2) machines will “produce better results” when lawyers reinforce or reject its predictions,<sup>598</sup> (3) we can offload tedious routine functions to machines, thereby reducing work drudgery and personal stress, and (4) human-machine efficiencies will liberate our schedules so that we can spend more time with family and friends, feed our curiosity, pursue our creative projects, and make space for serendipity.<sup>599</sup>

To capitalize on such positive synergies, we should not only embrace human-machine teaming, but we should also develop and expand our unique knowledge and skills portfolios. As knowledge entrepreneurs, we view our portfolio of market-valued skills as personal investments to be created, nurtured, expanded, and calibrated based on the needs of the legal marketplace and our professional ecosystem.<sup>600</sup> For example, transactional attorneys practicing tax law sell different knowledge and problem-solving skills than those sold by trial and appellate litigators. As buyers of legal services, clients purchase the intangibles of our analytic and strategic counsel, and subject matter expertise, along with tangible work products, such as estate plans, contracts, opinions, and court filings.<sup>601</sup> Being realists, we also understand that clients typically hire us (often as a last resort) to achieve an emotional, financial, or business gain.<sup>602</sup>

As CEO/CFO/CTO of our solo economic enterprise<sup>603</sup> seeking a place in the “future of law” we need to: develop market-valued expertise and collaborate with others;<sup>604</sup> understand the importance of being efficient, client-focused, and keeping the overhead low;<sup>605</sup> embrace the market opportunities in

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<sup>597</sup> Askin et al., *supra* note 187.

<sup>598</sup> *Id.*

<sup>599</sup> AUSTIN, *supra* note 44, at 63–69; COLVIN, *supra* note 30, at 168; LESLIE, *supra* note 35, at 76; ZUCKERMAN, *supra* note 39, at 216–17.

<sup>600</sup> ALBOHER, *supra* note 29, at 86 (referencing author and advertising-branding expert Sally Hogshead); *see generally* SALLY HOGSHEAD, RADICAL CAREERING: 100 TRUTHS TO JUMPSTART YOUR JOB, CAREER, AND YOUR LIFE 23 (2005) (emphasizing “you always have the power to reinvent your career. But with that power comes a significant responsibility: being accountable for your own success”). Similarly, when tuning and planning our unique combination of career competencies and goals, the Delta Competency Model discussed in Part IV.D. merits consideration. *See also* Carrel, *What is the Delta Model?*, *supra* note 387.

<sup>601</sup> WHELAN, JR., *supra* note 272, at 87.

<sup>602</sup> *Id.*

<sup>603</sup> GROVE, *supra* note 17, at 188.

<sup>604</sup> WHELAN, JR., *supra* note 272, at 261 (“Specialize, then collaborate. That’s how you’ll find your place in the future of law.”).

<sup>605</sup> ALBOHER, *supra* note 29, at 147–49.

being “virtual, portable, and flexible” knowledge free agents;<sup>606</sup> build our reputations and professional networks by performing well on project-based work;<sup>607</sup> and be part of the ongoing transformation in the delivery of legal services and modernization of our legal infrastructure. In particular, we should: (1) monitor emerging nimble legal enterprises;<sup>608</sup> and (2) be open-minded when it comes to “alternative business structure” proposals that may eventually reshape the delivery of legal services and improve access to justice across the United States.<sup>609</sup> According to MIT Professor Alex “Sandy” Pentland, “the legal profession has an opportunity to transition from being a cost center and source of friction to a center for new business and opportunity creation.”<sup>610</sup>

Starkly put, our two career paths include: (1) embrace change, innovate, and seize new opportunities, or (2) resist change, stagnate, and be left behind. The career of corporate lawyer Whitney Hudak offers an example of a nimble legal innovator selecting the first path.<sup>611</sup> Attorney Hudak joined Lyft in 2013 as associate counsel because she felt that Lyft helped people in meaningful ways by providing transportation solutions for customers and work opportunities for drivers.<sup>612</sup> Attorney Hudak explains, “Lyft was founded on a vision of filling empty seats on the road and bringing people together along the way. We’re combining technology and humanity to provide a transformational transportation experience. I’m really focused on helping to take Lyft to the next level.”<sup>613</sup> While every lawyer may not want to join a startup, we should

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<sup>606</sup> *Id.* at 70; WHELAN, JR., *supra* note 272, at 79 (“We are all solos, free agents whose labor relationships aren’t entirely secure.”); *see generally* DANIEL H. PINK, *FREE AGENT NATION: THE FUTURE OF WORKING FOR YOURSELF* (2001).

