POLICY BRIEF

America's Forgotten Secret to Innovation: *Try It*

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I. Introduction

America's capacity to translate technological progress into widespread prosperity is a key factor in the nation's broader success. America has never been timid about adopting and spreading new technology. From the steamboat to the railroad, the country's default posture has been to try first and regulate later. More precisely, America's typical response to new technology has reflected a coherent, if rarely articulated, three-part framework: develop and diffuse, address proven harms through iterative intervention, and generalize effective policy. That instinct has allowed for sustained gains in public welfare throughout the nation's history.

Today, fear of artificial intelligence (AI) risks imperiling this proven strategy and the resulting progress it makes possible. A perfect storm of misconceptions—some of which have been sustained and spread by state and federal officials—has led many Americans to actively protest efforts to further AI projects. The intensity of anti-AI views combined with the diverse stakeholders who have adopted that posture make up a formidable barrier to the try first approach America has long leaned upon.

This paper aims to more precisely identify how America has approached prior opportunities to expand its markets, its borders, and its technological capacity. It elaborates on the three prongs mentioned above and how adherence to those prongs in the context of the steamboat and railroad generally furthered human flourishing. In doing so, the paper allows for a more rigorous evaluation of modern AI regulatory proposals and suggests a path forward that's more likely to perpetuate the regulatory tendencies that have propelled America to this point.

Application of this framework to new eras of technology is arguably a constitutional necessity. The project set forth by the Founders is one of not only securing but advancing the general welfare. That has been implicitly interpreted by each and every generation of Americans as an invitation and obligation to expand the frontiers of opportunity. The Founders opened the Northwest. The 1820s and 1830s witnessed the creation of new markets via massive infrastructure projects. The 1850s, '60s, and '70s featured ongoing technological progress and physical expansion. The late nineteenth and early twentieth centuries brought electrification — not through the market alone, but through deliberate federal policy that wired rural America and transformed how millions lived and worked. Mid-century, incredible technological progress sent man to the Moon and spun off manifold products of incredible value for the whole of the American population, drastically increasing quality of life. And as the twentieth century closed, federal investment and private ingenuity brought about the internet era, which rewired commerce, communication, and civic life.

Each generation faced a new frontier. Each generation treated expansion—economic, geographic, scientific, informational—as a sort of constitutional inheritance and broader societal duty. Each levied extensive resources to seize that expansionary moment in a rapid fashion. In other words, these generations did not cautiously proceed but instead sought to immediately seize the opportunity at hand.

What made that pattern coherent was not recklessness. It was a sequence. Deployment came first. Measurement followed. Governance caught up. That sequence was not always tidy, and it was not always fair. People were harmed along the way. But the pattern held, and when the government departed from it, the costs were measurable and lasting.

The pages that follow develop and apply that framework in detail. Part II elaborates the three prongs—develop and diffuse, address proven harms through iterative intervention, and generalize effective policy—and explains why adherence to their sequence, rather than any particular regulatory outcome, is the appropriate metric by which to judge America's technological governance tradition. Part III examines how that framework played out, imperfectly but productively, across two of the nation's most consequential infrastructure buildouts: the steamboat and the railroad. Part IV applies that framework to the present, assessing where AI governance has followed the proven sequence and where it has not, and at what cost. The argument throughout is that the framework America has long relied upon, when followed, has proven more reliable than the precautionary alternative—and that departing from it now, as in prior eras, carries costs that will be difficult to reverse.

II. The Framework: Three Concurrent Obligations

General adherence to a three-prong strategy has enabled the United States to be the first to the future by building and leveraging the latest technological infrastructure: develop and diffuse, address proven harms through iterative intervention, and generalize effective policy. Each prong describes a distinct obligation—one borne primarily by markets and government acting in concert to lower barriers; one borne by regulators and civil society responding to evidence of tangible harm; and one borne by legislators and administrators with the institutional maturity to translate what works locally into durable national policy. The prongs are analytically distinct but not temporally rigid: they may operate simultaneously across different aspects of the same technological buildout, and the failure of any one tends to compromise the others.

