ON EMERGING TECHNOLOGIES: THE OLD REGIME AND THE PROACTIVITY

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ABSTRACT

Nowadays, emerging technologies are revolutionizing nearly every facet of human life, shaping legal, cultural, political, and technological landscapes. Despite various breakthroughs, emerging technologies have also brought to society legal and regulatory challenges, such as the pacing problem, regulatory silos, and the black box issue. However, existing state-centric regulation on emerging technologies results in fragmented, inconsistent, and ineffective statutes and policies. The traditional regulatory regime, due to its reactive mindset, incremental approaches, and tools of modest efficacy, fails to mitigate associated risks and harms, sometimes even impeding technological innovation. To tackle this dilemma, this Article proposes a proactive law approach with a forward-looking orientation. This Article seeks to usher in proactivity into the realm of emerging technologies regulation and enrich the connotation of proactive law with interconnected new governance mechanisms. Through this exploration, this Article calls for a paradigm shift in the regulatory mindset, embracing regulation as a dynamic, adaptive, and collaborative process, better angled for the transformations brought by emerging technologies. Proactive regulatory layers and strategies will be delineated and scrutinized in this Article, as well as more nuanced solutions to the relevant legal and regulatory challenges.

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INTRODUCTION

In recent years, we have witnessed an unprecedented surge in discussions around emerging technologies that are characterized by radical novelty, rapid growth, coherence, profound impact, as well as

elements of uncertainty and ambiguity.[1] The exponential evolution of emerging technologies like nanotechnology, blockchain, and artificial intelligence (AI) is not only transforming technological infrastructures of various industries but also reshaping crucial aspects of our lives. Envisioning a digital utopia where blockchains streamline and secure transactions, nanotechnology tailors materials at minute scales for specific properties, and AI-powered agents seamlessly perform diverse tasks, make decisions, and generate abundance, people foresee a future akin to "digital Athens" filled with leisure, art, and games, while technological artifacts take on mundane tasks.[2] However, this potential future reality may reveal a digital catastrophe. Despite technological advancements, the accompanying risks, harms, doubts, and damages loom large, spanning from deepfakes, data privacy, algorithm bias, and crypto bubbles to a lack of trust in new-fangled applications and the ultimate fear of a Terminator-style AI takeover. These negative externalities and implications cast a chilling effect on technological innovation, deflecting the trajectory of emerging technologies. Amid the mania and resistance surrounding these technological innovations, regulation is looked upon to guide technological development and shape the future.

However, the traditional state-centric approach to regulation proves inadequate in addressing the disruptive nature of emerging technologies. For example, despite AI's prowess in delivering precise predictions and insights, the opaqueness of its black box invites mistrust and perplexing dilemmas in explaining the decisions within AI applications.[3] The law commanding some Deep Learning Models to unveil and explain their decision-making process could be another anachronism. Meanwhile, the sheer speed of AI innovation magnifies the classic "pacing problem" in regulation, as regulators grapple with AI's unpredictability.[4] To further compound this issue, the various functions of emerging technological artifacts have thrust different regulatory bodies into a shared regulatory space.[5] Traditional silo-

1 Daniele Rotoloa, Diana Hicks & Ben R. Martina, *What is an Emerging Technology?*, 44 RSCH. POL'Y 1827, 1828 (2015).

2 The concept of "digital Athens" was introduced by economist Erik Brynjolfsson, describing a future society where machines would assume most of the work as slaves did for Athenian citizens in ancient Greece. BENJAMIN BEREND & MICHAELA BROHM-BADRY, *"Digital Athens" – Where is Digitalization Leading?*, *in* NEW WORK: SOVEREIGNTY IN THE POSTDIGITAL AGE 7, 7 (2022).

3 *See infra* Part I.C.

4 *See infra* Part I.A.

5 *See infra* note 190 and accompanying text on the shared regulatory space.

based regulation fails to effectively address the multifaceted, cross-sector problems posed by emerging technologies. AI-enabled applications, from automated driving to large language models, often involve a myriad of public and private stakeholders, incurring a plethora of legal issues and far-reaching consequences that stretch beyond the reach of law.[6] As a result, the regulation of emerging technologies risks succumbing to a multitude of fragmented norms and rules, engendering pathologies of juridification.[7]

The existing regulatory inefficiency and stillness expose a deeply rooted problem in regulatory law: the old "command-and-control" regulatory approach with a reactive mindset is no longer workable for a rapidly evolving social life. The current sea of change necessitates a more expansive and insightful examination of regulatory law. Indeed, the regulation field stands at a critical juncture demanding renewal and reinvention.[8] The new economic, social, and scientific realities present regulators with numerous challenges as they struggle to comprehend and adapt to these transformations. To deal with these difficulties, various schools of thought within legal academia are departing from traditional command-and-control regulatory models and opting for new regimes in response.[9] The emergence of "new governance" regimes seeks to enhance flexibility, encourage collaboration, stimulate experimentation and deliberation, and accommodate regulation across different levels of the state.[10] While some of these regimes have been adopted in state regulatory initiatives on emerging technologies, others remain theoretical. The majority of existing regulations have proven to be "remarkably unyielding to evolution," clinging to outdated and centralized regulatory frameworks.[11] The rapid and expansive growth of emerging technologies intensifies the

6 *See infra* Part I.B.

7 On "ugly word" juridification, see Gunther Teubner, *Juridification: Concepts, Aspects, Limits, Solutions*, *in* JURIDIFICATION OF SOCIAL SPHERES: A COMPARATIVE ANALYSIS IN THE AREAS OF LABOR, CORPORATE, ANTITRUST, AND SOCIAL WELFARE LAW 3 (Gunther Teubner ed., 1987) [hereinafter *Juridification*] (discussing overregulation and the expansion of law into other domains).

8 Orly Lobel, *The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Leal Thought*, 89 MINN. L. REV. 342, 343 (2004).

9 *Id.*

10 David M. Trubek & Louise G. Trubek, *New Governance & Legal Regulation: Complementarity, Rivalry, and Transformation*, 13 COLUM. J. EUR. L. 539, 539 (2007).

11 Gregory N. Mandel, *Regulating Emerging Technologies*, 1 L. INNOVATION & TECH. 75, 75 (2009).

conflict between old and new regulatory regimes, demanding a more robust and agile regulatory system.

Proactive law, a legal concept initially developed in the context of business law, may provide a unique solution. Originating in Scandinavia during the late 1990s, this legal concept aimed to enhance the contractual process in business transactions.[12] Since then, proactive law has traversed European legal landscapes, extending its influence to various fields such as regulation, risk management, tax law, and information technology.[13] Described as a holistic approach that "comprises a way of legal thinking combined with a set of skills, practices and procedures," proactive law enables organizations and individuals to identify opportunities and address potential issues *ex ante*.[14] With a forward-looking perspective, proactive law focuses on developing frameworks, rules, and procedures that not only respond to challenges but also anticipate and address issues before they manifest. Anchored in the Scandinavian legal realism tradition, the proactive law approach caters to real-life needs, accentuating "the

12 Gerlinde Berger-Walliser & Paul Shrivastava, *Beyond Compliance: Sustainable Development, Business, and Proactive Law*, 46 GEO. J. INT'L L. 417, 434 (2015).

13 *Id*.

14 Cecilia Magnusson Sjoberg, *Introduction*, 49 SCANDINAVIAN STUD. L. 13, 13 (2006). Other proactive law scholars have tendered definitions on "proactive law." For example, Dag Wiese Schartum defines proactive law as a legal approach "where a major objective is to avoid being surprised by the legal implications of incidents and situations." Dag Wiese Schartum, *Introduction to a Government-based Perspective on Proactive Law*, 49 SCANDINAVIAN STUD. L. 35, 36 (2006). Kaisa Sorsa defines proactive law as an "enabling, empowering and user-friendly, dynamic law aimed at obstructing unwanted phenomena and promoting desired goals." Kaisa Sorsa, *Proactive Law and Public and Private Regulation*, *in* PROACTIVE MANAGEMENT AND PROACTIVE BUSINESS LAW: A HANDBOOK 39, 39 (Kaisa Sorsa ed., 2011). The Europe Economic and Social Committee EESC (EESC) defines proactive law as the following:

> [I]t is done by, with and for the users of the law, individuals and businesses; the vision here is of a society where people and businesses are aware of their rights and responsibilities, can take advantage of the benefits that the law can confer, know their legal duties so as to avoid problems where possible, and can resolve unavoidable disputes early using the most appropriate methods.

Opinion of the European Economic and Social Committee on "The Proactive Law Approach: A Further Step Towards Better Regulation at E.U. Level," 2009 O.J. (C 175) 26, 26 [hereinafter EESC Opinion], https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52008IE1905 [https://perma.cc/FL2P-GR3U].

many-sided, varied, and interactive nature of human reality."[15] Proactive law is more about empowering and enabling "the creation and achievement of desired goals . . . ."[16] In an era of rapidly evolving technologies, proactivity, rather than the long-standing reactivity, may be the prescription to the chronic ailment of regulation.

While proactive law has been extensively scrutinized across various legal domains, its application to the regulation of emerging technologies remains largely unexplored in academic discourse.[17] This Article first delves into the connotation of proactive law, uncovering its shared logic with new governance theories such as "collaborative governance,"[18] "polycentric regulation,"[19] "responsive regulation,"[20] and "reflexive law."[21] In alignment with the evolving concept of proactive law developed over the past few decades, this Article then proposes to couple proactive law with new governance mechanisms, enriching its connotations and exploring its potential in steering the governance of emerging technologies. The accumulative insights on proactive law underscore the importance of transcending the traditional regulatory mindset of reactivity and breaking from the confines of conventional rulemaking. Proactivity,[22] as an enabler, is poised to be infused throughout the lifecycle of the regulatory process, calling for collaborative efforts from all stakeholders, shaping the trajectory of emerging technologies, and striking a delicate balance between safety and innovation. Moreover, with a comprehensive lens on emerging technologies, this Article zooms in on the unparalleled regulatory hurdles brought by AI and its active legal and regulatory initiatives and policies. A global perspective is also considered,

15 Soile Pohjonen, *Proactive Law in the Field of Law*, 49 SCANDINAVIAN STUD. L. 53, 54 (2006) (footnote omitted).

16 *Id.* at 55.

17 Sorsa, *supra* note 14.

18 *See generally* Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1 (1997).

19 *See generally* ELINOR OSTROM, UNDERSTANDING INSTITUTIONAL DIVERSITY 286 (2005); Michael D. McGinnis, Costs and Challenges of Polycentric Governance: An Equilibrium Concept and Examples from U.S. Health Care, Presentation at the Conference on Self-Governance, Polycentricity, and Development 1 (May 8, 2011) (on file with Indiana University).

20 *See generally* IAN AYRES & JOHN BRAITHWAITE, RESPONSIVE REGULATION: TRANSCENDING THE DEREGULATION DEBATE (1992).

21 *See generally* Gunther Teubner, *After Legal Instrumentalism? Strategic Models of Post-Regulatory Law*, *in* DILEMMAS OF LAW IN THE WELFARE STATE 299 (Gunther Teubner ed., 1988) [hereinafter *After Legal Instrumentalism?*].

22 "Proactivity" and "proactive law" are used interchangeably in this Article.

covering the legal and regulatory landscape of emerging technologies in the U.S., Europe, the U.K., and China.

This Article unfolds as follows. Part I maps out the key regulatory challenges brought by emerging technologies. Part II provides a background on the proactive law approach and further introduces proactivity as an innovative regulatory posture to the dynamic landscape of emerging technologies. Part III enriches the essence of proactive law by intertwining this approach with new governance theories, rendering it more suited for technology regulation. To clarify the proactivity in this evolving terrain, this Part delineates three regulatory layers—proactive rulemaking, *ex ante* controls, and ever-evolving resilience—fueled by proactive measures and strategies. Proactive law is distinguishably solution-oriented rather than problem-oriented.[23] Each layer is crafted to navigate inherent complexities posed by emerging technologies and furnish nuanced solutions to an array of regulatory challenges. Part IV presents regulatory practices in China as a potential case study for proactive regulation. China's proactive policies, principles, and mechanisms on emerging technologies will be scrutinized, alongside its associated problems and drawbacks. The insights gleaned, both theoretically and practically from the Chinese experience, shed light on building a more proactive regulatory framework on emerging technologies.

I. TECHNOLOGICAL CHALLENGES OF EMERGING TECHNOLOGIES TO TRADITIONAL REGULATION

It is recognized that emerging technologies, represented by AI, nanotechnology, and blockchains, are creating a sea of change in today's regulatory environment. While ushering in groundbreaking advances across various fields, these technologies pose escalating legal and regulatory risks. As new business models and services flourish, regulators, situated in a rapidly changing milieu, often find themselves unprepared for unforeseen applications and outcomes. Regulators around the world are striving to maintain a delicate balance between addressing these potential harms and disruptions and

23 Pohjonen, *supra* note 15, at 61-62.

fostering technology innovations.[24] A series of regulatory challenges unique to the regulation of emerging technologies have been identified by legal scholars and experts.[25] This Section zeroes in on the three primary challenges engendered by AI, one of the most prominent and rapidly advancing emerging technologies, and reveals the inadequacy of traditional regulation in dealing with these issues. These deficiencies become conspicuous when the responsibility of regulation is limited to state actors, exclusive reactive measures are employed, a one-size-fits-all approach prevails, and prolonged deliberation process hampers the efficiency and timeliness of regulation.

Before delving into the main AI-based regulatory challenges, a brief overview of AI is necessary. The term *artificial intelligence* was first coined in 1956 during a conference at Dartmouth College, where a shared vision emerged that suggested that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it."[26] Merriam-

24 Several pieces of recent legislation have attempted to achieve this delicate balance. *See, e.g.*, *The AI Act Explorer*, EU AI ACT, https://artificialintelligenceact.eu/ai-act-explorer/ [https://perma.cc/566C-Y4XH] (last visited Oct. 23, 2024); *Provisions on the Administration of Algorithm Recommendation of Internet Information Services in China*, OECD.AI (July 5, 2024), https://oecd.ai/en/dashboards/policy-initiatives/http:%2F%2Faipo.oecd.org%2F2021-data-policyInitiatives-27333 [https://perma.cc/DE82-2YWJ]; Gesetz vom 3. Oktober 2019 über Token und VT-Dienstleister (Token-und VT-Dienstleister-Gesetz) [TVTG], *translated in* Liechtenstein Law of 3 October 2019 on Tokens and TT Service Providers (Token and TT Service Provider Act, TVTG), 301 LIECHTENSTEIN LEGAL GAZETTE 1, 2 & art. 2.

25 *See e.g.*, Alicia Solow-Niederman, *Administering Artificial Intelligence*, 93 S. CAL. L. REV. 633 (2020) (discussing the shortcomings of adopting a command-and-control approach towards AI); Han-Wei Liu & Ching-Fu Lin, *Artificial Intelligence and Global Trade Governance: A Pluralist Agenda*, 61 HARV. INT'L L. J. 407 (2020) (mapping out the regulatory challenges facing the WTO against AI); Bryan Casey & Mark A. Lemley, *You Might Be a Robot*, 105 CORNELL L. REV. 287 (2020) (analyzing the definitional challenges of AI and its repercussions in regulation); *see generally* DAVID FREEMAN ENGSTROM, DANIEL E. HO, CATHERINE M. SHARKEY & MARIANO-FLORENTINO CUÉLLAR, GOVERNMENT BY ALGORITHM: ARTIFICIAL INTELLIGENCE IN FEDERAL ADMINISTRATIVE AGENCIES (2020), https://www.acus.gov/sites/default/files/documents/Government%20by%20Algorithm.pdf [https://perma.cc/D66B-9HN9] (studying how agencies acquire AI systems and oversee their use).

26 James Moor, *The Dartmouth College Artificial Intelligence Conference: The Next Fifty Years*, AI MAG., Winter 2006, at 87, 87 (2006); John McCarthy, Marvin L. Minsky, Nathaniel Rochester & Claude E. Shannon, *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence*, AI MAG., Winter 2006, at 12, 12.

Webster presently defines AI as "the capability of computer systems or algorithms to imitate intelligent human behavior."[27] However, many AI experts believe that it is instead accomplishing complex goals that defines artificial intelligence. In Stuart Russell's book *Human Compatible*, AI is characterized as machines that are "intelligent to the extent that their actions can be expected to achieve their objectives."[28] Similarly, Max Tegmark, another AI researcher and physicist, defines intelligence as the "ability to accomplish complex goals," focusing on AI's core characteristic of achieving optimal results.[29] Nobel Laureate Geoffrey Hinton, known as the "godfather of AI", goes a step further by proposing that AI should be considered "an altogether different form of intelligence to our own."[30]

As AI evolves, the captivating controversy of its definition continues. AI has also become an umbrella term denoting "a branch of computer science dealing with the simulation of intelligent behavior in computers,"[31] covering numerous technologies like machine learning, neural networks and deep learning, computer vision, natural language processing, and robotics.[32] Empowered by various technological methods, AI has brought breakthroughs to almost every field of human life, including food, energy, finance, healthcare, agriculture, manufacturing, transportation, communication, entertainment, and space exploration.[33] Take the field of healthcare as

27 *Artifical Intelligence*, MERRIAM-WEBSTER, https://www.merriam-webster.com/dictionary/artificial%20intelligence [https://perma.cc/2NVF-JQAR] (last visited Feb. 5, 2024).

28 STUART RUSSELL, HUMAN COMPATIBLE 9 (2019).

29 MAX TEGMARK, LIFE 3.0: BEING HUMAN IN THE AGE OF ARTIFICIAL INTELLIGENCE 50 (2017).

30 Olivier Salvado & Jon Whittle, *AI Pioneer Geoffrey Hinton Says AI Is a New Form of Intelligence Unlike Our Own. Have We Been Getting it Wrong this Whole Time?*, THE CONVERSATION (May 3, 2023), https://theconversation.com/ai-pioneer-geoffrey-hinton-says-ai-is-a-new-form-of-intelligence-unlike-our-own-have-we-been-getting-it-wrong-this-whole-time-204911 [https://perma.cc/6TMW-2N23] (suggesting that clinging to the similarities between human and AI or anthropomorphizing AI might be reductive to truly understanding and developing AI).

31 MERRIAM-WEBSTER, *supra* note 27.

32 Ekin Keserer, *The Six Main Subsets of AI: (Machine Learning, NLP, and More)*, AKKIO (Jan. 5, 2024), https://www.akkio.com/post/the-five-main-subsets-of-ai-machine-learning-nlp-and-more [https://perma.cc/9JSE-BGMC].

33 Bernard Marr, *15 Amazing Real-World Applications Of AI Everyone Should Know About*, FORBES (May 12, 2023), https://www.forbes.com/sites/bernardmarr/2023/05/10/15-amazing-real-world-applications-of-ai-everyone-should-know-about/ [https://perma.cc/X3JP-886E].

an illustration. Major hospitals are now using AI-enabled systems to assist medical professionals in diagnosing and treating a wide array of medical conditions.[34] AI can diagnose lung cancer from microscopic images with greater accuracy than human pathologists.[35] Advanced deep learning models can precisely predict an individual's biological age based on a retinal image.[36] This non-invasive method eliminates the need for specialized laboratory equipment and could be useful in the pharmaceutical industry, particularly in assessing the effectiveness of rejuvenation and anti-aging therapies.[37] In the near future, more AI methods will be harnessed to increase the accuracy of diagnoses and develop efficient treatments.[38] AI, with its versatility and complexity, has given rise to a diverse spectrum of applications and utilization scenarios and is progressively permeating into almost every facet of human life, infiltrating society down to the smallest detail in another form of power.[39] When regulators attempt to regulate this suddenly explosive technology, they are faced not only with one specific application like self-driving, neural machine translation, or face perception, but also with general-purpose AI (GPAI), which is capable of performing multiple tasks across different domains.[40] AI's increasingly disruptive and intricate repercussions, due partially to its sheer speed of innovation, have introduced significant complexities into the regulatory landscape.[41] The ensuing three regulatory

34 DonHee Lee & Seong No Yoon, *Application of Artificial Intelligence-Based Technologies in the Healthcare Industry: Opportunities and Challenges*, 18 INTL. J. ENV'T RSCH. & PUB. HEALTH 271, 271 (2021).