<sup>607</sup> WHELAN, JR., *supra* note 272, at 79 (“[T]he nature of work is shifting from firm-based to project based. Both inside and outside companies, workers increase their value one project at a time.”); Westfahl & Wilkins, *supra* note 39, at 1703, 1713–15 (discussing the importance of professional networks).

<sup>608</sup> *See, e.g.,* Cohen, *Lawyers with IQ/EQ*, *supra* note 30; Cohen, *Upskilling*, *supra* note 33; Cohen, *Getting Beyond The Tech*, *supra* note 46; Cohen, *Golden Age of the Legal Entrepreneur*, Cohen, *New Business Models—Not Tech*, *supra* note 544; Cohen, *Law is Lagging Digital Transformation*, *supra* note 597.

<sup>609</sup> Matt Reynolds, *To Increase Access to Justice, Regulatory Innovation Should be Considered*, ABA House Says, A.B.A. J. (Feb. 17, 2020, 5:40 PM), <http://www.abajournal.com/news/article/resolution-115> [https://perma.cc/ANY5-SE2X] (describing how Resolution 115 encourages “U.S. jurisdictions to consider regulatory innovations that expand legal services”); Dan Packel, *ABA Could Encourage States to Allow Outside Ownership of Law Firms*, LAW.COM (Dec. 3, 2019, 6:25 PM), <https://www.law.com/americanlawyer/2019/12/03/aba-could-encourage-states-to-allow-outside-ownership-of-law-firms/> [https://perma.cc/WF6W-BLZA].

<sup>610</sup> Pentland, *supra* note 168.

<sup>611</sup> Davies, *supra* note 557, at 31.

<sup>612</sup> *Id.* at 32.

<sup>613</sup> *Id.* at 34; Soo Youn, *Lyft Corporate Counsel: ‘We’re Partners’*, BLOOMBERG L. (June 26, 2018, 11:18 PM), <https://biglawbusiness.com/lyft-corporate-counsel-were-partners> [https://perma.cc/WA86-K8L7] (describing the importance of corporate counsel understanding all aspects of the business so that they can serve as business partners, capable of identifying risks and designing creative strategies for risk mitigation).

pay attention and seize opportunities in new businesses or practice areas to ensure that our skills, knowledge, and business perspectives can agilely adapt to industry disruptions. As for those selecting the second path, we can imagine that outcome since it is what we fear.

Next, we consider some steps for maximizing our career opportunities. To realign our cognitive services portfolio, we need to build new competencies and capacities, and expand (or even eliminate) services based on individual goals and market considerations.

**b. Building New Competencies and Capacities**

Because our goals will differ, the Delta Competency Models can be helpful tools for evaluating personal and career objectives and planning for “professional advancement.”<sup>614</sup> For example, new lawyers can use the Delta Model to assess their current competencies, plan for the future, and prepare for advanced roles.<sup>615</sup> For those of us facing career inflection points, the dynamic Delta Models can assist us with developing clarity on where we want to go next—and plan and act accordingly.<sup>616</sup>

Once we have a plan, the real work begins—shaping new competencies and capacities. As Intel’s Andrew Grove warned, these two remaining steps require conviction, determination, and resolute forward movement.<sup>617</sup> Specifically, building new competencies and capacities require (1) committing to lifelong learning and upskilling, (2) embracing a self-employment mindset, and (3) being gritty, resilient, and agile. In an era of digital disruption and economic restructuring, we must adapt our career pathways based on the possibilities presented—not as they were in the past.