The first prong involves a collective willingness to leverage public and private resources as well as to lower regulatory barriers to building out new technological infrastructure. The historical record suggests this works best when two conditions are satisfied: first, the government (and, by extension, the public) will take on no more risk or debt than necessary to assist with the technology becoming widespread; and, second, private actors will face the requisite degree of competition to ensure the most efficient and effective development and diffusion of the technology.

A third condition is the absence of incumbent gatekeeping. The develop and diffuse prong fails when established interests succeed in using legal or political mechanisms to block new entrants from accessing the market. The constitutional settlement that emerged from cases like *Gibbons v. Ogden* reflects an early judicial recognition of this principle: the commerce power cannot be deployed as a private veto over new competition.[1] Where incumbents have been denied that veto, technological diffusion has been rapid. Where they have retained it, diffusion has stalled and the public

has borne the cost.

As the nation has grown and technology has become more advanced, this stage has become more capital intensive. Yet, those investments are unavoidable. In the related context of fostering economic development in emerging economies, the US Economic Assistance Program declared in 1957 that "[t]here is a minimum level of resources that must be devoted to a development program if it is to have any chance of success. Launching a country into self-sustaining growth is a little like getting an airplane off the ground. There is a critical ground speed which must be passed before the craft can become airborne."[2] The same is true for the initial push required to introduce and spread a technology—be it digital, physical, or both—across a whole country.

The economic literature on infrastructure development reinforces this point. Rosenstein-Rodan's theory of the "big push"—developed in the context of mid-century economic development but applicable to technological infrastructure more broadly—holds that investments below a minimum threshold tend to fail not from bad design but from insufficient scale.[3] Individual projects that would be viable in a dense, well-capitalized environment become unworkable in isolation. The implication for technological governance is that the first prong cannot be satisfied incrementally. It requires a critical mass of investment—public and private, coordinated if not planned—before the technology's full potential becomes legible to either regulators or markets. This approach ensures that the default governance mechanism is market-based experimentation, which tends to operate more efficiently and rapidly than government mandates.

The second prong directs private actors, regulators, and the public to precisely identify tangible harms from the new technology and respond with tailored, measurable interventions that can be adjusted as necessary. Regulation at this stage must be properly geographically-scoped to align with the institutional capacity and constitutional authority of the government actor in question. It must also be instituted in a manner that allows for ongoing, verifiable, objective assessment of its costs, benefits, and responsiveness to the underlying harm being addressed.

Three additional conditions define successful execution of this prong, each drawn from the historical record. First, the harm must be identified with specificity before intervention is attempted. The steamboat record is instructive: Congress intervened in 1838 targeting engineers rather than boilers, and fourteen years of preventable deaths followed. The correct regulatory target—the boiler itself—was knowable from the evidence, but the institutional capacity to identify it was not yet in place.[4] Precision in identifying harm is not a counsel of inaction; it is a precondition for action that works. Second, the institutions tasked with measurement and enforcement must have sufficient technical expertise and freedom from capture to perform those functions honestly. Van Metre's critique of state railroad commissions—that they were staffed by lawyers with political interests rather than engineers and economists with relevant expertise[5] — describes a failure mode that recurs wherever this prong is attempted without the requisite institutional groundwork. Third, interventions must be designed from the outset to be revisable. The 1838 Steamboat Act[6] failed in part because Congress treated it as a settlement rather than an experiment. Sunset clauses, mandatory reporting requirements, and explicit metrics for assessing efficacy are not procedural luxuries—they are structural features of regulation that actually learns.

The third prong calls for regulators to generalize and spread effective interventions based on robust and reliable measurement of their impacts. Generalization must also respect the constitutional architecture through which American regulatory authority is distributed. The historical record reveals a recurring pattern: effective interventions pioneered at the state or local level—or within a single industry—were only successfully generalized once federal authority was clearly established and the technology's interstate character was undeniable. Premature nationalization of immature regulatory frameworks risks cementing the wrong lessons, while excessive delay in federalizing successful state models produces a fragmented patchwork that sophisticated actors can exploit through jurisdictional arbitrage.