35 TEGMARK, *supra* note 29, at 101.

36 Sara Ahadi, *Developing an Aging Clock Using Deep Learning on Retinal Images*, GOOGLE RSCH. (Apr. 11, 2023), https://blog.research.google/2023/04/developing-aging-clock-using-deep.html [https://perma.cc/P536-3J9H].

37 *Id.*

38 Mugahed A. Al-Antari, *Artificial Intelligence for Medical Diagnostics—Existing and Future AI Technology!*, 13 DIAGNOSTICS 688 (2023).

39 Michel Foucault's comment in his article, *The Subject and Power*, inspires me to compare AI to a sort of power as commented by Foucault. Michel Foucault, *The Subject and Power*, *in* BEYOND STRUCTURALISM AND HERMENEUTICS 208, 224 (Hubert L. Dreyfus & Paul Rabinow eds., 1982) ("[T]here is a primary and fundamental principle of power which dominates society down to the smallest detail.").

40 *General-Purpose Artificial Intelligence*, EUR. PARLIAMENT, https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/745708/EPRS_ATA(2023)745708_EN.pdf [https://perma.cc/6UP5-WYCA] (last visited Feb. 5, 2024).

41 *See* DAVID BOLLIER, ASPEN INST., ARTIFICIAL INTELLIGENCE, THE GREAT DISRUPTOR: COMING TO TERMS WITH AI-DRIVEN MARKETS, GOVERNANCE, AND LIFE 24-25 (2018), https://www.aspeninstitute.org/wp-content/uploads/2018/04/AI-

challenges are notably accentuated by AI and its systemic applications, warranting focused attention and succinct scrutiny.

A. The Pacing Problem

The "pacing problem," which refers to when technological advancements outpace policymakers, stands as a formidable hurdle in the realm of technology regulation.[42] This resonates with sociology's classic concept of "culture lag," which posits that "material culture changes more rapidly than the non-material culture necessarily related to it."[43] Non-material culture, including governmental institutions and legal traditions, struggles to keep up with material culture like technological innovations, which, in turn, gives rise to social problems and conflicts.[44] In the context of law and regulation, existing legal frameworks, entrenched in a static gaze, constantly fail to grasp the dynamic interplay between society and technology. A Deloitte analysis of the 2017 U.S. Code of Federal Regulations found that 68% of federal regulations have never been updated and only 17.2% have been edited once.[45] The assumption of constant behavior from those under regulation, especially in cases involving technology, is impractical.[46] Technology is outpacing the development of the legal structure, as well as corresponding regulatory measures.[47] The metaphor of "the hare and the tortoise" vividly paints this regulatory

2017-FINAL-Report.pdf [https://perma.cc/TQ8T-SSX4] (discussing the void in government in addressing AI governance).

42 Liu & Lin, *supra* note 25, at 304.

43 Robert D. Leigh, *Reviewed Work: Social Change. With Respect to Culture and Original Nature by William Fielding Ogburn*, 20 J. PHIL. 526, 526 (1923). The term "culture lag" was coined by William Fielding Ogburn in his work, *Social Change with Respect to Culture and Original Nature*. *Id.*

44 *Id.*

45 William D. Eggers, Mike Turley & Pankaj Kamleshkumar Kishnani, *The Future of Regulation: Principles for Regulating Emerging Technologies,* DELOITTE INSIGHTS (June 19, 2018), https://www2.deloitte.com/content/dam/insights/us/articles/4538_Future-of-regulation/DI_Future-of-regulation.pdf [https://perma.cc/CT36-46CU].

46 *See* Julia Black, *Decentring Regulation: Understanding the Role of Regulation and Self-Regulation in a 'Post-Regulatory' World*, 54 CURRENT LEGAL PROBS. 103, 108 (2001).

47 Gary E. Marchant, *The Growing Gap Between Emerging Technologies and the Law*, *in* THE GROWING GAP BETWEEN EMERGING TECHNOLOGIES AND LEGAL-ETHICAL OVERSIGHT 19, 22 (Gary E. Marchant, Braden R. Allenby & Joseph R. Herkert eds., 2011).

dilemma.[48] In the race against technologies, traditional government regulatory models and approaches resemble the tortoise, plodding along slower than ever, while innovation or the hare surges ahead.

In the era of emerging technologies, the "pacing problem" becomes particularly prominent, magnifying regulatory difficulties. Take the recent AI development as an example: from Moore's Law to Huang's Law, AI takes the lead, orchestrating its own timeline.[49] Huang's Law, coined after Nvidia's CEO, Jensen Huang, describes how the performance of the GPUs that power AI more than double every two years.[50] Acting as the contemporary counterpart of Moore's Law, Huang's Law enables GPUs to accelerate a wide array of applications, from autonomous vehicles and vessels to the fields of facial, vocal, and object recognition in personal devices.[51] In juxtaposition to the swift progress of AI, only a limited number of countries around the world have enacted concrete laws that specifically target AI applications, with some jurisdictions remaining largely taciturn towards AI's speed of innovation.[52] For instance, as of 2023, only three states in the United States have passed laws on the issue of AI deepfakes in political campaigns.[53] The slowness could be

48 Mark Fenwick, Wulf A. Kaal & Erik P. M. Vermeulen, *Regulation Tomorrow: Strategies for Regulating New Technologies*, *in* TRANSNATIONAL COMMERCIAL AND CONSUMER LAW 153, 154 (Toshiyuki Kono, Mary Hiscock & Arie Reich eds., 2018).

49 Moore's Law stipulates that the number of transistors on a chip doubles roughly every two years. Casey & Lemley, *supra* note 25, at 339.

50 Christopher Mims, *Huang's Law Is the New Moore's Law, and Explains Why Nvidia Wants Arm*, WALL ST. J. (Sept. 19, 2020), https://www.wsj.com/articles/huangs-law-is-the-new-moores-law-and-explains-why-nvidia-wants-arm-11600488001 [https://perma.cc/LFQ6-ALMP]. The graphics processing unit (GPU) is a type of computing technology, "best known for [its] capabilities in gaming . . . ." *What Is a GPU?*, INTEL, https://www.intel.com/content/www/us/en/products/docs/processors/what-is-a-gpu.html [https://perma.cc/EWX2-PG7Q] (last visited Oct. 23, 2024). Now, GPUs are used in AI and machine learning because they can significantly accelerate calculations due to their highly parallel nature. *Id.*

51 Mims, *supra* note 50.

52 Mikhail Klimentov, *From China to Brazil, Here's How AI is Regulated Around the World*, WASH. POST (Sept. 3, 2023), https://www.washingtonpost.com/world/2023/09/03/ai-regulation-law-china-israel-eu/ [https://perma.cc/J2F6-VEZT] (describing the legal and regulatory actions taken by countries such as China, Japan, and Brazil, while noting that some countries have adopted a "wait and see" approach).

53 Adam Edelman, *States Are Lagging in Tackling Political Deepfakes, Leaving Potential Threats Unchecked Heading into 2024*, NBC NEWS (Dec. 16, 2023), https://www.nbcnews.com/politics/artificial-intelligence-deepfakes-2024-election-states-rcna129525 [https://perma.cc/6MBP-KH5D].

traced to the tradition of reactive regulatory postures, elongated legislative processes,[54] and state regulators' limited ability to fully appreciate new technologies.[55] William Fielding Ogburn once cautioned that the lag between material conditions and adaptive culture may last for varying lengths of time, sometimes for many years.[56] In the example of AI development, the increased temporal lag between regulation and emerging technologies has generated greater uncertainties and regulatory voids, leading to regulation in a patchwork and uncoordinated fashion.

However, even if regulators pick up the pace, regulatory promptness may still trail behind technological innovation. As an illustration, the European Union, with its strong regulatory tradition, has been active in addressing AI's socio-technical challenges. The EU AI Act was initially crafted in 2021 with a focus on AI tools that have already been deployed in areas like law enforcement, job recruitment, and education.[57] Nevertheless, the sudden emergence of ChatGPT in late 2022 caught the European Commission off guard, rendering the proposed Act ill-equipped to handle general-purpose systems commonly referred to as foundation models.[58] Last-minute

54 As an example, in the United States, a bipartisan assembly of lawmakers proposed a bill on June 20, 2023, aiming to establish a commission dedicated to overseeing the regulation of artificial intelligence. Robert Seamans & Washington Bytes, *AI Regulation Is Coming To The U.S., Albeit Slowly*, FORBES (June 27, 2023), https://www.forbes.com/sites/washingtonbytes/2023/06/27/ai-regulation-is-coming-to-the-us-albeit-slowly/?sh=7629cfd27ee1 [https://perma.cc/6JDG-CCS7]. The commission is expected to deliver reports at intervals of six, twelve, and twenty-four months from its inception. *Id.* Despite the elongated process, experts project that the enactment of a comprehensive national AI law in the United States is unlikely to occur within the coming years. *Id.*; Bill Whyman, *AI Regulation is Coming- What is the Likely Outcome?*, CTR. FOR STRATEGIC & INT'L STUD. (Oct. 10, 2023), https://www.csis.org/blogs/strategic-technologies-blog/ai-regulation-coming-what-likely-outcome [https://perma.cc/77RU-YCTF].

55 Adam Edelman, *States Are Lagging in Tackling Political Deepfakes, Leaving Potential Threats Unchecked Heading into 2024*, NBC NEWS (Dec. 16, 2023), https://www.nbcnews.com/politics/artificial-intelligence-deepfakes-2024-election-states-rcna129525 [https://perma.cc/6MBP-KH5D].

56 WILLIAM FIELDING OGBURN, SOCIAL CHANGE WITH RESPECT TO CULTURE AND ORIGINAL NATURE 203 (1922).

57 *See Proposal for a Regulation of the European Parliament and of The Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts*, at 1, 2, COM (2021) 206 final (Apr. 21, 2021) [hereinafter *Proposed EU AI Act*], https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52021PC0206 [https://perma.cc/586U-UM6X].

58 Adam Satariano, *E.U. Agrees on Landmark Artificial Intelligence Rules*, N.Y. TIMES (Dec. 8, 2023), https://www.nytimes.com/2023/12/08/technology/eu-ai-act-regulation.html [https://perma.cc/WJ9D-UG8N].

adjustments were inserted into the newly proposed EU AI Act, leading to contentious debate and the derailment of the legislative process, partially due to the limited understanding of the potential impact, harms, and manifestations of GPAI.[59] As remarked by Lyria Bennett Moses, "regulators face an 'uncertainty paradox' where they are forced to make decisions in the absence of reliable risk information or foreknowledge to technological developments."[60] After three years of debate and revision, the EU AI Act entered into force on August 1, 2024; however, the majority of its rules are not applicable until two years after its enactment.[61]

B. Regulatory Silos

The traditional silo-based regulation sees each industry sector as a separate entity that does not interact with other entities and operates independently, thus warranting distinct regulatory principles.[62] However, emerging technologies disrupt this presumption by conflating diverse tasks from different sectors and achieving various functions that once operated independently. In the past, when a new-fangled use case became a focal point for regulation, novel classifications, definitions, and liabilities were identified by multiple agencies. The outcome typically involved a fragmented set of regulatory mandates and a silo effect, with the same technology being

59 Council of the European Union IP/986/23, Artificial Intelligence Act: Council and Parliament Strike a Deal on the First Rules for AI in the World (Dec. 9, 2023), https://www.consilium.europa.eu/en/press/press-releases/2023/12/09/artificial-intelligence-act-council-and-parliament-strike-a-deal-on-the-first-worldwide-rules-for-ai/ [https://perma.cc/26E3-7T8N]; Jess Weatherbed, *Why the AI Act Was So Hard to Pass*, THE VERGE (Dec. 14, 2023), https://www.theverge.com/2023/12/13/23999849/eu-ai-act-artificial-intelligence-regulations-complicated-delays [https://perma.cc/VZ5Q-N56X]; *Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts*, at 6, 2021 (COD) 106 (Nov. 25, 2022), https://data.consilium.europa.eu/doc/document/ST-14954-2022-INIT/en/pdf [https://perma.cc/DPQ4-W255].

60 Lyria Bennett Moses, *How to Think about Law, Regulation and Technology: Problems with 'Technology' as a Regulatory Target*, 5 L. INNOVATION & TECH 1, 7-8 (2013) (citing Marjolein van Asselt, Ellen Voss & Tessa Fox, *Regulating Technologies and the Uncertainty Paradox*, *in* DIMENSIONS OF TECHNOLOGY REGULATION 259 (Morag Goodwin, Bert-Jaap Koops & Ronald Leenes eds., 2010)).

61 *European Artificial Intelligence Act Comes into Force*, EUR. COMM'N (Aug. 1, 2024), https://ec.europa.eu/commission/presscorner/detail/en/ip_24_4123 [https://perma.cc/Y26N-SA67].

62 David Honig, *FCC Reorganization: How Replacing Silos with Functional Organization Would Advance Civil Rights*, 3 U. PA. J. L. & PUB. AFFS. 169, 174 (2018).

regulated differently or repetitively. For example, in the field of biotechnology, gene drive organisms could fit within the regulatory jurisdiction of multiple agencies, including the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the Department of Agriculture (USDA). All three agencies could regulate the application where a mouse is designed to control an invasive species, contingent upon the classification of the mouse as a plant pest (the USDA), a new animal drug (the FDA), or a pesticide (the EPA).[63] The wide range of gene drives' innovative uses could dismantle the rigid regulatory silos delineated by the U.S. Coordinated Frameworks that were established for the biotechnology coordination between the three agencies.[64]

In the realm of AI, regulatory silos have arisen to implement different legal and regulatory frameworks on innovative AI applications. AI-driven applications often involve diverse public and private stakeholders, incurring a plethora of legal problems across different areas of law. Take self-driving cars that appear on the roads as an example. Determining the jurisdictional status of automated driving becomes difficult for both regulators and the industry because the characteristics of automated driving fall into multiple statutory and regulatory domains. For instance, a self-driving taxi service may implicate federal regulations enacted by agencies like the National Highway Traffic and Safety Administration (NHTSA), the Federal Motor Carrier Safety Administration (FMCSA), the Federal Transit Administration (FTA), as well as oversight by state departments of transportation, local taxi agencies, and other entities.[65] The risk of horizontal and vertical regulatory overlap looms if each regulator imposes its own set of rules without a holistic approach to autonomous vehicle regulation.

Apart from fragmented regulation, regulatory silos may also slow down the response of regulators. Ford submitted a petition in 2021 to the NHTSA seeking a temporary two-year exemption from seven

63 Carlene Dooley, Note, *Regulatory Silos: Assessing the United States' Regulation of Biotechnology in the Age of Gene Drives*, 30 GEO. ENV'T L. REV. 547, 559 (2018) (citing NAT'L ACADS. OF SCIS., ENG'G, & MED., GENE DRIVES ON THE HORIZON: ADVANCING SCIENCE, NAVIGATING UNCERTAINTY, AND ALIGNING RESEARCH WITH PUBLIC VALUES 145 (2016)).

64 *Id.* at 549-51. The potential applications of gene drives encompass "suppress[ing] the mosquito population" to reduce malaria, lowering "pesticide and herbicide resistance in wild weeds," and reducing "invasive species by spreading a genetic trait that will eradicate them . . . ." *Id.* at 550-51.

65 Casey & Lemley, *supra* note 25, at 337.

provisions of the Federal Motor Vehicle Safety Standards.[66] These provisions included requirements related to the controls necessary for human drivers to operate vehicle features, as well as telltales, indicators, and warnings required to notify the human driver of a feature's status or malfunction.[67] Ford claimed that its autonomous vehicle provided an equivalent level of safety, and that these exemptions would facilitate more efficient research and development of autonomous vehicles.[68] Regardless of the validity of the claim, Ford withdrew its petition after two years of NHTSA's inaction.[69] Jennifer Homendy, Chair of the National Transportation Safety Board (NTSB), recently criticized the federal government's inaction on autonomous vehicles, stating that "[t]he federal government is not doing their [sic] job . . . ."[70] She called for the establishment of uniform standards by the federal government for autonomous vehicle manufacturers, distributors, and operators.[71]

In addition, as self-driving cars become more prevalent, new regulatory concerns that extend beyond the scope of traditional vehicle regulation will arise. These concerns, ranging from discrimination and data privacy to cybersecurity and unfair competition, may not align seamlessly with the regulatory frameworks currently in place.[72] The recent advent of advanced AI, like Generative AI, presents

66 Ford Motor Company—Receipt of Petition for Temporary Exemption From Various Requirements of the Federal Motor Vehicle Safety Standards for an Automated Driving System-Equipped Vehicle, 87 Fed. Reg. 43602 (July 21, 2022).

67 *Id.* at 43604. The provisions of the Federal Motor Vehicle Safety Standards that Ford petitioned to be exempt from are: FMVSS No. 101, Controls and Displays; No. 102, Transmission Shift Position Sequence, Starter Interlock, and Transmission Braking Effect; No. 108, Lamps, Reflective Devices, and Associated Equipment; No. 111, Rear Visibility; No. 126, Electronic Stability Controls; No. 135, Light Vehicle Brake Systems; and No. 138, Tire Pressure Monitoring. *Id.*

68 *Id.* at 43605-06.

69 Ford Motor Company—Petition for Temporary Exemption From Various Requirements of the Federal Motor Vehicle Safety Standards for an Automated Driving System-Equipped Vehicle; Withdrawal, 88 Fed. Reg. 19351 (Mar. 31, 2023).

70 Peter Valdes-Dapena, *'The Federal Government is Not Doing Their Job,' NTSB Chair Says About Automated Driving Tech*, CNN BUS. (May 6, 2023), https://www.cnn.com/2023/05/06/business/ntsb-automatic-driving-safety/index.html [https://perma.cc/J2QC-FH86].

71 Patrick H. Reilly, Elsa M. Bullard & Emanuel L. McMiller, *2023 Legislative and Regulatory Developments Affecting Autonomous Vehicles*, FAEGRE DRINKER (Sept. 12, 2023), https://www.faegredrinker.com/en/insights/publications/2023/9/2023-legislative-and-regulatory-developments-affecting-autonomous-vehicles [https://perma.cc/8LGW-S3C7].

72 Casey & Lemley, *supra* note 25, at 336.

multifarious applications and revolutionizes the technological infrastructures of many industries. As sectors increasingly converge and transform their operations, the retention of silo-based regulatory agencies will be outdated, generating inefficiency, coordination gaps, and suboptimal regulatory outcomes. An unyielding silo-based regulation could enlarge the legislative and regulatory "crazy quilt" that weaves "a bounty of approaches, with each patch of authority a little, or a lot, different from the others."[73] It could also lead to "ossification," where, owing to competing oversight mechanisms and the resistance to change within the regulatory process, a regulatory system becomes inflexible and unresponsive.[74]

C. The Black Box Problem

Black boxes are almost everywhere in our social life. A black box problem occurs every time we encounter systems whose "internal mechanisms are not fully open to inspection . . . ."[75] In 1986, Gunther Teubner analyzed the black box problem from the systems theory, noting that systems, such as law, economics, and politics, are like black boxes "in the sense of being mutually inaccessible to each other."[76] Although the inputs and outputs are known, the conversion processes remain obscure.[77] In the context of emerging technologies, when these closed technological systems produce outcomes or decisions, it may be challenging to discern how and why they arrive at particular results, making them "black boxes" whose internal mechanisms are unknown or not easily understandable.