First, as knowledge entrepreneurs, we must be curious, perpetual learning machines committed to lifelong learning and upskilling to expand our cognitive range.<sup>618</sup> We must also accept the reality that the knowledge and work skills we developed in our 20s may be irrelevant by age 35 or 40.<sup>619</sup> University of Denver Graduate Tax Professor Tony Nitti, CPA, recently wrote in *Forbes* how many of the professionals he encounters feel that “as their

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<sup>614</sup> MOON, DELTA MODEL LAWYER, *supra* note 23; *see also* Part IV.D.

<sup>615</sup> *Id.*

<sup>616</sup> GROVE, *supra* note 17 (positing step 1: clarity on where you are heading).

<sup>617</sup> *Id.* (explaining step 2: conviction and determination to meet your goals; step 3: resolute forward movement to seize the next opportunity).

<sup>618</sup> CHIDEYA, *supra* note 13, at 213; Cohen, *Upskilling*, *supra* note 33; HARTLEY, *supra* note 184, at 80 (quoting Matthew Brimmer, founder of General Assembly) (stating, in this time of rapid technology evolutions, “your education should always be in beta,” the engineering term for “a work in progress” product”).

<sup>619</sup> DAVENPORT, *supra* note 4, at 145. Professor Davenport quotes Bob Kegan, Harvard professor of adult learning, on the need for lifelong learning: “[t]he time it takes for people’s skills to become irrelevant will shrink. It used to be ‘I got my skills in my 20s; I can hang on until 60.’ It’s not going to be like that anymore. We’re going to live in an era of people finding their skills irrelevant at 45, 40, 35.” *Id.*

career progresses, their substance is not keeping pace with their title. And that (rightfully) scares the hell out of them.”<sup>620</sup> According to Professor Nitti, achieving and staying at the top of your career game as a subject matter expert requires work; this process requires going back to school and spending nights and weekends on your studies.<sup>621</sup> Echoing what Leonardo knew five hundred years ago—and a core message of this Article—Professor Nitti then reminds us that “knowledge builds on itself.”<sup>622</sup>

Second, having embraced a self-employment, knowledge entrepreneur mindset, we will continuously scan for emerging opportunities; develop, expand, and maintain market-valued knowledge and skills; embrace mobility;<sup>623</sup> and sign on for temporary “tours of duty”<sup>624</sup> to bolster our competencies, capacities, and reputation. Being lifelong learners, we will take responsibility for our professional development. Ideally, an employer will pay for training to expand our legal expertise and learn new skills for partnering with synthetic intelligences.<sup>625</sup> If not, we should self-fund because these human capital investments in knowledge and skills upgrade our cognitive range and enhance our market value.<sup>626</sup> By investing in ourselves, we create “portable

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<sup>620</sup> Tony Nitti, *The Five New Year's Resolutions Every Tax Pro Should Make*, FORBES (Jan. 1, 2020, 8:12 AM), <https://www.forbes.com/sites/anthonymitti/2020/01/01/the-five-new-years-resolutions-every-tax-pro-should-make/#32686b5019a1> [<https://perma.cc/S2J8-D29Q>].

<sup>621</sup> *Id.*

<sup>622</sup> *Id.*; Westfahl & Wilkins, *supra* note 39, at 1705, 1716–18, 1725–27 (discussing the need for collaborations between practitioners, businesses, and law schools to create lifelong learning opportunities for knowledge professionals).

<sup>623</sup> CHIDEYA, *supra* note 13, at 48 (quoting Austan Goolsbee, formerly the chair of the Council of Economic Advisers under President Obama and currently a professor at the University of Chicago) (“In the future, where there’s going to be a lot of mobility, the willingness of people to want to invest in things [like skills training] that only work at one employer is going to go down.”) Goolsbee then adds, “But at the same time, the willingness of employers to invest in job training when they’re offering even general skills that you can pack up and take somewhere else is also going to go down.” *Id.*