Two further features of successful generalization deserve emphasis. The first is restraint of scope. The railroad history demonstrates that effective safety regulation—the Safety Appliance Act of 1893[7]—succeeded precisely because it was targeted at a specific, evidence-supported problem rather than structured as a comprehensive governance regime. The Interstate Commerce Commission's subsequent expansion into economic rate regulation, by contrast, produced decades of jurisdictional confusion, regulatory capture, and ultimately deregulation born of regulatory failure.[8] Generalization that exceeds the evidentiary base of the second prong tends to overreach, and overreach tends to produce backlash. The second is the importance of measurement independence. Generalization built on industry-supplied data or politically motivated findings tends to encode the distortions of the second prong rather than correct them. The experience of the Franklin Institute in the study of steamboat regulation—generating research that improved safety but struggled to reach policymakers through functional institutional channels—illustrates the gap between knowledge production and knowledge use that the third prong must close.[9]

The extent to which state and federal actors have followed the aforementioned three prongs varies across generations. Analysis of the steamboat and railroad buildouts evidence that public and private actors may diverge from the recommended playbook. Still, those eras also make clear that so long as such divergences are relatively short-lived or minor in magnitude, then America can still

push the frontier further and, in doing so, uplift the vast majority of people.

Throughout time, the accretion of defensive maneuvers to protect the status quo at the expense of the frontier have made application of this framework difficult. In previous eras, the political system managed to ensure that barriers to this framework did not endure. The Supreme Court, for example, has repeatedly struck down state laws that, though well-intentioned, would have the effect of unduly inhibiting the expansion of America's economic and technological frontier or otherwise allowing for the exchange of ideas and free flow of commerce.[10] These repeated judicial interventions have sustained the framework when it runs into political headwinds. The net effect has been a country that by private initiative, legislative caution, and judicial oversight has proven able to lay the physical and digital infrastructure necessary for a brighter future. The next Part examines how this approach played out with respect to steamboats and railroads—not because history dictates outcomes, but because the case studies illuminate the conditions under which the framework succeeds and the failure modes that emerge when it is abandoned. Those conditions and failure modes are precisely what Part IV holds up against the current AI policy landscape.

III. Historical Case Studies: America's "Big Push" Tradition

America's technological progress has not happened by accident. It'd be incorrect, however, to conclude that it was planned. Our nation's track record for being first to the future is the result of adhering to the framework. This Part details how that framework applied to the steamboat and railroad. In both instances, massive infrastructure build-out as well as widespread technological diffusion was made possible by a watchful yet removed government. When local, state, and federal government actors did opt to intervene, their initial regulatory efforts did not unduly burden continued development and diffusion because of the regulatory design, a lack of institutional capacity, or both. Likewise, in both instances, more substantive regulation emerged well after society had a chance to establish norms around the proper use cases and the technology itself had become broadly accessible. The steamboat presented the young nation with its first opportunity to honor that logic. It passed, albeit at a notable cost. Still, the spread of the steamboat transformed the country's geographic footprint and diversified its economic portfolio.

A. The Steamboat

Develop and Diffuse: Private Initiative and the Opening of the Market

The initial surge in the number of steamboats and the critical role they played in moving people and products was made possible by the Supreme Court removing a key regulatory hurdle while state and federal legislators adopted a hands-off posture.