While the dilemma of the black box is not unique to the regulation of emerging technologies, the opacity inherent in the AI black box and its ramifications are exacerbated by various AI methods. AI applications that use machine-learning algorithms, such as deep neural

73 Linda R. Horton, *Over-the-Counter Drug Authority Issues: Selected Topics*, 48 FOOD & DRUG L.J. 545, 546 (1993).

74 *See* Thomas O. McGarity, *Some Thoughts on Deossifying the Rulemaking Process*, 41 DUKE L.J. 1385 (1992).

75 W. ROSS ASHBY, AN INTRODUCTION TO CYBERNETICS 86 (1947).

76 *After Legal Instrumentalism?*, *supra* note 21, at 320. For further discussion on analyzing the AI black box problem through a systems approach, see Ran Xi, *A Systems Approach to Shedding Sunlight on AI Black Boxes*, 53 HOFSTRA L. REV. (forthcoming 2025).

77 *Id.*

networks, can be as challenging to understand as the human brain.[78] Like how the human brain learns from experience, deep neural networks learn from data by incorporating thousands of artificial neurons.[79] These systems employ statistics and algorithms to navigate through ambiguous data and generate results, and then train and restructure themselves to enhance accuracy.[80] This self-learning capability enables AI to develop novel and efficient ways to tackle problems and exceed human intelligence in some areas. On the flip side, the intricacy arising from the deep neural networks and self-learning makes it difficult, even impossible, to ascertain AI's inner decision-making process, even for its creators.[81] As AI is proposed to be defined as a species of high intelligence different to human beings, and its thought process is equipped with different senses and powers and perception, it follows that humans cannot perceive and understand AI in an anthropomorphic way.[82] A well-known example of this phenomenon is DeepMind's "AlphaGo," which not only mastered the board game Go but also demonstrated the extremely fascinating but unpredictable trajectories of AI decision-making.[83] Thus, AI systems can also be black boxes in the way that they are "strange things" that humans are not familiar with and lack cognitive safety.[84]

The black-box nature of AI incurs a series of regulatory difficulties. Regulation—once viewed as "the sustained and focused

78 Opening up the black box of machine learning algorithms was characterized "as the 'equivalent of neuroscience to understand the networks inside' the brain." Yavar Bathaee, *The Artificial Intelligence Black Box and the Failure of Intent and Causation*, 31 HARV. J. L. & TECH. 889, 891 n.9 (2018) (quoting Davide Castelvecchi, *Can We Open the Black Box of AI?*, NATURE, Oct. 5, 2016, at 20).

79 *See* Ryan Abbott, *Inventive Algorithms and the Evolving Nature of Innovation*, *in* THE CAMBRIDGE HANDBOOK OF THE LAW OF ALGORITHMS 339, 353 (Woodrow Barfield ed., 2021).

80 Curtis E. A. Karnow, *The Opinion of Machines*, *in* THE CAMBRIDGE HANDBOOK OF THE LAW OF ALGORITHMS, *supra* note 79, at 16, 20.

81 Bathaee, *supra* note 78, at 897.

82 Salvado & Whittle, *supra* note 30.

83 Jonathan Tapson, *Google's Go Victory Shows AI Thinking Can Be Unpredictable, And That's a Concern*, THE CONVERSATION (Mar. 17, 2016), https://theconversation.com/googles-go-victory-shows-ai-thinking-can-be-unpredictable-and-thats-a-concern-56209 [https://perma.cc/XF73-G88P].

84 Bartosz Brożek, Michał Furman, Marek Jakubiec & Bartłomiej Kucharzyk, *The Black Box Problem Revisited. Real and Imaginary Challenges for Automated Legal Decision Making*, 32 A.I. & L. 427, 432-34 (2023) (discussing that the pursuit of cognitive safety renders it difficult for humans to accept outcomes from a decision-making process that is unexpected, regardless of the subject that makes the decisions).

attempt"[85] to alter human behavior—is at an inflection point. In the sphere of regulating AI, the regulatees are largely unpredictable and unexplainable thinking machines. When the law directly intervenes into these black boxes, the regulatory outcomes are usually far from satisfying. Traditional regulatory frameworks are troublesome when they mandate AI systems to explain their decision-making process via an external and simplified representation. These black box models with complex mathematical expressions simply do not possess a representation that can ease regulators' understanding.[86] Besides, the potency of machine learning and related AI methods partly lies in the inherent unpredictability of their decisions.[87]

The consequences of AI black boxes are significant. The inner opaque mechanisms make it difficult to generate trust in AI-driven applications and assign responsibility or accountability in the cases of errors or adverse results. For example, despite the promising applications of AI in healthcare, when clinicians and patients find the rationale behind the AI-generated diagnoses or suggestions elusive, they lose confidence in the reliability and validity of the AI applications.[88] This skepticism may breed hesitance toward adopting AI-driven artifacts, impeding the advancement of medicine and healthcare. Using another illustration, in the event of an unavoidable collision, the black box of an autonomous vehicle's decision-making process could be problematic in explaining the reasons it chose to harm a particular individual over another.[89] Additionally, the allure of black boxes also fosters automation bias that assumes that machine-driven systems yield better results compared to human judgment.[90]

85 Julia Black, *Critical Reflections on Regulation*, 27 AUSTRALASIAN J. LEGAL PHIL. 1, 26 (2002).

86 Adrien Bibal, Michael Lognoul, Alexandre de Streel & Benoît Frénay, *Legal Requirements on Explainability in Machine Learning*, 29 A.I. & L. 149, 157 (2020).

87 Brożek et al., *supra* note 84.

88 Shiraz Jagati, *AI's Black Box Problem: Challenges and Solutions for a Transparent Future*, COINTELEGRAPH (May 5, 2023), https://cointelegraph.com/news/ai-s-black-box-problem-challenges-and-solutions-for-a-transparent-future [https://perma.cc/JX7R-JW3J].

89 Vasiliki Papadouli, *Artificial Intelligence's Black Box: Posing New Ethical and Legal Challenges on Modern Societies*, *in* ARTIFICIAL INTELLIGENCE AND NORMATIVE CHALLENGES: INTERNATIONAL AND COMPARATIVE LEGAL PERSPECTIVES 39, 54-55 (Angelos Kornilakis, Georgios Nouskalis, Vassilis Pergantis & Themistoklis Tzimas eds., 2023).

90 Bryce Hoffman, *Automation Bias: What It is and How to Overcome It*, FORBES (Mar. 10, 2024), https://www.forbes.com/sites/brycehoffman/2024/03/10/automation-bias-what-it-is-and-how-to-overcome-it/ [https://perma.cc/N8R2-YAXD]

However, the harsh truth is that even a well-designed algorithm learns from data filled with bias and discrimination and makes decisions based on inputs from a flawed and erratic reality. In situations with high stakes, automation bias can deteriorate into wishful thinking or worse: the "opportunistic misuse of models to validate sharp business practices."[91]

In order to whiten AI black boxes and build public trust, the explainable AI movement (XAI) has emerged with a new set of scientific and computational techniques[92] and a series of legal orders and policy initiatives.[93] In the U.S., the National Institute of Standards and Technology formulated four principles of XAI, requiring that AI systems should provide clear, accurate, and meaningful explanations for their outputs.[94] In Europe, the European Union's General Data Protection Regulation (GDPR) provides a manifesto-like "the right to explanation," under which a user is entitled to request an explanation about an algorithm-made decision that largely influences them.[95] The recent EU AI Act spells out different levels of transparency requirements based on the risks of AI applications.[96] For instance, high-risk AI applications that pose significant potential harm to health,

("Automation bias refers to our tendency to favor suggestions from automated decision-making systems and to ignore contradictory information made without automation, even if it is correct.").

91 FRANK PASQUALE, THE BLACK BOX SOCIETY: THE SECRET ALGORITHMS THAT CONTROL MONEY AND INFORMATION 107 (2015) (footnote omitted).

92 Paulo Henrique Padovan, Clarice Marinho Martins & Chris Reed, *Black is the New Orange: How to Determine AI Liability*, 31 A.I. & L. 133, 151-58 (2023) (discussing various XAI techniques).

93 XAI is a domain of multidisciplinary research. Researchers from disciplines such as psychology, behavioral and social sciences, human-computer interaction, physics, and neuroscience all promote and contribute to the enhanced transparency of AI. There is also a considerable body of academic literature on XAI from a legal and regulatory perspective focusing on, for example, legal requirements on explainability in machine learning. *See* Waddah Saeed & Christian Omlin, *Explainable AI (XAI): A Systematic Meta-Survey of Current Challenges and Future Opportunities*, 263 KNOWLEDGE-BASED SYS. 8 (2023).

94 P. JONATHON PHILLIPS, CARINA A. HAHN, PETER C. FONTANA, AMY N. YATES, KRISTEN GREENE, DAVID A. BRONIATOWSKI & MARK A. PRZYBOCKI, NAT'L INST. OF STANDARDS & TECH., FOUR PRINCIPLES OF EXPLAINABLE ARTIFICIAL INTELLIGENCE 2-3 (2021).

95 Regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation), 2016 O.J. (L 119) 1 (EU), arts. 13-15 [hereinafter GDPR].

96 *Proposed EU AI Act, supra* note 57, at 1-2.

safety, and fundamental rights will be subject to heightened scrutiny on transparency.[97] To mitigate the relevant risks, requirements for high-quality data, documentation and traceability, human oversight, and accuracy will be mandated.[98] However, the EU AI Act has not fully considered the intricate landscape of varied purposes for explainability, as well as the diverse objectives held by different stakeholders. This lack of practical consideration of explainability complicates AI systems' development, testing, and conformity to transparency requirements in the real world.[99] Besides, the rise of GPAI with heterogeneous applications and diverse risks challenges the efficacy of the risk-based approach, as risk-based frameworks normally seek to "emphasize homogeneity and commensurability rather than variability and uniqueness."[100]

Another facet of the black box problem in AI regulation relates to the law. Transparency within the legal system is often viewed as a means to uphold a range of societal values, functioning as "a quality of complex socio-technical interactions between the AI and its users, developers, owners, and wider society."[101] However, the transparency widely designed and discussed in XAI or the technological world has a different, narrower concept. It is normally perceived as an algorithmic or "formal properties of a computer system in isolation," which is an end in itself.[102] When the legal rules on transparency are directly translated into AI systems, the scientific techniques of XAI are burdened with requirements that exceed their enabling nature. Criticisms from the computer science community have deemed the

97 *Artificial Intelligence Act: Deal on Comprehensive Rules for Trustworthy AI*, EUR. PARLIAMENT NEWS (Sept. 12, 2023), https://www.europarl.europa.eu/news/en/press-room/20231206IPR15699/artificial-intelligence-act-deal-on-comprehensive-rules-for-trustworthy-ai [https://perma.cc/96NX-MD95].

98 As to AI systems with limited risks or low risks, only limited transparency obligations are imposed, such as flagging the use of an AI system when interacting with humans. *Proposed EU AI Act*, *supra* note 57, at 7.

99 *See* Umang Bhatt, Alice Xiang, Shubham Sharma, Adrian Weller, Ankur Taly, Yunhan Jia, Joydeep Ghosh, Ruchir Puri, José M. F. Moura & Peter Eckersley, *Explainable Machine Learning in Deployment*, *in* PROCEEDINGS OF THE 2020 CONFERENCE ON FAIRNESS, ACCOUNTABILITY, AND TRANSPARENCY 648, 654 (2020).

100 Julia Black, *The Development of Risk-based Regulation in Financial Services: Just 'Modelling Through'?*, *in* REGULATORY INNOVATION: A COMPARATIVE ANALYSIS 156, 156 (Julia Black, Martin Lodge & Mark Thatcher eds., 2005).

101 Balint Gyevnara, Nick Fergusona & Burkhard Schaferb, *Bridging the Transparency Gap: What Can Explainable AI Learn From the AI Act?*, 372 FRONTIERS IN A.I. & APPLICATIONS 964, 964 (2023).

102 *Id.*

legal requirements on transparency as being ineffective, overreaching, or technically infeasible.[103] Such misalignment also occurs with other key terms like "meaning" and "trust," which transcend technical design considerations.[104] The socio-technical gap makes the law and regulation akin to a black box when interacting with emerging technologies.

The pacing problem, regulatory silos, and the black box problem are only exemplary regulatory challenges in AI regulation. Additional legal problems and regulatory risks, such as cybersecurity, data privacy, and intellectual property protection, accompany the diverse models and applications of AI.[105] Both conventional regulatory quandaries and novel regulatory difficulties are strikingly conspicuous in AI governance. The once fascinating characteristics of emerging technologies—novelty, rapid advancement, interdisciplinary nature, and widespread prominence—have turned into devils for regulators. No longer can regulation assume constant and static behavior when the regulated subjects are ceaselessly changing with increasing developments and escalating impact. Regulation is challenged to step out of the comfort zone of repetitive and incremental patterns and forced to rapidly innovate while safeguarding predictability and certainty. Under these dire circumstances, proactive law, a rebellious posture of regulation, is proposed to reexamine the very essence of regulation and confront the multifaceted regulatory challenges brought by emerging technologies. The following Section will introduce this dynamic regulatory mindset to AI regulation and forecast the transformative effects it may instigate in the regulatory panorama.

103 Michael Veale & Frederik Zuiderveen Borgesius, *Demystifying the Draft EU Artificial Intelligence Act*, 22 COMPUT. L. REV. INT'L 97, 106-08 (2021).

104 Bernard Keenan & Kacper Sokol, *Mind the Gap! Bridging Explainable Artificial Intelligence and Human Understanding with Luhman's Functional Theory of Communication* 4 (2023), https://doi.org/10.48550/arXiv.2302.03460 [https://perma.cc/9Y9J-4AVC].

105 *See, e.g.*, Margot E. Kaminski, *Regulating the Risks of AI*, 103 B.U. L. REV. 1347, 1375 (2023); Andrew W. Torrance & Bill Tomlinson, *Governance of the A.I., by the A.I., and for the A.I.*, 93 MISS. L. J. 107, 124 (2023).

II. A NEW REGULATORY MINDSET: INTRODUCING PROACTIVE LAW TO EMERGING TECHNOLOGIES REGULATION

A. Proactive Law Revisited

Law and regulation may be either proactive or reactive. In the late 1990s, the overarching concept of "proactive law" surfaced as a foundational perspective in the American legal field and was later explored in Finland.[106] The first publication associated with the proactive law approach was a paper titled "Quality Improvement through Proactive Contracting," delivered by Helena Haapio at the Annual Quality Congress of the American Society for Quality in Philadelphia in 1998.[107] The paper argued that organizations could reduce legal risks by using contracting processes as planning tools.[108] It also advocated the adoption of proactive contracting activities that use contract review checklists and other tools to troubleshoot. [109] The first Proactive Law conference was later held in 2003 in Helsinki, Finland.[110]

The concept of "proactive law" draws significant inspiration from "preventive law," which was pioneered by Louis Brown, who is often recognized as the "Father of Preventive Law."[111] The focus of preventive law was on preventive lawyering, i.e., practicing law so as to predict and prevent legal risks and problems.[112] In a similar vein, proactive law aims to construct a "defense mechanism" that strengthens corporate management, "'vaccinating' businesspeople against the 'disease' of legal trouble, disputes, and litigation."[113] However, unlike preventive law, proactive law doesn't restrict its focus solely to lawyering. Instead, it extends its emphasis to a wider community that encompasses both legal professionals and clients,

106 Sjoberg, *supra* note 14.

107 George J. Siedel & Helena Haapio, *Using Proactive Law for Competitive Advantage*, 47 AM. BUS. L.J. 641, 657 (2010).

108 Helena Haapio & Annika Varjonen, *Quality Improvement through Proactive Contracting: Contracts Are Too Important To Be Left To Lawyers!*, 52 WORLD CONF. ON QUALITY & IMPROVEMENT 243 (1998).

109 *Id.*

110 Siedel & Haapio, *supra* note 107.

111 *Id.* at 659; Pohjonen, *supra* note 15.

112 Sjoberg, *supra* note 14, at 14 n.1.

113 Helena Haapio, *Introduction Proactive Law: A Business Lawyer's View*, 49 SCANDINAVIAN STUDS. L. 21, 22 (2006) (explaining that both proactive and preventive approaches share similarities with preventive medicine, which "prevent[s] the occurrence of disease").

particularly emphasizing large businesses.[114] In pursuit of resilient corporate management and well-being, proactive law emphasizes collaboration between legal experts and other experts, such as professionals in sales, purchasing, technology, human resources, and finance.[115]

The dynamic concept of proactive law evolves through the continued contributions of legal experts and scholars. While the source of the Proactive Law Movement is business and contract law, its influence reaches various other areas, including telecommunications,[116] tax law,[117] consumer protection,[118] international trade,[119] alternative dispute resolution,[120] ESG reporting governance,[121] and judicial system reform.[122] To cater to the escalating demand for practical methods and legal theories related to proactive law, the Nordic School of Proactive Law was established.[123] A series of academic publications and conferences followed the establishment of the organization, not only enriching the multifaceted meanings of proactive law but also positioning it as a future-oriented approach,

114 *Id.* at 24.

115 Pohjonen, *supra* note 15; Haapio, *supra* note 113, at 26 (arguing that proactive law "mandates . . . lawyers to join forces with other professions").

116 *See* Soren Sandfeld Jakobsen, *Entering New and Converging Media Markets: How to Take a Proactive Approach to Legal Issues in the Electronic Communications Sector*, 49 SCANDINAVIAN STUDS. L. 393 (2006).

117 *See* Frederick Zimmer, *Tax Legislation between Politics and Legal (and Economic) Thinking*, 49 SCANDINAVIAN STUDS. L. 385, 385 (2006).

118 *See generally* Kaisa Sorsa, *Proactive Law Approach and Consumer Protection – Comparing UK and Finnish Consumer Authorities Systems*, 3 JFT 211 (2010).

119 *See* Sorsa, *supra* note 14, at 52 (examining the proactive law approach within the context of food imports into the European market).

120 *See* Tarja Salmi-Tolonen, *Proactive Law and Alternative Dispute Resolution Mechanisms*, *in* PROACTIVE MANAGEMENT AND PROACTIVE BUSINESS LAW: A HANDBOOK 85 (Kaisa Sorsa ed., 2011).

121 *See* Adam Sulkowski & Ruth Jebe, *Evolving ESG Reporting Governance, Regime Theory, and Proactive Law: Predictions and Strategies*, 59 AM. BUS. L.J. 449, 449 (2022).

122 *See* Zoran Vukusic Bokan, *Proactive Law as a Part of the Judiciary System Reform in the Republic of Croatia*, *in* 26th INTERNATIONAL SCIENTIFIC CONFERENCE ON ECONOMIC AND SOCIAL DEVELOPMENT: BOOK OF PROCEEDINGS 524, 524 (2017).

123 The Nordic School comprises researchers and practitioners from Denmark, Finland, Iceland, Norway, and Sweden, all sharing a common interest in proactive law. NORDIC SCH. OF PROACTIVE L., https://www.juridicum.su.se/proactivelaw/main/ [https://perma.cc/PZS6-EB3N] (last visited Dec. 12, 2023); Siedel & Haapio, *supra* note 107, at 658.

especially in the era of the information society.[124] Here, the notion of "law" encompasses not only state-centric rules and regulations but also envisions law as a versatile instrument that can be molded in various ways to create success, improve efficiency, and foster sustainable relationships.[125] Within this expansive notion, law assumes both a command-and-control and facilitative role in society.