<sup>624</sup> Hoffman et al., *supra* note 583 (explaining that tours of duty may last between two and four years). They assert that the “tour-of-duty approach can boost both recruiting and retention.” *Id.* They write, “The key is that it gives employer and employee a clear basis for working together. Both sides agree in advance on the purpose of the relationship, the expected benefits for each, and a planned end.” *Id.*

<sup>625</sup> Bernard Marr, *The Top 10 Artificial Intelligence Trends Everyone Should Be Watching in 2020*, FORBES (Jan. 6, 2020, 12:18 AM), <https://www.forbes.com/sites/bernardmarr/2020/01/06/the-top-10-artificial-intelligence-trends-everyone-should-be-watching-in-2020/#7d60088d390b> [<https://perma.cc/XZC3-K2X2>] (predicting that “2025, 75% of organizations will be investing in employee retraining in order to fill skill gaps caused by the need to adopt AI”); *see generally* Bryan Hancock et al., *Getting Practical About the Future of Work*, MCKINSEY Q., Jan. 2020, at 1, <https://www.mckinsey.com/business-functions/organization/our-insights/getting-practical-about-the-future-of-work> [<https://perma.cc/DCQ2-QCUT>] (describing the importance of adapting and updating skills in a fast-moving digital economy).

<sup>626</sup> *See, e.g.*, Lilly Kahng, *Who Owns Human Capital?*, 94 WASH. U. L. REV. 607 (2017); Orly Mazur, *Taxing the Robots*, 46 PEPP. L. REV. 277, 282 (2019) (advocating for updated public

equity,” which enables us to have more control over our lives and careers.<sup>627</sup>

Third, as knowledge entrepreneurs and chief executive officers of our individual economic enterprise, we must be gritty, resilient, and agile. In her book, *Grit: The Power of Passion and Perseverance*, University of Pennsylvania Professor of Psychology Dr. Angela Duckworth asserts that the “combination of passion and perseverance” equals grit.<sup>628</sup> Individuals with grit have a “ferocious determination” to achieve their goals.<sup>629</sup> Dr. Duckworth writes, “Grit is about holding the same top-level goal for a very long time.”<sup>630</sup> As evidenced by three years of law school and the bar exam, lawyers have grit.<sup>631</sup> The task at hand involves putting such grit into continuous career-building action.

Long-term career growth requires resilience. Resilience means the ability to handle stress without breaking, adjust to change, or recover from misfortune.<sup>632</sup> Despite their hardships, resilient people maintain their self-worth and optimistic outlook.<sup>633</sup> They possess an inner strength that enables them to bounce back when surprises (good or bad) occur and from “fumbles or outright mistakes.”<sup>634</sup> Harvard Business School Professor Rosabeth Moss Kanter explains that following such setbacks, resilience gradually appears in actions such as achieving a goal or making a contribution which reduces the

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policies that “provide a substantial investment in human capital”); *see generally* GARY S. BECKER, HUMAN CAPITAL: A THEORETICAL AND EMPIRICAL ANALYSIS, WITH SPECIAL REFERENCE TO EDUCATION (1964).

<sup>627</sup> HOGSHEAD, *supra* note 601 (“Radical Truth #44: Portable Equity is the Only Form of Job Security Today[.]”).

<sup>628</sup> ANGELA DUCKWORTH, GRIT: THE POWER OF PASSION AND PERSEVERANCE 8 (2016). Dr. Duckworth’s research shows that people with grit exhibit four “psychological assets”: (1) intense interest, (2) consistent practice (discipline), (3) purpose and the conviction that the endeavor matters, and (4) hope and resilience. *Id.* at 91–92.

<sup>629</sup> *Id.* (“[N]o matter the domain, the highly successful had a kind of ferocious determination that played out in two ways. First, these exemplars were unusually resilient and hardworking. Second, they knew in a very, very deep way what it was they wanted. They not only had determination, they had *direction*.”).

<sup>630</sup> *Id.* at 64. Seattle Seahawk’s coach, Pete Carroll, describes “grit” as a “life philosophy” that directs and organizes all of one’s everyday activities. *Id.*

<sup>631</sup> *Id.* at 11. Dr. Duckworth writes, “Adults who’d earned a MBA, PhD, MD, JD, or another graduate degree were grittier than those who’d only graduated from four-year colleges, who were in turn grittier than those who’d accumulated some college credits but no degree.” *Id.*

<sup>632</sup> *Resilience*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/resilience> [https://perma.cc/R2J9-8HTA].