American life fundamentally changed with the introduction of the steamboat. It became a "smaller continent, and the oceans shrank" thanks to the success of steamboats. This "revolutionary new technology," per Craig Landy, "open[ed] inland waterways to two-way navigation and dramatically cut transportation times and costs."[11] Landy is far from alone in asserting the significance of the steamboats. George R. Taylor likewise characterized the period from 1815 to 1860 as a "transportation revolution."[12] This so-called revolution was powered, in part, by the introduction of the steamboat. Louis Hunter similarly regarded the steamboat as "the principle vehicle of transportation on main channels of inland commerce"—a level of ubiquity that took place over the course of just a few years.[13] A dearth of scholarly inquiry into the introduction and spread of steamboat travel obscures its historical importance. Absent the spread of the steamboat, whole regions of America may not have transitioned from "unsettled backwoods into agricultural heartlands." [14] In quantitative terms, "the increase of steamboat productivity (on inland rivers), 1815-1860, exceeded that of any other transportation medium for a period of similar length in the nineteenth century."[15] Of course, the steamboat's value also emerged from improving the daily lives of Americans. The *New York Times* included letters to the editor regaling the adventures to be had on steamboats.[16]

The incredibly significant technological, economic, and social gains introduced by the steamboat came predominantly through private effort. James Mak and Gary M. Walton explained, "This progress was achieved with relatively little government aid compared to the rather extensive government outlays and support for canals and railroads."[17] They ascribe the growth and success of the steamboat to "private initiative."[18] Entrepreneurial steamboat

captains embarked on trips of ever greater length and with ever more cargo to overcome the public's initial skepticism as to their safety and durability. Papers reported on the specific voyages of ships like the Washington and Aetna, detailing the specifics so as to address public doubts as to the practicability of this new means of transport. By virtue of so many individuals attempting so many different trips (and some good press), by 1818 or 1819, the public had become confident in steamboats. One company made $4,000 in profit on their steamboat's voyage from New Orleans to Natchez in 1817. Another amassed $6,500 from a ride between New Orleans and Louisville.[19]

Steamboat contribution to the national economy—at least as measured by its productivity—took place between 1815 and 1850. A quick case study makes clear why the steamboat played such a transformative role: "On the Louisville-New Orleans route, upstream rates per 100 lbs. in current dollars fell from $5.00 in 1815 to $2.00 in 1820 to $0.25 in 1860."[20] At a higher level, the steamboat "serv[ed] the cotton empire and . . . extend[ed] American migration and commerce into the trans-Mississippi region[.]"[21] Steamboat advances also opened up and expanded agriculture in the Ohio Valley and the coal industry in Pennsylvania.[22] Its success also had a larger politically unifying effect—providing the Union with "one national heart, and one national mind by fostering the circulating of people as well as ideas."[23] The public generally applauded these developments. "Americans rejoiced over this awesome power," wrote John G. Burke.[24]

Such gains and market expansion were a product of continual efficiency gains: ships increased in size; crew sizes shrunk; and insurance costs decreased. American-led discoveries on this front led Louis Hunter to conclude that "[t]he steamboat was the first great American contribution to modern technology."[25] These improvements were the product of experimentation. Initial ship designs mirrored those of seafaring vessels. Through trips on "Western" rivers, however, the need for "radical changes" became apparent and subsequent tinkering by steamboat operators made those changes a reality. In the span of just 45 years—from 1815 to 1860—the time it took to sail from New Orleans to Louisville fell from almost three weeks to less than a week. More generally, the time to complete a round trip dropped by 60 percent. In sum, Mak and Walton attribute these gains to serial "advances in knowledge" and "learning by doing," more so than technical progress, such as steam power developments.[26] Innovators such as Shreve and Fulton pioneered new means of piloting and designing steamboats, which then sparked even more investigation of new methods of sailing and building.[27]

As detailed below, these iterative improvements may not have been possible under a more aggressive regulatory environment. The story of the spread of the steamboat is the story of slow but steady improvements identified through experimentation and tests of small changes.

The first prong asks relatively little of government: lower barriers, resist incumbent capture, and allow markets to do what markets do when given room. The steamboat era shows what that looks like when it works. It also shows the cost of what comes next—because a government that never develops the institutional capacity to measure harm during the diffusion phase will be poorly positioned to address it once warranted by evidence and popular demand.