Thus, there are dual dimensions of proactive law: preventive and promotive. The preventive dimension is geared towards anticipating and averting legal risks and issues, while the promotive dimension centers on ensuring desired outcomes.[126] Further, the promotive aspect of proactive law seeks to assist all actors involved in legal relationships—whether individuals, businesses, or regulators—in creating values and achieving their objectives.[127] In a business context, the promotive dimension strives to achieve success by integrating legal knowledge into company strategies and engaging in risk-benefit analysis.[128] As Helena Haapio remarks, "[p]roactive law works best with a team approach of self-care joined with professional care."[129] Private entities can adopt a proactive law approach by establishing a set of rules and processes meticulously tailored to suit their specific operational needs.[130] Following this discourse, the proactive law approach has been scrutinized and adopted in legal spheres involving law and strategy, as well as in law for competitive advantage,[131] probing the interplay between these coexisting developments.[132]

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124 Sjoberg, *supra* note 14, at 13.

125 *Id.*

126 Siedel & Haapio, *supra* note 107, at 660.

127 Gerlinde Berger-Walliser, *The Past and Future of Proactive Law: An Overview of the Development of the Proactive Law Movement*, *in* PROACTIVE LAW IN A BUSINESS ENVIRONMENT 13, 27 (Gerlinde Berger-Walliser & Kim Østergaard eds., 2012).

128 Siedel & Haapio, *supra* note 107, at 660.

129 Haapio, *supra* note 113, at 26.

130 Sorsa, *supra* note 14, at 39.

131 A competitive advantage is a strategic method of creating value that is not currently used by existing or potential competitors. A competitive advantage is not easily replicable. An example of competitive advantage could be a firm instituting a "company-wide change that not only prevented illegal discrimination, but re-oriented company culture and practices towards full equal employment opportunity." Siedel & Haapio, *supra* note 107, at 643; Robert C. Bird, *Pathways of Legal Strategy*, 14 STAN. J. L. BUS. & FIN. 1, 4 (2018).

132 *See generally* Siedel & Haapio, *supra* note 107, at 641 (the first attempt to discuss and merge the common themes of proactive law and law for competitive advantage); GEORGE SIEDEL & HELENA HAAPIO, PROACTIVE LAW FOR MANAGERS: A HIDDEN SOURCE OF COMPETITIVE ADVANTAGE 11-84 (2011); Constance E.

The proactive approach has also been championed from a governmental perspective. Dag Wiese Schartum advocates for an expanded perspective on proactive law and urges the inclusion of government agencies in the realm of proactivity.[133] From a governmental standpoint, legal institutions, traditionally designed for predictability,[134] can benefit from proactive lawmaking that works with diverse stakeholders for the anticipation and resolution of problems in advance. Moreover, the extent of government proactivity determines the effort private actors need to invest in interpreting, predicting, and acting in compliance.[135] Proactivity from a governmental standpoint has been adopted by the EESC. In its Opinion, the EESC argues that a proactive approach should be embraced across all stages of the legal process, including planning, formulation, implementation, and revision of laws.[136] The EESC also goes beyond by combining the proactive law approach with a diverse set of new governance mechanisms, e.g. the encouragement of incorporating self-regulation and co-regulation when appropriate.[137] The EESC recommends that the focus of legislators and administrators should shift outward from within the legal system to the external users of the law: society, citizens, organizations, and businesses that the legal system intends to serve.[138] The proactive law approach, in harmony with the EESC's "better regulation" policy advocated, strives to make the law "comprehensible, accessible, acceptable, and enforceable."[139]

Continuing the discourse, Kaisa Sorsa explores the implications of proactive law within the domains of multi-level regulation and private regulation.[140] As regulation stems from various sources, the proactive law approach is applicable to both public and private regulators and may span every stage of regulation. Particularly, proactivity emerges as a central tenet for private regulators who have

Bagley, *What's Law Got to do with It?: Integrating Law and Strategy*, 47 AM. BUS. L.J. 587 (2010); Robert C. Bird, *Law, Strategy, and Competitive Advantage*, 44 CONN. L. REV. 61, 61 (2010); Larry A. DiMatteo, *Strategic Contracting: Contract Law as a Source of Competitive Advantage*, 47 AM. BUS. L.J. 727, 727 (2010).

133 Schartum, *supra* note 14, at 41.

134 AYRES & BRAITHWAITE, *supra* note 20, at 110.

135 Schartum, *supra* note 14, at 40.

136 EESC Opinion, *supra* note 14, § 2.8.

137 *Id.* § 1.7.

138 *Id.* § 1.8.

139 *Id.* § 3.4.

140 Sorsa, *supra* note 14.

become an empirical reality "deeply embedded in the regulatory landscape."[141] By examining food importation into the European market, Kaisa Sorsa provides an illustration of how the two dimensions of proactive law exert influence on private regulation within the food industry. On the prevention side, private actors prioritize risk management by establishing standards and promoting adherence to legal requirements.[142] On the promotive side, the emphasis shifts to achieving desired outcomes and managing opportunities.[143] In such instances, private regulatory systems often seek to distinguish products by addressing concerns like environmental and biodiversity protection and animal welfare, thereby carving out competitive advantages.[144] Private regulation through both dimensions of proactive law holds the potential to promote international trade, enhance consumer protection, and elevate food safety in the European food market.

The vitality of proactive law endures as sustained and collaborative efforts are required in most spheres of regulated social life. Transitioning from the general overview of proactive law, its relevance becomes particularly evident when considering the existing legal and regulatory landscape of emerging disruptive technologies. The next Section will provide a closer examination of legal and regulatory obstacles posed by emerging technologies, underscoring the heightened necessity of a proactive law approach. As discussed in the next Section, the unparalleled regulatory challenges of emerging technologies exemplified by AI call for a paradigm shift in regulatory thinking. Proactive law, with its anticipatory, preemptive, and promotive nature, seamlessly extends into the realm of technology regulation.

B. Expanding Proactive Law on Emerging Technologies Regulation

Navigating the regulatory landscape of emerging technologies is a challenging odyssey. Emerging technologies represented by AI have become a social, political, economic, and cultural complex, revolutionizing not only technological infrastructures but also legal

141 BRONWEN MORGAN & KAREN YEUNG, AN INTRODUCTION TO LAW AND REGULATION 280, 281 (2007).

142 Sorsa, *supra* note 14, at 52.

143 *Id.*

144 *Id.*

underpinnings. As elaborated on above, the proactive law approach is future-oriented where the goal is to promote desirable outcomes and maximize opportunities *ex ante* while preemptively minimizing problems and risks.[145] The proactive law approach transcends disciplinary boundaries, weaving its influence across a variety of fields. The past thirty years of the proactive law movement provide a rich narrative history that reflects the prominence of a new regulatory mindset. From the perspective of proactive law, which concerns "enabling and empowering,"[146] regulation is seen as an ever-evolving process of understanding rather than a mere exercise of command-and-control. The regulatory system becomes more self-reflexive when both the reactivity and proactivity of the system are heightened.[147]

Proactive regulation is also a reality requisite in the era of emerging technologies, as evidenced in the field of Science & Technology Studies (STS). With the advent of new innovations, the concept of "interpretive flexibility" governs the malleability of technological designs, allowing various social groups, including regulators, to shape the utility of the technology.[148] However, interpretive flexibility reaches closure where divergent opinions cease to be sustained.[149] Once this point is reached, the prospects of influencing and shaping technology uses diminish. An illustrative example lies in the early days of online privacy when users did not proactively safeguard their privacy as technology companies initiated the use of cookies for data collection in the 1990s.[150] When non-privacy norms became entrenched and attained closure within several years, attempts to reverse companies' privacy practices proved exceedingly difficult.[151] Thus, a proactive approach becomes pragmatically indispensable for regulators who wish to modify and channel the intended uses of emerging technologies. When technologies are still emerging, a proactive stance enables regulators to intervene early, influence technological designs, and achieve

145 EESC Opinion, *supra* note 14, § 2.1.

146 *Id.* § 1.5.

147 *See* Pohjonen, *supra* note 15, at 59.

148 Neil Doherty, Crispin Coombs & John Loan-Clarke, *A Re-Conceptualization of the Interpretive Flexibility of Information Technologies: Redressing the Balance Between the Social and the Technical*, 15 EUR. J. INFO. SYS. 569, 575 (2006).

149 *Id.*

150 Gaia Bernstein, *A Window of Opportunity to Regulate Addictive Technologies,* 2002 WIS. L. REV.: FORWARD 64, 72.

151 *Id.*

various objectives, like mitigating risks related to health, privacy, and discrimination, when conditions are more malleable to modification.[152]

Applying proactive law to emerging technologies involves the anticipation of and solutions to legal and regulatory problems before they arise, aligning with the rapidly evolving nature of technological progress. In the regulatory sphere of emerging technologies, a proactive approach necessitates the establishment of clear and malleable legal frameworks that not only address current concerns but also anticipate potential future risks and legal considerations associated with possible applications. Regulators with a proactive posture may not match the speed of innovation seen in emerging technologies; however, they will be more poised for the evolution of technology and its challenges. For example, in the recent Uniform Commercial Code (UCC) amendment, a new Article 12 was added to create a distinct property type that adapts to the transformative impacts of distributed ledger technology (DLT) on electronic commerce.[153] The prefatory note to Article 12 underscores that the proposed legal regime is meant to apply beyond electronic or invisible assets created on existing DLT technologies such as blockchains. It expressly aims to "apply to electronic assets that may be created using technologies that have yet to be developed, or even imagined."[154] With this proactivity in mind, the model law drafters deliberately employ vaguely coined words like "controllable electronic records" to accommodate existing changes as well as future ones.[155]

The existing literature on the proactive law approach is abundant. Nevertheless, academic discussions regarding the application of proactive law to technology regulation are rather scarce. The remaining part of this Article will usher this dynamic concept into the realm of emerging technologies, unveiling its potential to reshape the existing regulatory landscape. Grounded in the proactive law approach and other new governance discourses, this Article will propose, scrutinize, and model innovative regulatory strategies tailored to technology regulation via the examples of AI regulatory practices in different jurisdictions. As the ensuing discussion reveals, it becomes evident that a future-oriented proactive law will play a pivotal role in

152 Moses, *supra* note 60.

153 UNIFORM COMMERCIAL CODE § 12 (AM. L. INST. & UNIF. L. COMM'N 2022).

154 *Id.* § 12 prefatory note.

155 *Id*. § 12-101.

dealing with the unprecedented legal and regulatory challenges brought by emerging technologies. In mapping out the regulatory pathways to technology regulation, the connotation of proactive law will also be remodeled and embellished, brimming with newfound vitality.

III. TRYING TO LEAD: REINFUSING PROACTIVE LAW WITH THREE LAYERS

As emphasized in the EESC Opinion, the proactive law approach is envisioned to permeate the entire life cycle and various echelons of regulation.[156] The same principle applies in its application on regulating emerging technologies. This Part seeks to elucidate the proactive law approach within the context of emerging technologies by delineating three regulatory layers. The layers—proactive rulemaking, *ex ante* controls, and ever-evolving resilience—are driven by proactivity and supported by innovative regulatory strategies and instruments. Each layer is designed to address the regulatory complexities inherent in emerging technologies and offer more detailed solutions to pertinent challenges, such as the black box problem, regulatory silos, and the pacing problem.

Certainly, regulation is a complicated and multifarious process, and the strategies and approaches outlined in the three layers can highlight only some of the most crucial aspects of technology regulation. The classification of the three layers is for the simplicity and cohesiveness of describing the application of proactive law at different stages of regulation, rather than for precision and comprehensiveness. The following analysis will give examples of relevant regulatory policies and initiatives, particularly the ones that concern contentious issues surrounding AI-powered use cases. Notably, collaboration, coordination, and adaptability will be the linchpins for constructing a robust regulatory framework tailored to the intricacies of emerging technologies.

156 EESC Opinion, *supra* note 14, § 6.11.

A. Proactive Rulemaking: Channeling Technology Uses

1. Minimizing the Pacing Problem: Collaboration in Proactive Law

The proactive law approach provides a new regulatory mindset. Rather than viewing law as a mere constraint, cost, administrative burden, or protective measure, the proactive law approach considers law to be an empowering tool for creating success and nurturing sustainable relationships.[157] This departure challenges the traditional governance theory primarily centered around the state. In remodeling the proactive law approach to regulation, its focus will naturally rest on "non-state actors who interact with each other and the state in varied and complex ways."[158] Recognizing that mere efforts and perspectives from state actors are inadequate to anticipate and forestall all problems, cooperation among state and non-state actors becomes imperative. Different actors possess different resources crucial for distinct regulatory functions and have different regulatory capacities to employ these resources to achieve specific goals.[159] Proactivity encourages all actors to collectively identify potential issues and prevent them from arising.[160] Through collaboration, all stakeholders will be enrolled in a proactive regulatory system, deploying current and future resources to initiate actions and achieve desired objectives. Such a proactive law approach echoes collaborative governance's requirement of "[p]articipation by interested and affected parties in all stages of the decision-making process" with a "problem-solving orientation."[161]

In the regulation of emerging technologies, the proactive approach demands the engagement and cooperation of all actors, from governmental agencies and international bodies to research institutes, technology companies, experts, consumers, and community associations. Only an aggregated regulatory capacity can provide all the essential regulatory resources (e.g., information, expertise,

157 Berger-Walliser, *supra* note 127, at 16.

158 Julia Black, *Proceduralisation and Polycentric Regulation*, DIREITO GV L. REV. 99, 100 (2005).

159 Regulatory capacity is a composite notion consisting of actual or potential resources, together with the existence of actual or potential conditions in which those resources will be deployed. Regulatory resources are various and dependent on the desired regulatory ends. *Id.* at 108.

160 The EESC Opinion calls for involving stakeholders early in order to reach the desired goals under the proactive law approach. EESC Opinion, *supra* note 14, §1.6.

161 Freeman, *supra* note 18, at 22.

authority and legitimacy, strategic position, and organizational capacity)[162] and mitigate risks *ex ante* from all sources. For example, the implementation of automatic emergency braking (AEB) technology, which helps prevent crashes and minimize their severity by automatically applying vehicles' brakes, exemplifies successful collaboration.[163] To improve road safety, the Insurance Institute for Highway Safety (IIHS) and NHTSA have worked directly with automakers since 2016 to integrate AEB technology into their vehicles.[164] By 2023, twenty-one automakers, representing over 99% of the U.S.'s new-car market, voluntarily committed to incorporating AEB in their manufactured cars.[165] This partnership between private firms and public interest groups facilitated a new standard for most passenger vehicles in the U.S. before the AEB regulatory policy was proposed.[166] This example illustrates how private firms, through a nudge from governmental entities and independent organizations, are well-placed to form heightened industry standards, contributing to regulatory functions.

In the dynamic landscape of emerging technologies, private actors are often endowed with greater access to information and scientific expertise. Among them, large private firms can have greater organizational capacity, enabling them to regulate their internal affairs and extend their resources to address problems more broadly.[167] As tech firms continuously "exert[] control over [their] own membership and their behavior,"[168] self-regulation becomes important and inevitable. Self-regulatory bodies typically possess heightened levels of specialized expertise and technical knowledge that surpass that of

162 Black, *supra* note 158, at 108-10.

163 *Fact Sheet: Auto Industry Commitment to IIHS and NHTSA on Automatic Emergency Braking*, NHTSA & IIHS, https://www.nhtsa.gov/sites/nhtsa.gov/files/aeb_factsheet_031616.pdf [https://perma.cc/L3V7-FPA3] (last visited Oct. 31, 2024).

164 Peter Valdes-Dapena, *'The Federal Government Is Not Doing Their Job,' NTSB Chair Says About Automated Driving Tech*, CNN BUS. (May 6, 2023), https://edition.cnn.com/2023/05/06/business/ntsb-automatic-driving-safety/index.html [https://perma.cc/DH2B-DMBL].

165 *Id.*; NHTSA & IIHS, *supra* note 163.

166 NHTSA proposed a regulation in May 2023 requiring the deployment of AEB on all new passenger vehicles. *Proposed AEB Regulation Is an Important Step for Safety*, IIHS & HLDI (May 31, 2023), https://www.iihs.org/news/detail/proposed-aeb-regulation-is-an-important-step-for-safety [https://perma.cc/X4RM-GLGM].

167 Black, *supra* note 158, at 110.

168 ROBERT BALDWIN, MARTIN CAVE & MARTIN LODGE, UNDERSTANDING REGULATION: THEORY, STRATEGY, AND PRACTICE 137 (2012) (footnote omitted).

independent regulatory agencies.[169] Armed with expertise, tech firms can anticipate potential problems, formulate rules that are more acceptable to affected users, and proactively design and revise technological artifacts. Moreover, agility and speed sets self-regulation apart.[170] Self-regulatory approaches offer the advantage of expeditious outcomes without being encumbered by the formalities associated with official regulation.[171] This is particularly evident in the realm of AI regulation, where complicated risk management hinges on the unique capabilities of individual AI systems. The enactment of official regulations covering comparable concerns would require a multitude of procedures and entail a significant timeframe. Agency reluctance to deal with these complicated issues and procedures has a potential negative impact on the overall regulatory system, leading to a state of "ossification" within the agency's rulemaking process.[172] Therefore, self-regulation, for its elements of expertise, efficiency, and effectiveness, stands as a malleable and timely regulatory strategy that avoids or minimizes the pacing problem.[173]

There is a diverse array of institutional arrangements that can be categorized as self-regulation.[174] For example, large tech companies are at the forefront of developing guidelines and setting standards. These companies generate voluntary codes of conduct and release high-level policies driven by incentives to uphold public confidence across their technological domains.[175] "Industry self-regulation" is another collaborative model. As described by Kathleen Waugh and Gary E. Marchant, "businesses voluntarily police themselves through 'business-led initiatives' without regulatory intervention by the

169 *Id.* at 139.

170 *Id.* at 140.

171 JULIA BLACK, RULES AND REGULATORS 36 (2003)

172 William F. Pedersen, *Contracting with the Regulated for Better Regulations*, 53 ADMIN. L. REV. 1067, 1070 (2001); *see* McGarity, *supra* note 74.

173 Marchant, *supra* note 47, at 28-29; *see* Brian Rappert, *Pacing Science and Technology with Codes of Conduct: Rethinking What Works*, *in* THE GROWING GAP BETWEEN EMERGING TECHNOLOGIES AND LEGAL-ETHICAL OVERSIGHT 109, 110 (Gary E. Marchant, Braden R. Allenby & Joseph R. Herkert eds., 2011).

174 Anthony Ogus, *Rethinking Self-Regulation*, 15 OXFORD J. LEGAL STUD. 97, 99-100 (1995).

175 Tech firms may also self-regulate in pursuit of other incentives, such as fast-track opportunities and potential penalty avoidance. Mandel, *supra* note 11, at 85-87.

government."[176] Under the "enforced self-regulation" model, private firms are compelled by the government to write codes of conduct "tailored to the unique set of contingencies facing them."[177]

Indeed, considerable progress has already been made toward AI self-regulation. For example, fifteen leading AI companies, such as Meta, OpenAI, Microsoft, Google, IBM, Nvidia, and Scale AI, have pledged to adhere to a set of voluntary guidelines negotiated by the White House.[178] These guidelines are expected to enhance the transparency and safety of AI technology, with a special focus on Generative AI.[179] Furthermore, the EU AI Act encourages providers of non-high-risk AI systems to create codes of conduct to apply the mandatory requirements for high-risk AI systems voluntarily.[180] These codes may encompass voluntary commitments related to environmental sustainability, accessibility for persons with disabilities, stakeholder participation in the design and development of AI systems, and diversity within development teams.[181] Acknowledging that legislation often lags behind technological

176 Kathleen Waugh & Gary E. Marchant, *Collaborative Voluntary Programs: Lessons from Environmental Law*, *in* THE GROWING GAP BETWEEN EMERGING TECHNOLOGIES AND LEGAL-ETHICAL OVERSIGHT, *supra* note 173, at 183, 184.