<sup>633</sup> CHIDEYA, *supra* note 13, at 160. Professor Chideya writes, “in the world of jobs and our psyches, resiliency often means evolving into a *new* form. We don’t just return to who or what we were. We often find strength in new jobs and careers, tapping into what we have done, finding new focus, and sometimes returning to aspects of ourselves long dormant.” *Id.*

<sup>634</sup> Rosabeth Moss Kanter, *Surprises Are the New Normal; Resilience Is the New Skill*, HARV. BUS. REV. (Jul. 17, 2013), <https://hbr.org/2013/07/surprises-are-the-new-normal-r> [https://perma.cc/GV5U-BJYC].

sting of the past and generates excitement about what comes ahead.<sup>635</sup> In this time of digital disruption and economic reshuffling, standing still is not an option. We must remain resilient so that we avoid getting stuck, move forward, and keep pace with smart machines.

Last, we must be agile like Leonardo. Because modern work involves bumpy and non-linear progressions, the most successful knowledge entrepreneurs “are the ones who realize the rules are in constant flux and that you set them yourself.”<sup>636</sup> Agility enables us to identify and respond to shifting situations and circumstances, see and seize new market opportunities, and create and deliver value to clients.<sup>637</sup> Recall now the agility and strength of Leonardo’s *Vitruvian Man*; we see the perfectly proportioned male figure in constant motion—with arms stretching to reach both the circle and square, feet nimbly balancing on shifting surfaces.

Vitruvian Lawyers meld their grit, resilience, and agility with curiosity, cognitive range, creativity, and lifelong learning to be knowledge entrepreneurs—or even “slash” career artists.

## ii. The Vitruvian Lawyer: Modern “Slash” Career Artists

As we have witnessed, Leonardo’s work blended his passion for art, engineering, science, and invention with his perpetual curiosity, breadth of knowledge, and unbounded imagination.

Leonardo successfully pursued multiple vocations or “slash” careers—as an artist/engineer/scientist/inventor.<sup>638</sup> Leonardo’s flexible approach to his career offers a potentially constructive model for knowledge work in the twenty-first century. Lawyers may find it useful to study and possibly emulate Leonardo’s episodic<sup>639</sup> and slash career<sup>640</sup> when they design their work lives in an age of machines with narrow and brittle intelligence.<sup>641</sup> So, instead of simply being “lawyers,” perhaps we should rethink how we identify ourselves so that we explicitly honor and recognize the value of our whole beings—especially our quirky curiosities, cognitive range, and natural creativity.

As Vitruvian Lawyers, we understand that since synthetic intelligences cannot think abstractly, analogize, hypothesize, idealize, reason, or imaginatively solve problems, these cognitive functions presently remain in the

<sup>635</sup> *Id.*; CHIDEYA, *supra* note 13, at 172, 174 (being resilient fuels continuous forward motion and self-evolution, even during times when progress stalls or obstacles appear).

<sup>636</sup> CHIDEYA, *supra* note 13, at 166.

<sup>637</sup> Hoffman et al., *supra* note 582 (stating that, in a dynamic, digital, and global economy, “[a]daptability and entrepreneurship became key to achieving sustaining success”); see CHIDEYA, *supra* note 13, at 179 (“Achieving satisfaction in a time of disruption and episodic careers is about seeking opportunity and *seeing* opportunity. You can make new choices and create new paths for yourself, but only if you can perceive them first.”).

<sup>638</sup> ALBOHER, *supra* note 29, at xiv.

<sup>639</sup> CHIDEYA, *supra* note 13, at 23, 46.

<sup>640</sup> ALBOHER, *supra* note 29, at xiv.