Address Proven Harms Through Iterative Intervention: Uneven Measurement, Limited Institutional Capacity

As the steamboat spread, so did reports of its harms. Yet, the states and the federal government did not adequately invest in their respective institutional capacity to understand and respond to the harms. The resulting regulations were poorly tailored to the underlying causes of steamboat incidents. Ultimately, albeit after the significant passage of time, those regulations were refined. A more deliberate approach—one focused on measurement and iteration—could have saved lives and shortened the duration of regulations with little to no positive effect.

Regulation of the steamboat lagged its popular adoption but responded to popular disquiet around steamboat incidents. State and local governments responded first to the so-called "steamboat problem."[28] Many state governments adopted inspection mandates to reduce the frequency of incidents and, specifically, explosions. Governor DeWitt, albeit unsuccessfully, urged his legislature to tackle the issue of steamboat racing and congestion on the Hudson in an 1826 address.[29] Lawmakers in Albany instead responded by instituting traffic norms—directing steamboats to leave plenty of room for passing ships to reduce the odds of a collision. Later that year, Alabama passed the first substantive regulatory measure, which called for annual inspections of steamboats.[30] Louisiana later instituted a more intensive regime that mandated more frequent and rigorous testing and denied ships without up-to-date examinations from making insurance claims in the event of an accident.[31] Indiana, Kentucky, Illinois, and Wisconsin soon followed up with their own versions of steamboat safety laws.[32] Yet, there was a general recognition—even among advocates of a more aggressive regulatory posture—that adequate governance of steamboats necessitated a federal response.

Congressional intervention emerged later. Though Congress weighed a steamboat safety law in 1824, it floundered because the House "was not prepared in its present state of information to legislate on a subject so extensive and important in its effects."[33] According to Commander Bennett, federal officials including and in addition to members of Congress worried about intervening too early given the national importance of a vibrant steamboat

industry.[34] Rather than codify what qualified as the right level of safety, officials expected that market forces would suffice to alter the practices and design choices of steamboat operators. The Secretary of the Treasury, writing in 1825, expressed as much in encouraging use of the "intelligence of the age, and . . . the operation of motives which are more powerfully felt by the owners and managers of steamboats" to guide steamboat governance.[35]

At that early stage, the industry's promise was easier to see than the full scale of its dangers. Steamboats had begun turning downstream-only waterways into two-way commercial corridors, and by 1830 more than 200 steamboats moved on western rivers,[36] even as the worst wave of boiler explosions was only beginning to reveal itself. Between 1825 and 1830, however, forty-two boiler explosions killed roughly 273 people, making the safety problem increasingly difficult for Congress to ignore.[37] Ultimately, both sides of that debate as to whether to clamp down on steamboats or tolerate a light-touch approach had some claim to being right. On the one hand, greater competition increased the supply of ships (in New York City alone, the number of steamboats went from 6 to 43 in the course of a single year) which drove down prices since passengers could now get from New York City to Albany for less than $5, whereas prices were closer to $7 when only a handful of operators had license to sail the Hudson.[38] On the other hand, the boats chugging up and down the river were "often shoddier steamboats, prone to boiler explosions and captains raced up and down the Hudson and pushed their vessels to the limit to beat the competition."[39]

The regulatory math changed when harms became more numerous, widespread, and understood. In the five-year stretch between 1825 and 1830, 273 people died in steamboat incidents.[40] Press around the nation covered these incidents with alarm, sparking a societal debate around how best to safeguard steamboat passengers. Congress reacted by mandating a series of investigations into the industry.[41] Yet, by 1833, the issue garnered presidential attention. President Andrew Jackson used his State of the Union Address to urge "immediate and unremitting attention of the constituted authorities of the country" to steamboat accidents.[42] President Martin Van Buren did the same in 1837. He bemoaned "[t]he distressing casualties in steamboats . . . seem to evince the necessity of attempting to prevent them[.]"[43] Beyond the clear expression of support for legislative action from the executive branch, Congress was likely also bolstered by the work of the Franklin Institute. Formed in 1824, the Institute operated as a sort of think tank that aimed "to advance the general interests of Manufacturers and Mechanics, by extending a knowledge of mechanical sciences to its members, and others, at a cheap rate."[44] They acted on that mission through hosting lectures, offering prizes for scientific advances, and maintaining a journal. These efforts were commonly tied directly to the ongoing safety challenges posed by steamboats.[45]

Critically, though, these efforts were not always successful nor communicated efficiently to lawmakers. The silver medal went unclaimed. Other research languished on the shelf before reaching policymakers. Still, the Institute proved to be a useful resource when regulators sought more information to help inform legislation.