177 John Braithwaite, *Enforced Self-Regulation: A New Strategy for Corporate Crime Control*, 80 MICH. L. REV. 1466, 1470 (1982).

178 *FACT SHEET: Biden-Harris Administration Secures Voluntary Commitments from Eight Additional Artificial Intelligence Companies to Manage the Risks Posed by AI*, THE WHITE HOUSE (Sept. 12, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/12/fact-sheet-biden-harris-administration-secures-voluntary-commitments-from-eight-additional-artificial-intelligence-companies-to-manage-the-risks-posed-by-ai/ [https://perma.cc/S65P-78YA]; *FACT SHEET: Biden-Harris Administration Secures Voluntary Commitments from Leading Artificial Intelligence Companies to Manage the Risks Posed by AI*, THE WHITE HOUSE (July 21, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/07/21/fact-sheet-biden-harris-administration-secures-voluntary-commitments-from-leading-artificial-intelligence-companies-to-manage-the-risks-posed-by-ai/ [https://perma.cc/V8UX-LFAT].

179 The commitments include conducting both internal and external assessments (red-teaming) of models or systems, promoting information sharing, encouraging third-party identification and reporting of issues and vulnerabilities, investing in cybersecurity, implementing a mechanism for users to discern AI-generated audio or visual content, issuing public reports for all significant new models, prioritizing research on societal risks associated with AI, and creating advanced AI systems to tackle major societal challenges. *Voluntary AI Commitments*, THE WHITE HOUSE, https://www.whitehouse.gov/wp-content/uploads/2023/09/Voluntary-AI-Commitments-September-2023.pdf [https://perma.cc/MYF3-FB6U] (last visited Sept. 26, 2024).

180 *Proposed EU AI Act*, *supra* note 57, art. 69.

181 *Id.*

advancements, the European Commission intends to lead a joint initiative with the U.S. to devise a voluntary code of conduct that would be adopted by tech companies.[182] The U.S./EU Trade and Technology Council (TTC) has already established expert groups to draft AI codes of conduct that address standards and tools for trustworthy AI, terminology for AI, and inherent risks posed by generative AI systems.[183] "Codes of conduct" are envisaged as means of self-regulation adept at keeping pace with the exponential growth of emerging technologies.[184]

Self-regulation can be responsive to changes in technologies and their accompanying risks. However, common criticisms of self-regulation center around capture and the lack of accountability and fairness procedures.[185] Partially due to these concerns, nearly all self-regulatory mechanisms of governmental significance are subject to some degree of external state influence. As discussed in the next Section, state actors, with their exclusive command-and-control power, will continue to be the mainstay in setting coherent standards and establishing overarching rules, even in the regulation of state-of-the-art technologies.

182 *See* Philip Blenkinsop, *EU Tech Chief Sees Draft Voluntary AI Code Within Weeks*, REUTERS (June 1, 2023), https://www.reuters.com/technology/eu-tech-chief-calls-voluntary-ai-code-conduct-within-months-2023-05-31/ [https://perma.cc/656X-NYHT].

183 Florin Zubaşcu, *EU and US Hatch Transatlantic Plan to Rein in ChatGPT*, SCI. BUS. (June 1, 2023), https://sciencebusiness.net/news/AI/eu-and-us-hatch-transatlantic-plan-rein-chatgpt [https://perma.cc/2BRC-FDSH].

184 *See* Antony J. Blinken, *Secretary Antony J. Blinken and U.S.-EU Trade and Technology Council Ministerial Co-Chairs at a Joint Press Availability*, U.S. DEP'T OF STATE (May 31. 2023), https://www.state.gov/secretary-antony-j-blinken-and-u-s-eu-trade-and-technology-council-ministerial-co-chairs-at-a-joint-press-availability/[https://perma.cc/LU24-QP7L] ("[T]he TTC has an important role to play in helping establish voluntary codes of conduct that would be open to all likeminded countries, particularly because there's almost always a gap when new technologies emerge between the time at which those technologies emerge and have an impact on people and the time it takes for governments and institutions to figure out how to legislate or regulate about them."). Blinken believed that codes of conduct can be established to mitigate the potential downsides of generative AI while amplifying its benefits. *Id.*; *see also* Rappert, *supra* note 173, at 110.

185 BALDWIN ET AL., *supra* note 168, at 142-46 (discussing the weaknesses of self-regulation in accountability and fairness); *see also* ANTHONY OGUS, REGULATION: LEGAL FORM AND ECONOMIC THEORY 108-09 (2004) (describing that traditional criticisms of self-regulation involves regulatory capture and "a low degree of public accountability").

2. Dismantling Regulatory Silos: Establishing Overarching Authority

As the proactive law approach calls for the cooperation of all actors in the regulation of emerging technologies, state actors are naturally included as an integral part of the blueprint. The importance of state actors has not been diminished by the increasing prominence of non-state actors nor the top-down approach adopted by a growing mixture of regulatory instruments. In a collaborative model, a state agency may take on duties in addition to its traditional role as a standard-setter and enforcer. It may be a "convenor-facilitator" orchestrating non-state actors' negotiations on defining objectives, standards, and the metrics for evaluation, or it may function as a "capacity builder" for institutions capable of engaging in co-regulation partnerships.[186] Manifested in the above examples, self-regulation, whether through industry guidelines, voluntary commitments, or codes of conduct, is shadowed by government scrutiny, government-led negotiation, or state-driven initiatives.

The traditional role of state actors as rule-makers shifts within the collaborative model for technology regulation. In a proactive regulatory framework where self-regulators contribute to frontier codes of conduct and diverse guidelines at national and supranational levels, state actors assume the responsibility of harmonization. To ensure the harmonization among different technical standards and practices, they may be tasked with crafting overarching rules or nudging private regulators to reach consensus on interoperable standards. Government can also establish a coordination authority, overseeing the applications of these technologies, promoting interoperability, and ensuring seamless integration while minimizing legal uncertainties and risks. In fact, the notion of endowing state actors as coordinators echoes with the theories of new governance regimes, even polycentric governance. In polycentric governance, multiple centers of decision-making collaborate to decide the authorized actions and act non-hierarchically. However, they act "under a common set of overarching rules"[187] and have "recourse to central mechanisms to resolve conflicts."[188] Larger, general-purpose

186 Freeman, *supra* note 18, at 11, 15.

187 McGinnis, *supra* note 19, at 1-2; Josephine van Zeben, *Polycentricity*, *in* ROUTLEDGE HANDBOOK OF THE STUDY OF THE COMMONS 38, 38 (Blake Hudson, Jonathan Rosenbloom & Dan Cole eds., 2019).

188 Vincent Ostrom, Charles M. Tiebout & Robert Warren, *The Organization of Government in Metropolitan Areas: A Theoretical Inquiry*, 55 AM. POL. SCI. REV.

governmental agencies are apt authorities to cope with conflicts and address problems of coordination which are chronic and deep-rooted in self-regulatory regimes.

The other dimension of coordination is targeted at governmental agencies. Interagency coordination stands out as a significant challenge of modern governance,[189] particularly exacerbated by the diffusion of emerging technologies. General-purpose technologies, exemplified by AI, have multiple affordances, enable diverse tasks, and achieve multifarious purposes within one foundation model. One piece of technology combines not only traditionally siloed applications but also creates an unprecedented "shared regulatory space"[190] where numerous agencies are faced with the same technological artifacts. For example, AI companies built on foundation models can establish a platform that provides self-generated professional consultations that offer financial, medical, and legal advice.[191] The services offered by the platform would fall under multiple regulated domains. Despite efforts by regulatory agencies to mandate rules or issue guidance within their sectors, there may be variations in stringency. Additionally, some regulators may still remain silent on related AI applications. The discrepancy can be traced to varied standard-setting methodologies, capabilities, and access to AI expertise. The AI companies in this scenario would be subject to different oversight mechanisms, leading to regulatory inconsistency that would pose a great obstacle to their market development, particularly if they are small and medium-sized enterprises (SMEs). In this context, overarching rules or authority become essential to ensure

831, 831 (1961). However, it is noteworthy that under polycentric governance theories, the involvement of governmental officials should be more limited compared to traditional top-down regulatory regimes. *See* McGinnis, *supra* note 19, at 31 ("So long as external governmental officials give at least minimal recognition to the legitimacy of such rules, participants may be able to enforce the rules themselves.").

189 Jody Freeman & Jim Rossi, *Agency Coordination in Shared Regulatory Space*, 125 HARV. L. REV. 1131, 1134 (2012) (arguing that many areas of regulation are "characterized by fragmented and overlapping delegations of power to administrative agencies").

190 The use of "shared regulatory space" here is in a slightly different way. Instead of describing "a wide variety of delegations to multiple agencies," this Article uses "shared regulatory space" to emphasize the shared regulatory subjects and identical and interrelated regulatory concerns brought by general-purpose technologies. *Id.* at 1145.

191 The example here is drawn from DEP'T FOR DIGIT., CULTURE, MEDIA & SPORT, ESTABLISHING A PRO-INNOVATION APPROACH TO REGULATING AI: AN OVERVIEW OF THE UK'S EMERGING APPROACH 15 (2022).

a coherent compliance process and prevent duplicative or conflicting requirements from different regulators, especially for businesses operating across or between industry sectors.

In the history of regulatory coordination over the past decades, a series of coordination instruments have been identified. These include joint policymaking, establishing a new agency dedicated to coordination, or designating an existing regulator as the "lead regulator."[192] For instance, on January 24, 2024, the European Commission published its decision to establish the European Artificial Intelligence Office, also known as the AI Office.[193] The AI Office will evaluate and monitor the GPAI models, and oversee the implementation and enforcement of the new rules governing various AI applications.[194] In the U.K., the Digital Regulation Cooperation Forum (DRCF) was created in 2020 to promote coherent and consistent digital regulation, coordinating four British regulators: the Competition and Markets Authority (CMA), the Financial Conduct Authority (FCA), the Information Commissioner's Office (ICO), and Ofcom.[195] However, it remains unclear whether the role of DRCF will expand to take on a coordination position in regulating AI.[196]

3. Developing an Interaction Relation with the Black Boxes

Different from the centuries-old reactive approach, the proactive law approach shifts its focus toward the future rather than dwelling on the past. It concentrates on the practical application and reception of

192 Freeman & Rossi, *supra* note 189, at 1166 (giving examples of joint rulemaking by two or more agencies to adopt a single regulatory preamble and text); Alejandro E. Camacho, *De- and Re-Constructing Public Governance for Biodiversity Conservation Symposium: Governing Wicked Problems*, 73 VAND. L. REV. 1585, 1598, 1620 (2020) (giving examples of appointing the National Marine Fisheries Service (NMFS) as the lead regulator for marine species and the Fish and Wildlife Service (FWS) for freshwater and wildlife species, and FWS-NMFS joint regulations).

193 Commission Decision of 24 January 2024 Establishing the European Artificial Intelligence Office, 2024 O.J. (C 1459).

194 *Id.* art. 3.

195 *About the DRCF*, DRCF, https://www.drcf.org.uk/about-us [https://perma.cc/222G-XR8D] (last visited Jan. 19, 2024).

196 In the policy paper, an expanded role for the DRCF in a new regulatory framework for AI has been discussed. *A Pro-Innovation Approach to AI Regulation*, SEC'Y OF STATE FOR SCI., INNOVATION & TECH. (Aug. 3, 2023), https://www.gov.uk/government/publications/ai-regulation-a-pro-innovation-approach/white-paper#annex-a-implementation-of-the-principles-by-regulators [https://perma.cc/3S3S-73G9].

the law in everyday life, emphasizing the interactions within the systems it aims to influence.[197] The interaction that proactive law values is notably absent in the regulation of AI black boxes. Whether seeking interpretability, explainability, or intelligibility, the existing regulatory approaches are devised to chop open the black boxes, revealing their internal logic, mechanisms, and rationale of the decision-making or prediction process. Indeed, all these measures are necessary. They help build trust, safeguard fairness, and improve accountability. Nevertheless, they overlook one warned pitfall from the systems theory: no system can act directly upon another and attempts to do so invite regulatory failures.[198] Regulation as an external influence on other systems is feasible, but only within the bounds of the respective self-production.[199] Regulatory strategies that neglect to maintain and conform to self-producing internal interactions will "ultimately run aground on the internal dynamics of self-referential structures" in both the regulating of and within the regulated system.[200] According to Teubner, black boxes do not become "whitened" by illuminating their obscure internal conversion process; instead, the "whitening" process involves observing the external patterns of black boxes, understanding their relationships to other systems, and developing interactive communication frameworks.[201] This is the regulatory strategy that proactive law resonates with and intends to integrate to complement the existing black box regulation.[202]

Communication is paramount in this context. First, instead of clinging to unraveling the intricacies of algorithmic decision-making or demanding algorithms to solve the transparency issues within the legal realm, the proactive rulemaking process will focus on the *circumstances* in which algorithmic decision-making can actively

197 EESC Opinion, *supra* note 14, §1.4.

198 *Juridification*, *supra* note 7, at 21.

199 Legal regulations are accepted by environmental systems only as external triggers for internal developments which are no longer controllable by law. *Id.* at 20-21.

200 *After Legal Instrumentalism?*, *supra* note 21, at 309.

201 *See id.* at 320. ("Black boxes become 'whitened' in the sense that an interaction relation develops among them which is transparent for them in its regularities.").

202 The proactive law approach sees law as an enabler, echoing the logic of the reflexive law created by Gunther Teubner. Pohjonen, *supra* note 15, at 59 (footnote omitted) ("Social needs are met by creating self-regulatory mechanisms structured by law. Law is seen as interactive and functioning in specific environments.").

contribute to an ongoing communication in society.[203] Recognizing the dynamic nature of the interaction between AI and law, it is necessary to consider the operational context of AI systems, the stakeholders it encompasses, use cases, its intended purposes, and the environment. For instance, in the field of healthcare, a specialized clinic's AI-based medical device may provide more sophisticated and useful recommendations in comparison to a similar device used in a less specialized rural hospital.[204] The way these medical devices perform in real-life situations may differ from simulated testing due to human factors and the intricate interaction of these complex systems with the environment.[205] Taking these circumstances into account will prevent the imposition of impractical or unattainable regulatory standards on technological systems.

To enhance communication, it is also imperative to explicate legal principles such as transparency, accuracy, accountability, and trust when engaging with the algorithmic decision-making process. While the ambiguity of these legal terms is often benign in the context of regulatory flexibility, it concurrently gives rise to miscommunication when interfacing with technological systems, owing to the inherent different systemic meanings of these concepts.[206] Legal definitions also often become outdated with the rapid evolution of emerging technologies. The U.K.'s policy paper has proposed an approach that outlines the core characteristics of AI instead of giving it a detailed, universally applicable definition.[207] The paper advances that "by setting out these core characteristics, developers and users can have greater certainty about scope and the nature of UK regulatory concerns while still enabling flexibility—recognising that AI may take forms we cannot easily define today—while still supporting coordination and coherence."[208] Clear definitions of technical terms are also necessary. The definition of the "output" of AI systems is absent from the EU AI Act, but the legal

203 Keenan & Sokol, *supra* note 104, at 2.

204 Sara Gerke, *Health AI for Good Rather than Evil? The Need for a New Regulatory Framework for AI-Based Medical Devices*, 20 YALE J. HEALTH POL'Y L. & ETHICS 433, 504-05 (2021).

205 *Id.*

206 *See supra* Part I. B.

207 *Establishing a Pro-innovation Approach to Regulating AI*, GOV.UK (July 20, 2022), https://www.gov.uk/government/publications/establishing-a-pro-innovation-approach-to-regulating-ai/establishing-a-pro-innovation-approach-to-regulating-ai-policy-statement [https://perma.cc/G8C3-9PBD].

208 *Id.*

criteria for transparency are contingent on factors that need clarification to some extent.[209]

Interaction with AI black boxes is an evolving and dynamic process. Regulatory approaches should adapt and restructure their patterns of interaction with emerging technologies in a timely manner. By addressing the factors discussed in this Section, the socio-technical gap could be ameliorated. After all, the socio-technical gap is a social construction, and "it is society that has needs of technology and not the other way around."[210]

B. Ex Ante Controls: Cooperative Regulatory Practices on Emerging Technologies

All regulatory strategies must be realized through enforcement mechanisms, and their success ultimately hinges on these processes. The same is true for the proactive law approach. The concept of compliance and enforcement, as explored in various regulation literature, extends beyond legal actions to encompass a wide range of informal practices, including persuasion, education, advice, and negotiation.[211] In alignment with the principles of the proactive law approach, this Part draws into focus the voluntary, agile, and cooperative aspects of the enforcement process in the realm of emerging technologies.

Under the proactive law approach, successful enforcement is not an end but rather an integral part of a larger plan to attain certain desired objectives. As stated in the EESC Opinion:

The life cycle of a piece of legislation does not begin with the drafting of a proposal or end when it has been formally adopted. A piece of legislation is not the goal; its successful implementation is. Nor does implementation just mean enforcement by institutions, it also means adoption, acceptance and, where necessary, a change of behaviour on the part of the intended individuals and organisations.[212]

To achieve its desired goals, enforcement may take diverse forms and employ various instruments. Voluntary and spontaneous

209 Gyevnara et al., *supra* note 101, at 969. There is no explicit definition of "output" in the proposed EU AI Act. *Proposed EU AI Act*, *supra* note 57, art. 3.

210 Keenan & Sokol, *supra* note 104, at 2.

211 BRIDGET M HUTTER, COMPLIANCE: REGULATION AND ENVIRONMENT 12 (1997).

212 EESC Opinion, *supra* note 14, § 2.5.

compliance is encouraged, with legal penalties being a last resort.[213] The proactive law approach occupies a distinctive position within the regulatory arena of emerging technologies, asserting that voluntary, cooperative, and agile enforcement mechanisms can effectively advance the fundamental goals of society without stifling technology innovation.

1. Preventive Dimension: Detection and Punishment

As outlined in Part I, the proactive law approach has two dimensions: preventive and promotive.[214] The former prevents problems and legal risks from materializing while the latter is more constructive, fostering desirable outcomes and encouraging positive conduct. Originally devised as a corporate strategy, proactive law nurtures legal well-being and promotes a sense of "self-care" among companies through the two dimensions.[215] When applied to regulatory frameworks, the proactive law approach transforms regulatory enforcement into a harmonious blend of prevention and construction.[216] In the regulation of emerging technology, this synergy may prove beneficial not only in curbing non-compliance of private actors, but also in engendering trust, innovation, and responsibility. Both dimensions, as illustrated in this Section, carry equal significance and will be implemented concurrently.

The preventive dimension involves giving more importance to detecting and monitoring and relying on *ex ante* controls to mitigate the magnitude of problems. In the rapidly evolving technological environments, rules "striv[ing] for universal applicability" inevitably face challenges due to the continuous emergence of new applications and risks, leading to "particularistic irrationality."[217] Prompt enforcement constitutes an integral aspect of proactive regulation on emerging technologies, given that regulators, in racing against technology closure, have a limited time frame to shape technology uses in pursuit of social objectives.[218] Enforcement will be difficult when business interests are entrenched in a specific technology usage,

213 *Id.* § 3.2 ("The recourse to legal proceeding is the exception—the 'ultimate ratio.'").

214 *See supra* Part I.A.

215 Berger-Walliser & Shrivastava, *supra* note 12, at 436.

216 *See id.* at 469-72.