<sup>641</sup> MITCHELL, *supra* note 11, at 40.



exclusive jurisdiction of the human mind.<sup>642</sup> Accordingly, as savvy knowledge entrepreneurs, we will develop and continuously upgrade our unique portfolios of market-valued cognitive-emotional services that only we humans can sell to clients. Adhering to Andrew Grove's sage advice that "only the paranoid survive,"<sup>643</sup> we will remain mindful that "History—and ordinary human life—is full of opportunities missed by not recognizing that change has occurred, and that the previously unthinkable is now doable."<sup>644</sup> Accordingly, we fully understand that only the nimble and adaptable will thrive. Fortunately, the adaptable wetware<sup>645</sup> in our brains can program (and reprogram) itself by continuously creating "new concepts," altering approaches, adjusting to changing conditions,<sup>646</sup> designing new paradigms to solve problems,<sup>647</sup> and creating new professional opportunities.

Like Leonardo, we can put our curious, cognitively diverse, imaginative minds to work—creating the future.

#### E. Leonardo's "To-Do List" Updated for Quantum Lawyers

Over his lifetime, Leonardo followed a popular practice in Renaissance Italy of "keeping a commonplace and sketchbook, known as a *zibaldone*."<sup>648</sup> Leonardo's notebooks were anything but common because they serve as a "documentary record of [his] applied creativity."<sup>649</sup> Art historian Kenneth Clark describes Leonardo's notebooks as "the most astonishing testament to

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<sup>642</sup> Scott Atran, *What Neuroscience And Machine Models Of The Mind Should Be Looking For, in WHAT TO THINK ABOUT MACHINES THAT THINK* 220, 221 (John Brockman ed., 2015) ("I don't think machines will ever be able to capture (imitate) creative human thought processes, include novel hypothesis formation in science or even ordinary language production."). He explains, Newton's laws of motion and Einstein's insights into relativity meant imagining ideal worlds without precedent in any past or plausible future experience, such as moving in a world without friction or chasing a beam of light through a vacuum. Such thoughts require levels of abstraction and idealization that disregard, rather than assimilate, as much information as possible to begin with. *Id.*

<sup>643</sup> GROVE, *supra* note 17.

<sup>644</sup> MLODINOW, *supra* note 31, at 130–31.

<sup>645</sup> *Wetware*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/wetware> [<https://perma.cc/5HBS-68GN>] (defining "wetware" as "the human brain or a human being considered especially with respect to human logical and computational capabilities"); POLSON & SCOTT, *supra* note 336, at 236 (observing that "human wetware" algorithms cannot be scrutinized like AI prediction rules).

<sup>646</sup> FUENTES, *supra* note 37, at 20 (noting that "[l]iving organisms change and adapt, or they fail to and suffer the consequences"); COLEMAN, *supra* note 6, at 220 ("We know today that our brains are neuroplastic and that we can rewire ourselves and our thinking.").

<sup>647</sup> MLODINOW, *supra* note 31, at 84, 92 (referencing Thomas Kuhn's "paradigm shift" concept articulated in his book, *The Structure of Scientific Revolutions*).

<sup>648</sup> ISAACSON, *supra* note 41, at 106.

<sup>649</sup> *Id.* Isaacson estimates that the 7,200 pages currently in existence represents about twenty-five percent of Leonardo's sketches and writings. *Id.*

the powers of human observation and imagination ever set down on paper.”<sup>650</sup>

At first glance, the notebooks seem to be filled with random juxtapositions, but upon further study, one sees the “meanderings” of Leonardo’s “universal mind” as he shifts back and forth between the arts and sciences to discover “patterns that underlie things that at first appear disconnected.”<sup>651</sup>

In addition to seeking how to perform practical tasks, such as walking on ice and repairing canals and locks in “the Lombard manner,”<sup>652</sup> Leonardo’s ambitious “to-do” list included notes to “draw Milan,” and multiple entries to describe “the tongue of a woodpecker.”<sup>653</sup>

Throughout his *Leonardo da Vinci* biography, Professor Isaacson emphasizes how history’s most creative minds often “drill down into random curiosities.”<sup>654</sup> Isaacson concludes his study of Leonardo by identifying some ways in which modern humans can be more like Leonardo; here is a summary “to-do” list synthesized from the diverse minds cited in this Article:

- Be relentlessly and randomly curious.
- Seek broad knowledge.
- Keep an ongoing to-do list.
- Look for unexpected connections.
- Recover one’s “childlike” wonder.
- See and observe.
- Pay attention to details—they matter.
- Discover the unseen hidden in shadows.
- Explore the adjacent possible.
- Geek out and pursue rabbit holes.
- Embrace distraction by fixating on shiny objects.
- Devise theories and then test them through experimentation.
- Procrastinate to give ideas time to marinate and simmer.

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<sup>650</sup> *Id.* (quoting Clark).

<sup>651</sup> *Id.* at 108; AUSTIN, *supra* note 44, at 1–57 (referencing Part I “The Meandering Chase”).

<sup>652</sup> ISAACSON, *supra* note 41, at 173 (referencing Notebooks/J.P. Richter, 1488, 1501, 1452, 1496, and 1448).

<sup>653</sup> *Id.* at 5, 178, 398. In his Coda, Isaacson describes the “tongue of the woodpecker” as (1) extending “more than three times the length of its bill,” (2) retracting when not in use “into the skull and its cartilage-like structure continues past the jaw to wrap around the bird’s head and then curve down to its nostril.” *Id.* at 525. Isaacson adds that the woodpecker’s long tongue not only serves as the means to dig tree grubs, it also functions as a brain cushion when pecking trees. *Id.*

<sup>654</sup> *Id.* at 398; *see generally* WALTER ISAACSON, BENJAMIN FRANKLIN: AN AMERICAN LIFE (2003); WALTER ISAACSON, EINSTEIN: HIS LIFE AND UNIVERSE (2008); ISAACSON, STEVE JOBS, *supra* note 147; WALTER ISAACSON, THE INNOVATORS: HOW A GROUP OF HACKERS, GENIUSES, AND GEEKS CREATED THE DIGITAL REVOLUTION (2015).

- Strive for perfection as it may yield exceptional results.
- Sketch ideas.
- Escape thought silos.
- Seek to make the impossible possible.
- Feed fantasy.
- Embrace mystery and ambiguity.
- Create what you want.
- Specialize and then collaborate with smart, creative travelers.<sup>655</sup>
- Find time to unplug and recharge to allow one's elastic and curious mind to rest, connect, and discover.<sup>656</sup>
- Make room for serendipity.<sup>657</sup>
- Explore the secrets and subtleties of shadows.
- Improvise.<sup>658</sup>

Last, the Appendix sketches the preliminary contours of the Vitruvian Lawyer to stimulate debate and foster evolution.<sup>659</sup>

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<sup>655</sup> ISAACSON, *supra* note 41, at 519–24; WHELAN, JR. *supra* note 272, at 261.

<sup>656</sup> MLODINOW, *supra* note 31, at 125; LESLIE, *supra* note 35, at 176 (“Curiosity is likely lead to better work, but only if it’s allowed time to breathe.”); Krill, *supra* note 576 (writing “[l]awyers do not need additional incentive to spend increasing time with their phones . . . they do need is more time to connect with other human beings whether they are co-workers, colleagues, family, friends, or therapists”).

<sup>657</sup> AUSTIN, *supra* note 44, at 63–69; COLVIN, *supra* note 30, at 168; LESLIE, *supra* note 35, at 76; ZUCKERMAN, *supra* note 39, at 216–17.

<sup>658</sup> MOSS KANTER, *supra* note 435, at 96 (“Idea-catching is often improvisational.”).

<sup>659</sup> This idea is adapted and expanded from Escajeda, *Legal Education: A New Growth Vision, Part I*, *supra* note 360, at 1104. This prototype incorporates concepts referenced in this Article. For some interesting related ideas, see generally Westfahl & Wilkins, *supra* note 39, at 1702–27 (posing a “New Model of Professional Development”).