The legacy of the Franklin Institute deserves close study. This research body identified the proper target of regulatory intervention. That research did not reach Congress. Legislators ought to be attentive to where expertise exists and ensure that it establishes a means to gather and, when necessary, act on that information. Unfortunately, that was not the case in the steamboat era—a translational failure that came at grave costs.

Generalize Effective Policy: A Case Study in What Not to Do

Congress's failure to locate and act on the Franklin Institute's research resulted in a misguided regulatory approach. When Congress did intervene, it followed a similar initial step as the states and local governments. The first wave of interventions amounted to information gathering, during which Congress analyzed steamboat incidents and shared their findings.[46] Next, Congress relied on mechanical mandates to attempt to ensure safety-related devices were standard on each vessel.[47] A more aggressive, penalty-based approach only emerged after these initial policy experiments. By 1838, public demand for action reached an understandable apogee—by that point approximately 2,400 people had died in steamboat incidents since 1807.[48]

The United States Steamboat-Inspection Service, housed within the Department of Commerce, launched in 1838.[49] The Service aimed to protect passengers as well as manage the interests of all stakeholders in marine transportation. It took on three key tasks: inspecting equipment; licensing crew members; and, investigating and prosecuting alleged violations of applicable steamboat-inspection laws.[50]

These regulatory efforts, however, had mixed success. News of steamboat disasters and dangerous behavior was common throughout the antebellum era. The pages of *The New York Times* were littered with such stories. On October 9, 1851, a boiler exploded on the steamboat *Brilliant*, causing a "very great" loss of life near Bayou Goula.[51] Four days later, on October 13, 1851, three steamboats "raced" to Cleveland from Buffalo.[52] In April of 1852, at least one hundred individuals died due the boilers on the Saluda exploding.[53] In that same year, another one hundred or so lives were lost after the Henry Clay sank on the Hudson River.[54] The public noticed the danger too. After the Henry Clay disaster, one letter-to-the-editor author accused steamboat owners of "prefer[ing] the gains of racing to the safety" of their passengers and warned that steamboat operators should not be able to turn a

reputation for speed into profits."[55] One engineer, reflecting on the aforementioned stories, observed in late 1852, "Steamboat disasters among us have followed each other in such quick succession of late, and so many valuable citizens, to say nothing of females and innocent children have suffered a most painful and agonizing death, that when we read the sickening story of them, it is enough to shock the sensibilities of the stoutest."[56]

The 1838 Act clearly was a failure in terms of substantially reducing steamboat deaths. Its provisions had predictable shortcomings. Inspectors were effectively encouraged to clear even sketchy steamboats because their incomes were drawn from the fees they earned when hired by a captain.[57] As of 1836, the US was home to around 750 steamboats, which outnumbered the total number in Europe.[58] Enforcement of the law was also limited due to jurisdictional challenges and procedural hurdles. At a meta-level, the main issue with the 1838 Act was that Congress opted for the wrong point of regulatory intervention—attempting to govern engineers instead of addressing the boilers, which were behind many explosions.