217 AYRES & BRAITHWAITE, *supra* note 20, at 110 (footnote omitted).

218 *See supra* Part II.B.

and laws are less effective where the undisputed repetitive use of a certain technology has become the new social norm.[219] Consider the instance of deepfakes. The disturbing use of "deepfakes" was initially considered as a mere variation of plentiful fake motion pictures online.[220] However, within a few years, the widespread proliferation of millions of AI-fused deepfakes has given rise to privacy concerns, criminal risks, and threats to democracy and national security.[221] Private companies are hesitant to filter or block content that doesn't clearly violate the law, adding complexity to the regulatory landscape.[222] Regulators are now faced with complicated challenges and myriad harms associated with the diffusion of deepfake technology across the Internet.

Regulators must act early. Agile measures are required in the initial stages of uncovering non-compliant behavior. Yet, when dealing with technology applications, enforcers often encounter formidable challenges in monitoring wayward conduct, especially in extensively regulated communities where, in the case of deepfakes, every online user is a possible offender.[223] As technologies mature and diffuse, violating rules becomes cheap and can be clandestinely executed, the impact of which may be global.[224] Preventive enforcement will rely on flexible and swift non-state controls rather than pure state measures to identify non-compliant and undesirable behaviors. Private firms will play a crucial role in the detection process by resolving the resourcing problem through their enormous power to

219 Bernstein, *supra* note 150, at 74.

220 In 2018, a study reported the detection of less than 10,000 deepfakes on the Internet. Daniel Byman, Chris Meserole & V. S. Subrahmanian *The Deepfake Dangers Ahead; AI-Generated Disinformation, Especially from Hostile Foreign Powers, is a Growing Threat to Democracies Based on the Free Flow of Ideas.* WALL ST. J. (Feb. 23, 2023), https://www.wsj.com/articles/the-deepfake-dangers-ahead-b08e4ecf [https://perma.cc/M9CV-WREU].

221 Bobby Chesney & Danielle Citron, *Deep Fakes: A Looming Challenge for Privacy, Democracy, and National Security*, 107 CALIF. L. REV. 1753, 1771-86 (2019) (discussing a variety of harmful uses of deepfake technology); *see also* Jack Langa, *Deepfakes, Real Consequences: Crafting Legislation to Combat Threats Posed by Deepfakes*, 101 B.U. L. REV. 761, 769-74 (2021) (discussing deepfake harm to national security and election interference).

222 Chesney & Citron, *supra* note 221, at 1765.

223 *See* BALDWIN ET AL., *supra* note 168, at 228.

224 In the instance of deepfakes, there are multiple online deepfake apps that the public can download and use. A quick Google search uncovers over 36 accessible deepfake apps. However, it is noteworthy that the deepfake technology itself is neutral, possessing both benefits and harms to society. For benefits of the deepfake technology, see Chesney & Citron, *supra* note 222, at 1769-70.

moderate content. Compared to state actors, private firms are more agile at updating monitoring mechanisms to detect new forms of non-compliance and prevent the dissemination of illegal deepfakes at the outset. In practice, tech companies, leveraging their cutting-edge access to emerging AI technology, are already developing automated techniques for detecting deepfakes. Google Deep Mind has introduced a beta version of SynthID, capable of watermarking and identifying AI-generated content by embedding an imperceptible digital watermark into the pixels, which are detectable for identification purposes.[225] Early efforts at detection are not exclusive to public sectors and private firms. Various stakeholders, including research institutions, non-profit organizations, experts, and online users, can contribute to the enforcement process through the developing detention algorithms, providing education on deepfake harms, and enhancing awareness of misinformation.[226]

Moreover, the ever-evolving variation of deepfakes demands continuous refinement of detection mechanisms, a responsibility expected of tech companies. Despite tech companies' current earnest endeavors to develop methods for detecting deepfakes, their passion may wane as detection improvement becomes a constant need. Strategic punishment may be employed to "underwrite[] regulatory persuasion as something that ought to be attended to."[227] The recent revision of the DEEPFAKES Accountability Act of 2023 (DEEPFAKES Act) is a good illustration.[228] The DEEPFAKES Act

225 Jennifer Kite-Powell, *Google Launches Tool That Detects AI Images In Effort To Curb Deepfakes*, FORBES (Aug. 31, 2023), https://www.forbes.com/sites/jennifer hicks/2023/08/31/google-launches-tool-that-detects-ai-images-in-effort-to-curb-deepfakes/?sh=7be6d73b5ee5 [https://perma.cc/KY49-QQE5].

226 For example, researchers from various universities have developed methods to identify fraudulent videos and detect digital manipulations. *See* Nina I. Brown, *Deepfakes and the Weaponization of Disinformation*, 23 VA. J. L. & TECH. 1, 23 (2020).

227 AYRES & BRAITHWAITE, *supra* note 20, at 25.

228 DEEPFAKES Accountability Act, H.R. 5586, 118th Cong. (2023-2024). The bill was originally introduced in the 116th Congress in 2019 to offer recourse for victims of deepfake porn. Since then, notable progress has occurred in the technology related to the creation and detection of deepfakes, as well as digital content provenance. The bill has been updated to recognize the advances and changes in these technologies. Press Release, Congresswoman Yvette D. Clarke, Clarke Leads Legislation to Regulate Deepfakes (Sept. 21, 2023), https://clarke.house.gov/clarke-leads-legislation-to-regulate-deepfakes/ [https://perma.cc/KL9R-GEQR].

contains provisions not only addressing private sector collaboration[229] but also imposing detection requirements for online platforms. Online platforms are required to have the technical capability to embed digital content provenance, and they will be held liable if they lack a system to effectively identify deepfakes.[230] A tough punitive response is a key component of a cooperative regulatory practice, ensuring a genuine and ongoing private self-enforcement when confronting the ever-evolving landscape of emerging disruptive technologies.

2. Promotive Dimension: Capacity Building of Private Actors

The other dimension of proactive law is promotivity. If the preventive dimension aims to collaborate with all actors to foster early intervention and minimize problems, the promotive dimension looks beyond individual aberrant behaviors to address systemic non-compliance through *capacity building*. Proactive law believes that prevention alone is insufficient; rather, law should act as a positive force, ultimately encouraging good behavior and assisting stakeholders—both state and non-state actors—in achieving their objectives.[231] The promotive dimension carries the additional responsibility of value creation alongside preventing legal problems and disputes.[232] Through this dimension, proactive law recognizes that the economic self-interest of private actors is a driving force that, if adequately harnessed by the regulator, can help them in attaining policy goals.[233]

This idea correlates with what responsive regulation terms *capacity building*, which emphasizes the augmentation of private actors' capabilities and the cultivation of trust.[234] According to John Braithwaite, many regulatory problems could be addressed by "expanding the managerial capacities of regulated actors to solve them

229 H.R. 5586 §§ 7(b), 10.The DEEPFAKES Act pledges that the Department of Homeland Security will establish an information sharing program and create various detection methods. These measures aim to enable online platforms to alert each other, thereby preventing the dissemination of malicious deepfakes or related forgeries. *Id.* § 9.

230 *Id.* § 10.

231 Berger-Walliser, *supra* note 127, at 16, 22, 30-31.

232 Berger-Walliser & Shrivastava, *supra* note 12, at 471.

233 *Id.*

234 *See* John Braithwaite, *Types of Responsiveness*, *in* REGULATORY THEORY: FOUNDATIONS AND APPLICATIONS 117, 124 (Peter Drahos ed., 2017).

for themselves."[235] Regulators should not hastily resort to law enforcement solutions before considering a range of approaches that support capacity building.[236] Braithwaite proposes a pyramid of support, where an escalation of measures could be taken by regulators to expand the strength of those being regulated, thereby encouraging more effective and responsive problem-solving.[237] In the context of deepfake technology, instead of enforcing harsh sanctions on companies, the promotive approach will encourage competition in detection methods to elevate deepfake monitoring through new ceilings. Through a series of governmental support, ranging from education, informal praise, and prizes, and research grants to top-level reformed patent incentives,[238] tech companies are expected to create new detection technologies to combat misinformation. When private firms receive various forms of support from the state, they are more likely to respond to these expectations.

The promotive enforcement will also enhance trust in emerging technologies. Lack of trust, shadowed by black boxes, has been a stumbling block in the adoption of many innovative AI applications. As noted by Niklas Luhmann, "[t]rust rests on illusion."[239] In reality, trust could be obtained despite a deficit of information. The promotive dimension would not be confined to the opening of black boxes; it would involve building trust by empowering private actors. Trust could be built upon responsible corporate behavior and an accountable regulatory structure without revealing and interpreting every snippet of information. In fields like healthcare AI systems, where explainability is largely lacking, trust can still be engendered by enhancing provider competence, prioritizing patient interest, and ensuring information integrity.[240] All these elements collectively eliminate mistrust or the absence of trust in AI by promoting better business practices and cultivating a more trustworthy industry. Consequently, the black box problem can be approached through a

235 John Braithwaite, *The Essence of Responsive Regulation*, 44 U.B.C. L. REV. 475, 480 (2011).

236 *Id.*

237 *Id.* at 481-82.

238 *Id.*

239 NIKLAS LUHMANN, TRUST AND POWER 32 (1979).

240 Robin C. Feldman, Ehrik Aldana & Kara Stein, *Artificial Intelligence in the Health Care Space: How We Can Trust What We Cannot Know*, 30 STAN. L. & POL'Y REV. 399, 413-19 (2019) (suggesting refining and strengthening existing healthcare structures to enhance trust in AI).

range of government initiatives that push the performance of leading actors through new ceilings and thus make it easier to raise expectations for those lagging behind. It is important to note that promotive measures will not adhere to a step-by-step escalation of support but will be contingent on the regulated activities to determine the incentives.[241]

The proposed cooperative regulatory practice is advantageous for the effective enforcement of and compliance with technology regulation. Nevertheless, taming technology is a delicate equilibrium. Despite the emphasis of the proactive law approach on voluntariness, cooperation, and a culture of compliance, non-compliance in high-risk activities or unacceptable behaviors may necessitate a prompt transition to deterrence and sanctions as appropriate measures. It is necessary that, within these two dimensions, proactive regulation will deploy both persuasive and punitive strategies to govern emerging technologies.

C. Embedding Resilience in Technology Governance

Technology is in a constant state of evolution, demanding corresponding regulatory strategies. While proactive law aims to anticipate, quantify, prevent, and mitigate future risks tied to emerging technologies, this forward-looking approach will be flawed if it does not take into consideration the resilience of regulation. Originally a concept from ecology and now applied to social systems,[242] resilience refers to a system's capability to "absorb and respond to the effects of potentially hazardous events."[243] Although anticipating and managing

241 *Cf.* step-by-step escalation of support, see Braithwaite, *supra* note 235, at 481-82.

242 OSTROM, *supra* note 19, at 67.

243 Cass R. Sunstein, *Foreword: On the Imperative of Adapting to Climate Change*, 39 YALE J. ON REG. 469, 472 (2022) [hereinafter *Adapting to Climate Change*]. Resilience is a term of many meanings in many contexts. Resilience could be perceived as being an outcome, a system property, or a process. As Cass R. Sunstein comments, "Resilience is a matter of degree." The term "resilience" used in this Article pertains to an envisioned ideal state that the regulatory framework for emerging technologies should encompass, and it also refers to the process where regulators actively adapt to inevitable challenges, building a resilient mechanism and constructing an improved system in response. Cass R. Sunstein, *Beyond the Precautionary Principle*, 151 U. PA. L. REV. 1003, 1056 (2003) [hereinafter *Beyond the Precautionary Principle*]; NAT'L SCI. & TECH. COUNCIL, RESILIENCE SCIENCE AND TECHNOLOGY GRAND PATHWAYS FRAMEWORKS 2 (2023), https://www.whitehouse.gov/wp-content/uploads/2023/03/Resilience-Science-and-Technology-Grand-Pathways-Framework.pdf [https://perma.cc/2UJW-BKTN].

risks is crucial for dealing with the rapid growth and new-fangled applications of emerging technologies, there is a potential pitfall—a "one and done" regulatory mindset that is particularly prone to error. Such a static regime also exacerbates the tension with self-regulation, the latter being more fine-tuned to real-world changes and uncertainties. This Section consummates the proactive law approach by incorporating resilience into the regulatory framework and outlining a trial-and-error process essential for technology regulation. As this Section reveals, resilience should not be overlooked in constructing an adaptable regulatory regime on emerging technologies.

Resilience, at its core, emphasizes the trait of "bouncing back" to "anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions."[244] The concept of resilience intertwines with adaptation, which refers to adjustments in response to new or changing environments to mitigate adversity.[245] Resilience in proactive law is rather uncovered than invented. In the EESC Opinion, the proactive law approach is described as providing "a new way of thinking which takes as its starting point the real-life needs . . . of individuals and businesses."[246] Only through a dynamic process can proactive law truly be responsive to the ever-changing risks and issues reality presents. In this vein, proactivity and resilience are not polar opposites. Instead, they both recognize the imperative to flexibly adjust requirements and methods in response to real-world developments, though different in modalities.[247] The OCED's Recommendation for agile governance also stresses the role of resilience in unlocking the full potential of

244 JANE A. LEGGETT, CONG. RSCH. SERV., CLIMATE CHANGE: DEFINING ADAPTATION AND RESILIENCE, WITH IMPLICATIONS FOR POLICY 2 (2021), https://sgp.fas.org/crs/misc/IF11827.pdf [https://perma.cc/Z4NY-NDCA].

245 *Adapting to Climate Change*, *supra* note 243, at 472; *Beyond the Precautionary Principle*, *supra* note 243, at 1056; Gary E. Marchant & Yvonne A. Stevens, *Resilience: A New Tool in the Risk Governance Toolbox for Emerging Technologies*, 51 U.C. DAVIS. L. REV. 233, 236 (2017) (pointing out that the principle of resilience is in conformance with adaptive management); NAT'L SCI. & TECH. COUNCIL, *supra* note 243, at 6 (noting the relationship between resilience and adaptive capacity).

246 EESC Opinion, *supra* note 14, §§ 2.3, 2.

247 The nature of resilience is *ex post* given its focus on the capacity to recover after harm has occurred. However, resilience can be planned *ex ante*, such as resilience by design. In this case, only resilience's implementation is *ex post*. Marchant & Stevens, *supra* note 245, at 236, 244.

innovation and transforming the regulatory policy from the traditional "regulate and forget" to "adapt and learn."[248]

It is accordingly useful to view resilience as a technology governance tool employed throughout the entire life cycle of the regulatory process.[249] The proactive law approach not only requires the courage to navigate uncertainties but also demands the willingness to devise solutions while leaving room for the reevaluation of both solutions and objectives. Confronted with the ever-shifting panorama of technological progress and its manifold regulatory challenges, proactive regulation emerges as an essential endeavor. Proactivity affords agile and anticipatory responses to regulatory crises; however, it is not without potential missteps. Some proactive solutions will be only provisional, some may fail, and some goals may need modification.[250] To this end, resilience takes on paramount importance. Regulators need to conduct post-implementation assessments to gauge the effectiveness of regulations. Timely revisions are required to enhance adaptability against evolving risks. Resilience provides a sustainable process to mitigate the pacing problem inherent in regulating emerging technologies.

As an illustration, a regulatory framework embedded with resilience will decide that enforcement doesn't end with enforcing, i.e., the application of rules, regulations, and standards on the ground. To complete the whole enforcement cycle, it will be necessary to assess enforcement activities and modify enforcement tools and strategies based on past experiences.[251] Furthermore, even though assessment and modification typically occur after the fact, they could be strategically designed beforehand. These actions are not isolated; instead, they are interlinked and impact the performance of other regulatory components, like detection and execution, either positively

248 ORG. ECON. COOP. DEV. [OECD], PRACTICAL GUIDANCE ON AGILE REGULATORY GOVERNANCE TO HARNESS INNOVATION (2021), https://legalinstruments.oecd.org/public/doc/669/9110a3d9-3bab-48ca-9f1f-4ab6f2201ad9.pdf [https://perma.cc/B2JK-WHJA].

249 Resilience is regarded as the fourth and least developed tool in technology governance, the other three tools being risk analysis, precautionary principle, and liability. Marchant & Stevens, *supra* note 245, at 244.

250 *See* Mark A. Lemley & Eugene Volokh, *Law, Virtual Reality, and Augmented Reality*, 166 U. PA. L. REV. 1051, 1135 (2018) ("Setting legal rules too early risks rendering those rules irrelevant as the technology moves in unexpected ways. Worse, legal rules can unduly channel or stifle the development of technology.").

251 Robert Baldwin & Julia Black, *Really Responsive Regulation*, 71 MOD. L. REV. 59, 76 (2008) (proposing that there are five elements of enforcement, including assessing success or failure and modifying approaches).

or negatively.[252] Likewise, proactive rulemaking unfolds as an iterative process where lessons based on real risks and harms will be translated onto adjusted regulations.

However, the likelihood is that the complexity and rapid growth of emerging technologies will outstrip the capacities of the regulatory agencies to frame resilient policies and standards.[253] As stressed by the U.S. National Science and Technology Council, "effective and meaningful resilience is synergistic," calling for a collaborative effort from all stakeholders to understand and adapt to emerging threats and vulnerabilities.[254] Resilience requires a malleable regulatory framework, e.g., a "soft law" approach,[255] along with flexible regulatory instruments like voluntary agreements.[256] For instance, the U.K.'s policy paper advocates for a principle-based approach to respond to AI opportunities and risks. The proposed AI regulatory framework is underpinned by five principles: "safety, security and robustness"; "appropriate transparency and explainability"; "fairness"; "accountability and governance"; and "contestability and redress."[257] These principles will be issued on a non-statutory basis and enforced by current regulatory bodies.[258] After the initial period of implementation and feedback from different levels of stakeholders, statutory duties may be imposed.[259] Compared to rigid and onerous statutory requirements, a principle-based approach enables the

252 *Id.*

253 Robert Lee & P.D. Jose, *Self-Interest, Self-Restraint and Corporate Responsibility for Nanotechnologies: Emerging Dilemmas for Modern Managers*, 20 TECH. ANALYSIS & STRATEGIC MGMT. 113, 117 (2008) (discussing addressing the slow pace of regulation).

254 "Resilience requires a synergy between high-level planners with the macro-level ability to predict and prepare for disruptions and community-level organizations and regulatory and enforcement agencies, as well as individuals who make these plans actionable on a day-to-day basis." NAT'L SCI. & TECH. COUNCIL, *supra* note 243, at 3.

255 Soft approaches are increasingly being used as strategic and effective instruments in national and local oversight programs. *See* Jacob Gersen & Eric Posner, *Soft Law: Lessons from Congressional Practice*, 61 STAN. L. REV. 573 (2008).

256 Companies' commitments, codes of practice, and management standards can all be understood as voluntary agreements. For examples of voluntary agreements in technology regulation, see *supra* Part III.A.1.

257 SEC'Y OF STATE FOR SCI., INNOVATION & TECH., *supra* note 196.

258 *Id.*

259 *Id.*

regulatory regime to "adapt as needed while providing industry with the clarity needed to innovate."[260]

IV. A NEW FRAMEWORK: CHINA'S PROACTIVE REGULATION ON AI

Proactive law, infused with the three layers, aims to create a regulatory regime that is truly agile and responsive to the transformative nature of emerging technologies. This Part shifts focus from delineating the proactive law approach to analyzing the existing regulatory regimes on emerging technologies from the perspective of proactivity. As states embark on the journey of taming emerging technologies, they have articulated diverse frameworks, each molded by distinctive regulatory concerns and spaces. Some states' regulatory strategies and practices have been analyzed in previous discussions.[261] Indeed, proactivity is discerned in the fabric of existing legislation, policies, and initiatives. Most jurisdictions have woven proactive elements into their blueprints to varying degrees for the regulation of emerging technologies. This Part will focus on the regulatory landscape of China, spotlighting the Chinese approach as an exemplar of exceptional proactivity in AI regulation. It is noteworthy that the intent of this Part is not to present an exhaustive list of China's AI regulatory practices. Instead, this Part will use China's AI regulation as a potential case study, shedding light on the praxes of proactive law while also delving into its associated shortcomings. Together, these theoretical and practical lessons provide solutions to the future regulation of AI and other emerging technologies and contribute to the construction of a more agile and robust regulatory system.