## VI. CONCLUSION

*AI*s are “*TOMs*—‘totally obedient morons.’”<sup>660</sup>

— David Deutsch, Quantum Physics Professor, Oxford University

In this time of digital disruption and legal industry transformation, human curiosity, cognitive range, and creativity represent economic power. To harness and use such power, we must—like Leonardo—marshal our curious, cognitively diverse, creative, and collaborative minds to explore the shadows and margins where innovation often resides. We will move past a standard black-and-white color palette to reflect instead on how theory paired with experimentation can yield vibrant discoveries and opportunities.

As modern knowledge entrepreneurs, we will leverage the unique abilities of organic and synthetic intelligences to generate and deliver client, social, and economic value. Being Vitruvian Lawyers, we will unite our curiosity, cognitive range, emotional intelligence, and imaginations to generate original ideas and novel solutions. Although our legal work products will likely never be on par with the genius of Leonardo’s *Vitruvian Man* or his *Mona Lisa*, resolving client problems in an effective, ethical, and elegant way constitutes an achievement of value and an important public service.

Like Leonardo, Vitruvian Lawyers are adventurous innovators who race toward the future—always seeking more knowledge, collaborating with diverse minds, imagining the impossible, and sketching plans for a world in which humans, AI, robots, and other technologies live together in harmony.

Vitruvian Lawyers = Apex Imaginators.

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<sup>660</sup> Despite these impressive capabilities, Oxford University quantum physics professor David Deutsch describes current AIs as “TOM, the Totally Obedient Moron, an inspired acronym that captures the essence of all computer programs to date: they have no idea what they are doing or why.” David Deutsch, *Beyond Reward and Punishment*, in POSSIBLE MINDS: TWENTY-FIVE WAYS OF LOOKING AT AI 113, 122 (John Brockman ed., 2019). Professor Deutsch then describes the current quest for Artificial General Intelligence (AGI) as seeking “DATA: a Disobedient Autonomous Thinking Application.” *Id.*

## VII. APPENDIX

• **Curiosity** • **Cognitive range (depth and breadth)** • **Creativity** • **Emotional intelligence (soft skills)** (empathy, mindfulness, self-awareness, self-regulation, motivation, collaboration, teamwork, negotiation, conflict resolution, persuasive written and oral communication skills) • **Ethical reflection** (deliberation, reflection, discernment, integrity, fairness, justice, moral, social values) • **Critical and analytical thinking skills** (question, intuit, elastic thinking, analogize, hypothesize, theorize, speculate, exercise judgment, connect abstract concepts, have holistic/big picture outlook, attain global and cultural agility and awareness) • **Growth mindset** (adaptability, grit, resilience, agility) • **Entrepreneurial (startup) mindset** (identify problems, spot trends, imagine possibilities, initiate action, create prototypes, make and seize opportunities, take smart risks) • **Experimental mindset** (practice flexibility and adaptability, improvise, question status quo, explore shadows and edges, bust silos, test-and-learn approach to life and work, seek and welcome challenges) • **Knowledge entrepreneurship (self-employment) mindset and lifelong learning to build/maintain market value** (proactive outlook focused on change, cognitive range, continuous self-improvement) • **Technology competence** (embrace and be aware of new technologies, develop basic tech competence) • **Strategic/tactical skills** (multidisciplinary problem-solving, identify strategies, balance tradeoffs, develop holistic solutions, plan tactics, execute) • **Business skills** (professional network development, basic fluency in finance, accounting, and valuation, resource development, allocation and realignment, business model design implementation, and iteration, management, marketing, presentation skills, customer service) • **Multidisciplinary, systems, and kaleidoscope thinking** (question status quo, imagine new paradigms, shake-up perspectives, collaborate, develop process improvement and project management skills, generate prototypes and minimum viable products) • **Human-centered design thinking**

**Human  
Intelligence  
Strengths**

Technical fundamentals

Doctrinal knowledge

Process knowledge

Procedural knowledge

Discipline-specific  
analytic thinking

Anomalies detection

Pattern recognition

Simulations

Options/solutions  
Identification

**Artificial or  
Synthetic  
Intelligence  
(potential)  
Strengths**