It took 14 years for Congress to attempt to make up for its mistake—a signal of the risks of a set-it-and-forget-it approach to policymaking. By the time that Congress located the proper target of its regulatory scrutiny, steamboat explosions were responsible for about 3,500 deaths.[59] Congress should be given some grace for this lapse in regulatory judgement. As flagged by Sir John Rennie, an important voice in steamboat manufacturing in the UK, no one knew how to build a perfect steamboat.[60] Regulators struggled to precisely identify the cause of explosions. As Gregory P. Sandukas observed, "Nothing was clear-cut during this period and there was no single theory to explain all explosions."[61] "It was a new profession with no body of knowledge to learn from," pointed out Sandukas.[62] Owners sometimes hired "mere stokers who had only a rudimentary grasp of the operation of steam equipment."[63]

Ongoing incidents and reports of regulatory issues likely propelled Congress to bolster the Steamboat Inspection Service in 1852.[64] Lawmakers then opted to create the first federal agency charged with monitoring a private industry. The Service counted on the success of a decentralized approach. Nine supervising inspectors, appointed by the President, would meet annually to identify and publish rules and regulations to guide the work of local inspectors.[65]

Still, regulation fell short of what members of Congress and the public writ large likely hoped for. Incidents continued at a fairly rapid clip. A year after the 1852 Act, a group of engineers warned that regulations applied differently to different boats and that owners faced too little liability in the event of accidents.[66] These regulatory shortcomings may have been the result of ongoing structural issues. As Dr. Maust explained, "The complex technical nature of [steamboat governance] meant that few members of Congress were willing to absorb the details of these plans."[67]

Congressional failure to heed an evidence-based approach to governance in the steamboat era resulted in a sizable, avoidable death count. Congress eventually adopted a more responsive regulatory approach. It is clear that a different approach could have shortened the time for Congress to reach this point.

Net Benefit and Analytical Coda

Before turning to the railroad, it is worth examining the regulatory lessons afforded by the steamboat era. America's leadership in developing, diffusing, and iterating on the steamboat was "without parallel in other parts of the world,"[68] but also resulted in thousands of deaths. Surely, a better path was possible.

There are strong arguments to be made that America could have improved on its public policy responses to the steamboat and railroad. Congress could have more narrowly and intensely targeted boilers as the specific object of regulatory scrutiny. Or the federal government could have instituted standards for railroad development more expeditiously. Both steps would have assuredly led to better futures, right? The answer is, "It's unknowable."

Imagine if Congress had imposed more stringent regulations on steamboats that required quarterly boiler and hull inspections by a qualified individual. Presumably this would have reduced the number of steamboat operators and increased the average fare. Those alternatives, however, came with their own known and probable shortcomings. There were 16.9 horse-related fatalities for each 10,000 horse-drawn vehicles in Chicago as of 1916.[69] Individuals who avoided a steamboat explosion may have been killed by a bucking horse. The Great Epizootic Epidemic of 1872 resulted in the deaths of five percent of the urban horse population in the Northeast.[70] Calamity ensued. Transit of goods and people slowed, resulting in hoarding and an uptick in food prices. Diminished use of steamboats may have exacerbated the crises raging in overcrowded cities—namely, public health and sanitation issues. Our analysis of the relevant legislative history uncovered a lack of consideration of such opportunity costs. Under a different regulatory regime, the United States may have missed out on several key benefits from the proliferation of the steamboat.

On the whole, absent a thorough, contemporaneous record containing precise measurement of the relevant metrics, these sorts of retrospective reviews lack rigor. Arguments that Congress should have adopted an explicit policy approach can be brushed away by application of Hitchens's razor: What can be asserted without evidence can also be dismissed without evidence. Arguments that Congress and state legislators should have changed their policymaking process, however, carry more weight.

It is uncontestable that Congress would have benefited from bolstering its institutional capacity to collect and understand developments in the steamboat industry. Rather than mandate exec-

utive officials to conduct investigations on an ad hoc basis, for instance, Congress may have compelled more frequent and in-depth reports. It's also clear that Congress would have benefited from a more iterative approach to policymaking. The 1838 Act occupied the regulatory field for more than a decade, with little to no evidence that it worked as intended. Had Congress imposed a sunset clause on the law or detailed metrics by which to assess the efficacy of the Act then it may have identified the errors of its first approach sooner. The railroad era would test these same obligations, yet on a much broader scale.