To understand states' AI regulations and their degree of proactivity, it is essential to know their ambitions for AI and the broader picture. Currently, more and more states have realized the power of AI, and many have included AI innovation in their national strategies.[262] China is one of these states. Back in 2017, China's State

260 *Id.*

261 *See, e.g.*, *supra* Part III.A.1 & 2.

262 Nations such as Canada, the U.S., the U.K., France, Japan, Singapore, and China have all included AI development in their national strategy. For example, the U.S. has a long-term commitment to pioneering AI technology. Back in 2016, the U.S. government released the National Artificial Intelligence Research and Development Strategic Plan (National AI R&D Strategic Plan) and Preparing for the Future of Artificial Intelligence, the former outlining key priorities and goals for federal investments in AI R&D and the latter making recommendations for specific

Council released the New Generation Artificial Intelligence Development Plan (The Plan), a national strategy that outlines China's vision and policies on AI.[263] According to The Plan, by 2025, AI will become a major driving force for the upgrading of industries and the economic transformation of China, with AI applications spanning wide sectors from smart cities, manufacturing, and healthcare to national security.[264] By 2030, China aims to become a global leader in AI theory, technology, and applications, in hopes of establishing itself as a major global innovation center.[265] The blueprint for AI is within China's broader plan to promote a digital economy, construct an intelligent society, and become a world-leading technological powerhouse.[266] Legal and regulatory systems as soft infrastructures

further actions by Federal agencies and other actors. The National AI R&D was recently updated in 2023 to set out comprehensive and actionable strategies, underscoring US leadership while tackling the ethical, legal, and societal implications of AI as it becomes more widespread. L. Galindo, K. Perset & F. Sheeka, *An Overview of National AI Strategies and Policies*, OECD GOING DIGITAL TOOLKIT NOTES (Aug. 3, 2021), https://www.oecd.org/en/publications/an-overview-of-national-ai-strategies-and-policies_c05140d9-en.html [https://perma.cc/F349-VXYZ]; *The National Artificial Intelligence Research and Development Strategic Plan*, NAT'L SCI. & TECH. COUNCIL (Oct. 13, 2016), https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/microsites/ostp/NSTC/national_ai_rd_strategic_plan.pdf [https://perma.cc/CZN7-92WZ]; *Preparing for the Future of Artificial Intelligence*, NAT'L SCI. & TECH. COUNCIL (Oct. 12, 2016), https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/microsites/ostp/NSTC/preparing_for_the_future_of_ai.pdf [https://perma.cc/576Z-JLY4]; SELECT COMM. ON A.I., NAT'L SCI. & TECH. COUNCIL, NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN 2023 UPDATE (2023), https://www.whitehouse.gov/wp-content/uploads/2023/05/National-Artificial-Intelligence-Research-and-Development-Strategic-Plan-2023-Update.pdf [https://perma.cc/UT6W-2CYZ].

263 Xinyidai Rengongzhineng Fazhan Guihua (新一代人工智能发展规划) [New Generation Artificial Intelligence Development Plan], STATE COUNCIL (July 20, 2017) [hereinafter The Plan], https://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm [https://perma.cc/C8EQ-QTNY].

264 *Id.*

265 *Id.*

266 Zhonghua Renmin Gongheguo Guomin Jingji He Shehui Fazhan Dishisige Wunian Guihua He 2035 Yuanjing Mubiao Gangyao (中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要) [14th Five-Year Plan For National Economic and Social Development of the People's Republic of China], STATE COUNCIL (Mar. 12, 2021), https://www.gov.cn/xinwen/2021-03/13/content_5592681.htm [https://perma.cc/5M94-272C]; Zhonggong Zhongyang Guowuyuan Yinfa Shuzi Zhongguo Jianshe Zhengti Buju Guihua(中共中央国务院印发《数字中国建设整体布局规划》) [The State Council Have Issued the "Overall Plan for the Construction of Digital China], PEOPLE'S DAILY ONLINE (Feb. 28, 2023), http://politics.people.com.cn/n1/2023/0228/c1001-32632549.html [https://perma.cc/XB4P-Z5S5].

are also included in the national strategy.[267] The Chinese government has devised objectives for building a comprehensive system of laws, regulations, ethical standards, and policies on AI, thereby promoting AI innovation while strengthening security assessment and AI safety.[268]

Moreover, AI's wide applications and its diffusion in almost every facet of the Chinese people's daily lives demand quick responses from the Chinese government. Chinese regulators are grappling with every transformative impact brought by AI technologies, fearing that the undue or tardy channeling may lead the AI's trajectory to unknown or dangerous directions.[269] As of 2024, more than a dozen Chinese governmental agencies have released regulations and guidelines on AI, covering both vertical and horizontal and hard and soft regulations.[270] Despite the current patchwork fashion, China has been working on a comprehensive AI Act.[271] The Chinese Academy of Social Sciences (CASS) released a Model Law on Artificial Intelligence (Model Law) that presents a comprehensive regulatory framework for AI.[272] China has also been surprisingly swift in responding to the new AI methods and cross-sector applications. Over the past few years, China has rolled out some of the world's first

267 The Plan, *supra* note 263.

268 *Id.*

269 For instance, even though ChatGPT is not accessible in China, Chinese regulators are still concerned that generative AI like ChatGPT will disrupt state control and interefere with core socialist values. As a result, Chinese governments have been agile in monitoring AI uses and issuing new regulations addressing potential concerns. *See* Agence France-Presse, *China's Xi Jinping Calls for Greater State Control of AI to Counter 'Dangerous Storms,'* THE GUARDIAN (June 1, 2023) , https://www.theguardian.com/world/2023/jun/01/chinas-xi-jinping-calls-for-greater-state-control-of-ai-to-counter-dangerous-storms [https://perma.cc/D3B4-3S7B].

270 For reference, the OECD has archived more than twenty Chinese AI policies, but it is not an exhaustive list. *AI in China*, OECD.AI., https://oecd.ai/en/dashboards/countries/China [https://perma.cc/ZMA9-6EKJ] (last visited Jan. 27, 2024).

271 In the latest legislative work plan, the State Council mentioned the preparation to submit the draft of the Artificial Intelligence law for review by the Committee of the National People's Congress (NPC). Guowuyuan Bangongting Guanyu Yinfa Guowuyuan 2023 Niandu Lifa Gongzuo Jihua De Tongzhi (国务院办公厅关于印发国务院2023年度立法工作计划的通知) [Circular of the General Office of the State Council on Issuing the Legislative Work Plan of the State Council for the Year 2023], GEN. OFF. OF THE STATE COUNCIL (May 31, 2023), https://www.gov.cn/zhengce/content/202306/content_6884925.htm [https://perma.cc/RF3F-V9BJ].

272 CHINESE ACAD. SOC. SCIS, MODEL LAW ON ARTIFICIAL INTELLIGENCE (EXPERT DRAFT PROPOSAL) (2023) [hereinafter Model Law], http://iolaw.cssn.cn/zxzp/202309/W020230907361599972836.pdf [https://perma.cc/4BLP-T736].

binding national regulations on AI. For instance, mere months after ChatGPT's big break, a piece of regulation was introduced on generative AI (Generative AI Measures) by Chinese regulatory bodies.[273] However, as the draft for the Generative AI Measures was criticized for being slogan-like and difficult to enforce,[274] China's proactivity on AI regulation seems untenable for being more formalistic than substantive. This Part dissects Chinese regulators' approaches, including their inclusive and prudent regulation, coordination of cross-sector agency actions, and regulatory tools to the black box problem. The shadows of the proactive posture, i.e., the underlying problems of formalism and prompt rulemaking, will also be discussed.

A. Collaborative Governance and Inclusive and Prudent Regulation

As elaborated in Part II, the proactive law approach demands the engagement and collaboration of all actors with a problem-solving mindset.[275] The rising importance of non-state actors in emerging technologies regulation has been recognized and emphasized by Chinese regulators. In both the Generative AI Measures and the comprehensive Model Law, collaborative governance is underscored as crucial for building a robust regulatory framework in which all stakeholders shall participate and contribute to governing AI.[276] For

273 On July 13, 2023, the Cybersecurity Administration of China (CAC), in conjunction with six other agencies, issued the Interim Administrative Measures for Generative Artificial Intelligence Services (Generative AI Measures), set to take effect on August 15, 2023. Shengchengshi Rengong Zhineng Guanli Zanxing Banfa (生成式人工智能管理暂行办法) [Interim Administrative Measures for Generative Artificial Intelligence Services], CYBERSPACE ADMIN. OF CHINA (July 10, 2023) [hereinafter Generative AI Measures], http://www.cac.gov.cn/2023-04/11/c_1682854275475410.htm [https://perma.cc/67XF-G86H]. The draft for Generative AI Measures was published earlier on April 11, 2023. Guojia Hulianwang Bangongshi Guanyu "Shengchenshi Rengong Zhineng Fuwu Guanli Banfa 'zhengqiu yijian gao' Gongkai Zhengqiu Yijian de Tongzhi" (国家互联网信息办公室关于《生成式人工智能服务管理办法（征求意见稿）》公开征求意见的通知) ["Notice from the Cyberspace Administration of China on Public Consultation for the 'Administrative Measures for Generative Artificial Intelligence Services (Draft for Comments)'"], CYBERSPACE ADMIN. OF CHINA (Apr. 11, 2024) [hereinafter Draft for Generative AI Measures], https://www.cac.gov.cn/2023-04/11/c_1682854275475410.htm [https://perma.cc/2G6J-35RM].

274 See *infra* Part IV.D; Generative AI Measures, *supra* note 273.

275 *See infra* Part II.

276 Generative AI Measures, *supra* note 273; Model Law, *supra* note 272, art. 13. Article 13 of the Model Law is termed "collaborative governance" and provides that "[t]he state shall establish and improve a governance mechanism for artificial

instance, Article 5 of the Generative AI Measures provides that the government will "[s]upport industry associations, enterprises, education and research institutions, public cultural bodies, and relevant professional bodies, etc. to coordinate in areas such as innovation in generative AI technology, the establishment of data resources, applications, and risk prevention."[277] Chinese regulators have demonstrated a problem-solving orientation in producing rules on AI problems, by responding to real-life legal risks and embedding information sharing and deliberative engagement in the rule-making process. In March 2021, when a popular AI consumer app in China sparked viral fame by transforming static photos into humorous videos, Internet regulators immediately summoned eleven major companies, including industry giants like Alibaba, Tencent, and ByteDance, the operator of TikTok. The meeting intended to delve deeper into the security implications of deepfake technology.[278] In a subsequent 2022 regulation addressing deepfakes, Internet regulators adopted a suggestion from Tencent on terminology in opting for the term "deep synthesis," a more neutral descriptor compared to the loaded connotations of "deepfakes."[279] This choice reflects a recognition of the intricate nature of deepfake technology, acknowledging both its potential risks and benefits.[280] It is suggested

intelligence that involves government oversight, corporate responsibility, industry self-regulation, social supervision, and user self-discipline, promoting collaborative governance by multiple stakeholders." *Id.*

277 Generative AI Measures, *supra* note 273. For an English translation, see *Interim Measures for the Management of Generative Artificial Intelligence Services*, CHINESE L. TRANSLATE (July 13, 2023), https://www.chinalawtranslate.com/generative-ai-interim/ [https://perma.cc/ND65-CQ7Y].

278 Karen Hao, *China, a Pioneer in Regulating Algorithms, Turns Its Focus to Deepfakes Beijing is Among the First Governments to Regulate Hyper-Realistic, AI-Generated Media*, WALL ST. J. (Jan. 8, 2023), https://www.wsj.com/articles/china-a-pioneer-in-regulating-algorithms-turns-its-focus-to-deepfakes-11673149283 [https://perma.cc/Q5BL-JBBL].

279 Cao Jianfeng (曹建峰), *Guanyu "shenduhecheng" de shige wujie(关于"深度合成"技术的十个误解) [Ten Misunderstandings about "Deep Synthesis"]*, TENCENT RSCH. INST. (May 13, 2020), https://tisi.org/14419/ [https://perma.cc/CV76-UQ7C].

280 Matt Sheehan, *China's AI Regulations and How They Get Made*, CARNEGIE ENDOWMENT FOR INT'L. PEACE (July 10, 2023), https://carnegieendowment.org/2023/07/10/china-s-ai-regulations-and-how-they-get-made-pub-90117 [https://perma.cc/A24V-BKDG]; Hulianwang Xinxi Fuwu Shendu Hecheng Guanli Guiding(互联网信息服务深度合成管理规定) [Provisions on the Administration of Deep Synthesis Internet Information Services], CYBERSPACE ADMIN. OF CHINA, MINISTRY OF INDUS. & INFO., & MINISTRY OF PUB. SEC. (Nov. 25, 2023),

that involving all stakeholders in dialogue will lead to more effective implementation of rules, as each party has a vested interest in the outcome.[281] By adopting collaborative governance, Chinese regulators could anticipate a higher caliber of decision-making.

Another regulatory tenet in Chinese AI regulation is the inclusive and prudent approach. The inclusive and prudent approach, first raised in 2016,[282] has been a governing principle in regulating digital economy and technological innovations.[283] Much akin to the proactive law philosophy, the ethos of the inclusive and prudent approach views regulation as a means of empowerment by the state, aimed at fostering innovation and nurturing a conducive environment for business and technology.[284] With the ever-evolving technological landscape, the inclusive aspect of regulation embraces, despite prevailing uncertainties, a broad and welcoming stance towards novel applications and business models. Recognizing the government's limitations in fully grasping and adapting to emerging technologies, the prudent aspect advocates for cautious observation and evaluation and eschews immediate stringent regulation.[285] Stringent regulatory actions are deemed necessary only in cases of imminent harm or to

https://www.gov.cn/zhengce/zhengceku/2022-12/12/content_5731431.htm [https://perma.cc/Y4KA-86K2] [hereinafter Deep Synthesis Regulation].

281 Freeman, *supra* note 18, at 23.

282 In May 2016, the State Council's directives on enhancing regulations called for prudent regulation, which suggests that for emerging Internet and sharing economy, regulation should put emphasis on monitoring, assessment, and inclusive development. As to the areas with significant potential risks, strict regulatory measures should be enforced. This directive is regarded as the initial formation of the concept of inclusive and prudent regulation. LIU Quan (刘权), *Shuzi jingji shiyu xia baorongshenshen jianguan de fazhi luoji* (数字经济视域下包容审慎监管的法治逻辑) [*The Rule of Law Logic of Inclusive and Prudential Regulation from the Perspective of Digital Economy*], 44 FAXUE YANJIU (法学研究) [CHINESE J. L.], 37, 39-40 (2022). The Chinese phrase "包容审慎" (inclusive and prudent) has a few corresponding English translations, including inclusive and prudent regulation, inclusive prudence, and inclusive and prudential regulation. This Article chooses to use "inclusive and prudent regulation," the most used translation.

283 *Id.*

284 HOU Dongde & TIAN Shaoshuai (侯东德&田少帅), *Jinrong Keji Baorongshenshen Jianguan Zhidu Yanjiu* (金融科技包容审慎监管制度研究) [*Research on Financial Technology Inclusive Prudential Supervision System*], 2020 NANJING SHEHUI KEXUE (南京社会科学) [NANJING J. SOC. SCI.], no.10, at 87, 88.

285 LIU Nailiang (刘乃梁), *Baorongshenshen Yuanze De Jingzheng Yaoyi—Yi Wangyueche Jianguan Wei Li* (包容审慎原则的竞争要义——以网约车监管为例) [*Competitive Essentials of Principle of Inclusive Prudence: Taking Regulation of Online Car Hailing as an Example*], 37 FAXUE PINGLUN (法学评论) [L. REV.] 122, 122 n.1 (2019).

penalize harmful practices.[286] Lacking a clear definition, the inclusive and prudent approach evolves as a dynamic concept, fleshed out by Chinese scholars with flexible and innovative governance tools, such as market incentives, competition policies, and regulatory sandboxes.[287] These tools have formed integral components of the regulatory arsenal for implementing inclusive and prudent regulations.

Despite the ardent legislative and scholarly advocacy for inclusive and prudent regulation, the regulatory reality sometimes takes an opposite path. Take, for instance, the case of Initial Coin Offering (ICO), a blockchain fundraising method using tokens, which is banned in China.[288] Similarly, the issuance and trading of Non-fungible Tokens (NFTs), which are used to certify authenticity and property rights on blockchains, have faced stringent regulations in China.[289] The stringent measures encompass restrictions on the assets underlying NFTs and a complete prohibition on their financialization.[290] Consequently, most NFT platforms in China prohibit secondary transactions, such as transfers or gifting, to deter financial speculation. While the inclusive and prudent approach appears idyllic in theory, its implementation encounters difficulties in the real world, raising questions about its transformative potential within China's traditional command-and-control regulatory framework.

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286 ZHANG Xiaoyu (张效羽), *Xingzhengfa Shiye Xia Hulianwang Xinyetai Baorongshenshen Jianguan Yuanze Yanjiu* (行政法视野下互联网新业态包容审慎监管原则研究) [*Research on the Principles of Inclusive and Prudent Regulation of New Internet Business Formats from the Perspective of Administrative Law*], 2020 DIANZI ZHENGWU (电子政务) [E-GOV'T] 71, 72-74.

287 LIU Quan, *supra* note 282, at 46-49 (suggesting market incentives and regulatory sandboxes); LIAO Fan (廖凡), *Lun Jinrong Keji De Baorongshenshen Jianguan* (论金融科技的包容审慎监管) [*On the Inclusive and Prudential Regulation of FinTech*], 31 ZHONGWAI FAXUE (中外法学) [PEKING U. L.J.] 797, 810 (suggesting the regulatory sandbox); LIU Nailiang, *supra* note 285, at 122 (suggesting competition as a regulatory instrument).

288 LIU Quan, *supra* note 282, at 43.

289 *NFT*, MERRIAM-WEBSTER, https://www.merriam-webster.com/dictionary/NFT [https://perma.cc/CD65-WAK8] (last visited Feb. 5, 2024).

290 Guanyu Fangfan NFT Xiangguan Jinrong Fengxian De Changyi (关于防范NFT相关金融风险的倡议) [The Initiative to Prevent Relevant Financial Risks of Non-Fungible Token], CHINA NAT'L INT. FIN. ASS'N (中国互联网金融协会), CHINA BANKING ASS'N (中国银行业协会) & SEC. ASS'N CHINA (中国证券业协会) (Apr. 13, 2022) [hereinafter The Initiative], http://www.bbaachina.org.cn/show/620.html [https://perma.cc/7PPK-SKXA]. The initiative is not a mandatory rule but represents the government's regulatory attitude as it is published by official industry organizations.

Again, the 2023 Generative AI Measures emphasize the inclusive and prudent approach as a guiding principle.[291] The ensuing Model Law, renowned for its leniency towards errors, not only highlights this approach but also proposes a "negative list" framework aimed at granting greater freedom to AI companies.[292] The negative list, akin to the EU's risk-based approach, subjects products and services listed therein to a licensing oversight mechanism, while those outside the list are subject to a more relaxed registry system.[293] Notwithstanding the uncertainty of its final adoption in official legislation, the leniency of the "negative list" approach hinges on the breadth of the list, which could sway the balance in either direction. Nonetheless, the prospect of transformation seems plausible, given China's sanguine outlook on AI technology and its ambitious blueprint for AI development.

B. From Nine Dragons to One: Coordinating AI Regulation

Due to AI's heterogeneity, even a subset of AI could implicate multiple regulatory agencies in the shared regulatory space, which is the new norm rather than an exception in emerging technologies regulation.[294] In China, AI regulation has followed a predominantly vertical approach, focusing on specific AI applications. Many ministries and commissions, acting under the State Council, have collaborated to issue regulations on AI through joint policymaking. For instance, provisions regarding generative AI involved seven governmental agencies, while regulation on "deep synthesis" were jointly published by three regulatory bodies.[295] Similarly, provisions on recommendation algorithms had co-signatories from four regulatory agencies.[296] When it comes to soft regulation, more

291 Generative AI Measures, *supra* note 273.

292 Xue Zheng, "Rengong Zhineng Shifanfa 1.0 (Zhuanjia Jianyi Gao)" Fabu Tichu Fumian Guanli Qingdan Deng Duoxiang Chuangxin Cuoshi (《人工智能法示范法1.0（专家建议稿）》发布提出负面管理清单等多项创新措施) [Model Law on Artificial Intelligence (Expert Draft Proposal) Released, Proposing Innovative Measures Such as a Negative Management List], 21 JINGJI (Aug. 15, 2023), https://www.21jingji.com/article/20230815/herald/dbf102e76faa8fab477f7f4f8d7e5aba.html [https://perma.cc/8CW9-UTCG] (Comments on and Illustrations of the CASS by drafters of the Model Law); Model Law *supra* note 272.

293 Model Law, *supra* note 272.

294 *See supra* Part I. B.

295 Generative AI Measures, *supra* note 273; Deep Synthesis Regulation, *supra* note 280.

296 Hulianwang Xinxi Fuwu Suanfa Tuijian Guanli Guiding (互联网信息服务算法推荐管理规定) [Provisions on the Management of Algorithmic

agencies got involved, with one guiding opinion from nine agencies.[297] It is worth noting that the current division of authority in AI regulation is more a result of voluntary collaboration or competition among Chinese agencies than legislative mandates parceling out authority to multiple entities. Meanwhile, ministries like the Ministry of Science and Technology (MST) and the Cyberspace Administration of China (CAC) have also independently issued regulations and guidelines on AI.[298] However, this free combination of regulatory authorities has led to fragmentation and inconsistency, given AI's intricate and varied nature. Moreover, the potential chaos and regulatory gaps in AI regulation are reminiscent of the pandemonium in the era of Internet platforms, where the Chinese idiom "九龙治水" (nine dragons governing water) illustrated the siloed and divergent nature of Internet regulation without coordination.[299] Moreover, the side effects of the "nine dragons

Recommendations in Internet Information Services] ("Regulation on Recommendation Algorithms"), STATE COUNCIL, (Dec. 31, 2021) [hereinafter Algorithms Recommendation Regulation], https://www.gov.cn/zhengce/zhengceku/2022-01/04/content_5666429.htm [https://perma.cc/5HBZ-5FXN].

297 Guanyu Jiaqiang Hulianwang Xinxi Fuwu Suanfa Zonghe Zhili De Zhidao Yijian (关于加强互联网信息服务算法综合治理的指导意见) [Guiding Opinions on Strengthening Overall Governance of Internet Information Service Algorithms] (promulgated by CAC, Publicity Department of the CCP Central Committee, Education, MST, MIIT, MPS, Ministry of Culture and Tourism (MCT)), CYBERSAPCE ADMIN. OF CHINA, (Sept. 29, 2021), http://www.cac.gov.cn/2021-09/29/c_1634507915623047.htm [https://perma.cc/98WK-BACD].

298 *See, e.g.*, Kejibu guanyu zhichi jianshe xinyidai rengongzhineng shifan yingyong changji de tongzhi [科技部关于支持建设新一代人工智能示范应用场景的通知] [Notice from the Ministry of Science and Technology on Supporting the Construction of New-Generation AI Demonstration Application Scenarios], MINISTRY OF SCI. & TECH. (Aug. 12, 2022), https://www.most.gov.cn/xxgk/xinxifenlei/fdzdgknr/qtwj/qtwj2022/202208/t20220815_181874.html [https://perma.cc/K5HN-NMZL]. CAC regularly publishes latest notices, guidelines, and reports on AI-related issues. For example, CAC is the administrative agency for registration of Generative AI services. Guojia Hulianwang Xin Bangongshi Guanyu Fabu Shengchengshi Rengongzhineng Yi Beian Xixi de Gonggao (国家互联网信息办公室关于发布生成式人工智能服务已备案信息的公告) [Notice by the Cyberspace Administration of China on the Registration for Generative AI Services], CYBERSAPCE ADMIN. OF CHINA (Apr. 3, 2024), https://www.gov.cn/lianbo/bumen/202404/content_6943924.htm [https://perma.cc/7J8A-MV2R].

299 The metaphor of "nine dragons governing water" originates from ancient Chinese mythology, where dragons are responsible for regulating rain, lakes, and waterways. However, when nine dragons oversee water regulation, it often results in confusion, inefficiency, and ultimately, system dysfunction. This effect has been widely recognized in the regulation of Internet platforms. *E.g.*, XU Xiangdong (许向东), *Woguo Wangluo Zhibo de Fazhan Xianzhuang Zhili Kunjing ji Yingdui*

governing water" were exacerbated by the reality that some of China's ministries and agencies such as the Ministry of Industry and Information Technology (MIIT) and the National Development and Reform Commission (NDRC) are more powerful in policy debates than other ministries.[300] China's administrative structure also grapples with ossification, a pathology that has not abated in recent years but may worsen in the face of an expanded shared regulatory space, competing oversight mechanisms, and a diverse array of regulatory instruments, such as proposals and guidelines.

Currently, CAC, a central governmental agency created after the fragmented Internet governance, has taken the lead in responding to the latest progress in AI technology. However, the CAC's authority may face challenges as AI regulation expands beyond online content governance, an area within the CAC's purview. Legal and regulatory matters concerning AI applications in healthcare and autonomous vehicles, for instance, go beyond the CAC's jurisdiction, demanding collaboration with other regulatory bodies.

In response, similar to the practice of the EU, an overarching authority will likely be established in China to harmonize multi-agency regulations and enforcement. Under the proposed Model Law, a China Administration of Artificial Intelligence (CAAI) will be set as "the competent agency responsible for developing and administrating AI."[301] The CAAI would take the reins in developing and administering AI regulations, setting ethical and safety standards, and coordinating activities related to the monitoring, assessment, and audit of AI technologies.[302] However, the fate of the CAAI remains uncertain pending the official adoption of the Model Law by the NPC. It leaves room for speculation that the National Data Administration

Celve (我国网络直播的发展现状、治理困境及应对策略) [*The Statutes, Dilemma and Countermeasures of China's Webcasting*], 40 JINAN XUEBAO (暨南学报) [JINAN J. PHIL. & SOC. SCIS.] 70, 75-76 (2018) (discussing the shortcomings of the "nine dragons governing water" effect in live webcast regulation); Zhang Xiaoyu (张效羽), *Hulianwang Fenxiang Jingji dui Xingzhengfa Guizhi de Tiaozhan yu Yingdui* (互联网分享经济对行政法规制的挑战与应对)[*Challenges Posed by Internet Sharing Economy to Administration Regulations and China's Responses Thereof*], 38 HUANQIU FALVE PINGLUN (环球法律评论) [GLOBAL L. REV.] 151, 160 (2016) (describing the "nine dragons governing water" landscape in regulating China's shared economy).

300 SUSAN V. LAWRENCE & MICHAEL F. MARTIN, CONG. RSCH. SERV., UNDERSTANDING CHINA'S POLITICAL SYSTEM 30 (2013), https://sgp.fas.org/crs/row/R41007.pdf [https://perma.cc/R2CL-U2AQ].

301 Model Law, *supra* note 272, art. 12.

302 Xue, *supra* note 292.

(NDA), a newly formed regulatory body, will take over most, if not all, of the responsibilities of AI regulation. Endowed with broad powers encompassing data regulation and digital economy oversight, the NDA can insert decisive tactical influence over AI by drafting related regulations and guidelines and implementing AI policies at a national level.[303] Chinese agencies are "a fractious and highly competitive group."[304] Devising the overarching authority or authorities over AI will not only be a regulation design but a fierce competition among Chinese regulatory agencies, angling for more power than others. Regardless of whether the CAAI or NDA takes the lead, collaboration between these entities will be essential, given their overlapping jurisdictions and the competitive dynamics among Chinese regulatory agencies.

C. Algorithm Registry: Shedding Sunlight onto the Black Boxes

Chinese regulators, like others in the world, are haunted by the enigma of the black box problem inherent in AI technologies. In response, China has devised an innovative solution known as the algorithm registry. This registry serves as an online filing system where algorithms with "public opinion properties or social mobilization properties" are mandated to disclose information regarding their training and development processes.[305] To complete the registration process, algorithm providers must furnish details such as the algorithm's name, service format, application areas, types, self-assessment reports, and intended disclosure content.[306] Established through China's 2022 Algorithms Recommendation Regulation, the

303 In detail, the NDA is responsible for data regulation, including "coordinating and promoting the construction of data infrastructure, coordinating the integration, sharing, development, and utilisation of data resources," as well as regulating the digital economy and implementing a national big data strategy. Tracy Qu, Xinmei Shen & Ben Jiang, *China's Proposed National Data Bureau to Become a Powerful Tool for Beijing to Ratchet up Development of Digital Economy, Analysts Say*, S. CHINA MORNING POST (Mar. 3, 2023), https://www.scmp.com/tech/policy/article/3212823/chinas-proposed-national-data-bureau-become-powerful-tool-beijing-ratchet-development-digital [https://perma.cc/9GNC-8KB3].

304 Sheehan, *supra* note 280 (quoting CONG. RSCH. SERV., *supra* note 300); Angela Huyue Zhang, *Agility Over Stability: China's Great Reversal in Regulating the Platform Economy*, 63 HARV. INT'L L.J. 457, 465 (2022) (discussing that Chinese regulators are very parochial and are "in a relentless competition for policy control").

305 Algorithms Recommendation Regulation, *supra* note 296.

306 *Id.*

algorithm registry extends horizontally across various AI methods and applications meeting the filing criteria.[307] The registration information, albeit in a redacted form, is made publicly available online. As of January 2024, over 100 algorithms have been registered, spanning applications in AI-generated texts, images, videos, digital humans, and intelligent dialogues across sectors like education, finance, entertainment, and healthcare.[308] Furthermore, algorithm providers are obliged to cooperate with regulators and provide explanations regarding training data sources, scale, types, annotation rules, algorithm mechanisms, and other pertinent technical details when requested.[309]

On the one hand, the algorithm registry and the required disclosures signal a recognition that effective regulation entails an intervention into the workings of black boxes.[310] However, the algorithm registry, or the underlying disclosure framework, could be a potential remedy for the black box problem. As discussed earlier, rather than demanding an explanation for every decision made by AI applications, the proactive law approach emphasizes fostering interactions with these black boxes.[311] Communication emerges as the linchpin for establishing such interaction. A mandatory disclosure regime on AI enhances the pool of information available to both regulators and users alike. The disclosure burden also places indirect social and regulatory pressure on algorithm providers, nudging them to make more judicious decisions when it comes to training data and designing algorithmic mechanisms.[312] Meanwhile, consumers and

307 *Id.*; Generative AI Measures, *supra* note 273; Deep Synthesis Regulation, *supra* note 280.

308 The list of algorithm registration is available on the official website of the algorithm registry system. The CAC also publishes the updated list of algorithm filings on its website. For the latest list, see Guojia Hulianwang Xinxi Bangongshi Guanyu Fabu Disanpi Shendu Hecheng Fuwu Suanfa Beian Xin De Gonggao (国家互联网信息办公室关于发布第三批深度合成服务算法备案信息的公告)[Announcement by the State Internet Information Office on the Release of the Third Batch of Information on Record Filing for Deep Synthetic Service Algorithms], CYBERSAPCE ADMIN. OF CHINA (Jan. 5, 2024), http://www.cac.gov.cn/2024-01/05/c_1706119043746644.htm [https://perma.cc/JEW5-DVKZ].

309 Generative AI Measures, *supra* note 273, § 17.

310 Sheehan, *supra* note 280.

311 *See supra* Part II.A.

312 The idea of mandatory disclosure regime also comes from Karen Yeung's discussion on mandatory disclosure in product regulation: "Rather than attempting to regulate production processes, product composition, quality or price, the state might instead mandate the disclosure of information relating to the composition, its side-effects and/or its process of production, with the aim of facilitating more

users, armed with relevant algorithmic information, feel more empowered and informed about their engagements with AI applications, thereby fostering trust. In this vein, the mandatory disclosure regime represents a hybrid approach, combining elements of both command-and-control mechanisms and market-based incentives.[313]

Still, the inner workings of algorithms may remain turbid to the targeted audience despite the disclosure of relevant information. Nevertheless, the introduction of an open-access algorithm registry, founded on principles of communication, creates an aura of transparency, which suffices to whiten the black boxes to an acceptable degree. Regulators around the world may frown upon the specific content or requirement of the algorithm registry in China, but the tool itself can serve as a regulatory scaffolding that achieves overarching goals such as efficiency and trust in the governance of AI technology.[314]

D. Resilience in AI Regulation: An Iterative Approach

China's policymaking has been regarded as flexible and pragmatic, adeptly navigating changing regulatory landscapes.[315] This inherent resilience extends to Chinese regulation of AI, which has embraced an iterative and adaptive approach. A notable example is seen in the revision of the Draft for the Generative AI Measures, which initially faced significant backlash upon its release.[316] The draft imposes several technically insurmountable requirements on AI providers, such as "ensur[ing] the authenticity, accuracy, objectivity, and diversity" of the training data, "true and accurate" generated content, and non-discrimination based on race or sex.[317] However, following months of critique, the final version underwent substantial

informed decision-making by citizens in their purchasing and consumption decisions." Karen Yeung, *Government by Publicity Management: Sunlight or Spin*, 1 PUB. L. 360, 366-68 (2005).

313 *Id.* Users could decide for themselves whether to use the AI application in question.

314 Sheehan, *supra* note 280.

315 Zhang, *supra* note 304, at 464.

316 Josh Ye, *China's Slow AI Roll-out Points to Its Tech Sector's New Regulatory Reality*, REUTERS (Jul. 13, 2023), https://www.reuters.com/technology/chinas-slow-ai-roll-out-points-its-tech-sectors-new-regulatory-reality-2023-07-12/ [https://perma.cc/T23S-AH6N].

317 Draft for Generative AI Measures, *supra* note 273.

revisions. The draft's scope of regulation was narrowed to public-facing providers, its language was shifted from "ensuring" to "strengthening" data quality, and the regulatory target was shifted from AI-generated content to provider behavior.[318] These changes indicate Chinese regulators' receptiveness to criticism and a commitment to refining regulatory frameworks. The willingness to reassess solutions, address risks, and adapt to evolving circumstances underscores China's proactive regulatory approach in the AI sector. However, the ongoing experimentation in policy initiatives responds to the problem of uncertainty, considering the lack of reliable information, often leading to "disappointing or even perverse results . . . ."[319] While iterative and changing lawmaking allows for an "adapt and learn" process, it may also lead to confusion and compliance challenges for businesses, potentially wreaking havoc on the whole regulatory ecosystem.

As explored earlier, adopting a principle-based approach is beneficial to foster resilience in AI regulation at the current stage.[320] Furthermore, regional regulatory experiments, instead of state-level implementation, offer fertile ground for striking the delicate balance between innovation and predictability. Take Shanghai, where a series of local regulations have been enacted to propel AI development in a measured manner.[321] The Shanghai Regulation introduces a tiered management system, enforces sandbox supervision, and tolerates minor infractions under careful oversight.[322] To ensure accountability alongside innovation, an Ethics Council has been established to increase ethical standards within the industry.[323] Similarly, across the United States, states like California, Connecticut, Illinois, and New York have taken legislative actions on bias, transparency, and data

318 *E.g.*, instead of requiring the AI-generated content in compliance with core socialist values, the final version shifts the requirement to the behaviors of providers. Generative AI Measures, *supra* note 273.

319 MORGAN & YEUNG, *supra* note 141, at 85.

320 *See supra* notes 257-260 and accompanying text.

321 *Artificial Intelligence*, SHANGHAI INT'L SERVS., https://english.shanghai.gov.cn/en-KeyIndustries/20231209/ce6a1ddb606c4e5b83e50a43de347ebf.html [https://perma.cc/C6CY-F539] (last visited Oct. 24, 2024).

322 Ashyana-Jasmine Kachra, *Making Sense of China's AI Regulations*, HOLISTIC AI (Feb. 12, 2024), https://www.holisticai.com/blog/china-ai-regulation [https://perma.cc/7PFW-972E].

323 *Id.*

privacy of AI applications.[324] Employing a whole nation as a regulation testing ground is a bold maneuver, or even a blunt one. However, "[a] single courageous State may . . . serve as a laboratory," paving the way for innovative experiments in AI regulation on a smaller scale "without . . . the rest of the country."[325]

Together, these moves are turning China into a large laboratory for experiments in governing AI. Proactivity lies at the heart of China's strategy, enabling the nation to stay abreast of technological advancements through early legislation and enforcement, utilizing inventive regulatory tools like the algorithm registry and negative list. These measures hold promise in addressing complex AI regulatory challenges such as the opacity of black boxes and the pacing problem. Moreover, China's efforts to coordinate regulatory actions aim to mitigate the inefficiencies and inconsistencies stemming from regulatory silos. Yet, despite its swift responses, China's proactive stance lacks a fundamental shift in regulatory mindset. While lauded for collaborative governance and an inclusive and prudent approach, its substantive measures often fall short, revealing a gap between rhetoric and reality. Ultimately, the success of proactive law hinges on the concerted collaboration of all stakeholders and the infusion of dynamic, polycentric elements throughout the entire regulatory lifecycle.

CONCLUSION

Proactivity is not a panacea. Regulators are at the crossroads amidst the relentless march of disruptive technologies. Without a fundamental change in the regulatory mindset, existing statutes and policies will risk being rigid and outdated, ossifying the whole system. As general-purpose technologies burgeon, silos will be dismantled, and regulators will inevitably be thrust into the same regulatory space. Unless appropriate measures are developed, AI black boxes could become more impenetrable, defying our understanding as AI morphs into a different form of intelligence. Proactive law represents not merely a vision but a call for transformation. Regulation should cater

324 Rachel Wright, *Artificial Intelligence in the States: Emerging Legislation*, THE COUNCIL OF STATE GOV'TS (Dec. 6, 2023), https://www.csg.org/2023/12/06/artificial-intelligence-in-the-states-emerging-legislation/ [https://perma.cc/MTG2-4ZMM].

325 *See* New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting).

to real-life needs, turning into a dynamic and responsive process through collaboration, communication, and resilience. With a forward-looking orientation, a proactive regulatory framework can better navigate the novel challenges and unforeseen difficulties brought by emerging disruptive technologies. Then, "the spirit of the new age could quietly infuse the old regime and change it utterly without destroying it."[326]

326 ALEXIS DE TOCQUEVILLE, THE ANCIEN RÉGIME AND THE FRENCH REVOLUTION 195 (Jon Elster ed., Arthur Goldhammer, trans., 2011).