B. The Railroad

Develop and Diffuse: Private Capital and the Absence of Incumbent Gatekeeping

The steamboat demonstrated that the first prong could work on the rivers of a young republic. The railroad asked whether it could hold across a continent, against longer odds and with far more capital at stake. The answer depended on whether America's economic potential could be unlocked at all—and in 1825, that was far from certain. "[I]t is clear that the successful development of the United States economy was not assured from the vantage point of 1825," pointed out Cootner.[71] Its natural resource bounty lay behind vast mountains and at great lengths from its ports. Realizing its economic potential required gambling in a big way on a new technology: railroads.

The explosion of America's railroad network signals the immense value this technology offered to the young nation. Commercial locomotives became available in the 1820s, following decades of tinkering by engineers.[72] The first intercity railroad—stretching a whole thirteen miles—was laid in the 1830s.[73] By 1850, more than 9,000 miles of track connected Americans to new communities, new markets, and new opportunities.[74] By 1890, the American railroad network was largely established.[75] The pace and breadth of America's economic growth throughout the nineteenth century would not have been possible without the drop in land transportation brought about by this surge in infrastructural activity.[76]

Modern readers may assume that this buildout must have been the product of an explicit regulatory regime. A review of the evolution of America's railroads reveals the opposite. Federal involvement in railroad regulation launched with the Interstate Commerce Act of 1887.[77,78] Efforts to dictate railroad safety standards at the federal level did not start in earnest until 1893, which marked the passage of the Safety Appliance Act.[79,80] By that time, around 150,000 miles of railroad track had been laid and the infrastructure had already become a core part of the nation's national security and economy.[81]

The early days of railroad development were characterized by simply trying to make this new means of transportation profitable. As Paul H. Cootner explains, the path to commercially viable railroad travel in the 1820s did not feature any "earthshaking technical development[s], but the slow steady improvement in the economy of railroad construction and operation that comes with continuous redesign."[82]

The absence of incumbent interests that could otherwise hinder railroad development is an underinvestigated, yet profoundly important aspect of this developmental effort. Legal or economic barriers to this stage in the aforementioned framework can thwart the full potential of a new technology to introduce new frontiers and markets to the American people. *Gibbons* removed a key legal barrier in the steamboat context.[83] In the case of railroads, the fact that these roads did not really compete with canal or turnpike alternatives likely allowed for a more steady and significant spread of new tracks. Any such veto power or gatekeeping by those powers may have been fatal to numerous railroad projects.

The initial economics of the railroad were tight. Investors were unsure of whether the first lines would succeed. Still they went ahead with trying to connect markets and communities. Their gambles may not have occurred were it not for "some reasonable hope of profits to risk their funds."[84] As Cootner dryly summarizes, rapid and substantial investment in this transportation boom "enabled this country to expand its population and production at a lesser cost than would otherwise have been the case."[85]

"The railroads," per Cootner, "experienced constant technical improvement—larger locomotives, bigger and better designed rails, better brakes, substitution of coal for wood as fuel, etc."[86] The relative dearth of federal regulations was imperative to the rapid pace at which the US managed to connect its communities and establish new markets.

The first prong worked. Private capital flooded in, track spread west, and markets opened that had not existed a generation before. But the first prong cannot carry the weight of the second. Identifying and addressing the harms that accompanied the boom required institutional capacity that, on the whole, was not yet in place.

Address Proven Harms Through Iterative Intervention: State Commissions and the Limits of Institutional Capacity

The second prong fell first to the states. Their efforts to monitor and constrain the railroad industry revealed, in miniature, the institutional failures that would recur at the federal level: regulators without the expertise to measure harm and incentive structures that rewarded inaction.

The railroad boom was not entirely devoid of inhibitory legal intervention, though tremendous growth was permitted before legislators started to step in. The first two decades of this infrastructure project—roughly from 1820 to 1840—included thousands of miles

of track being laid with few to no state or federal limits.[87] During that period, "all levels of government actively promoted railroad development."[88] As documented by Mark T. Kanazawa and Roger G. Noll, for example, Congress passed several bills over the course of the 1850s to accelerate railroad development.[89] New Hampshire announced the first state railroad commission in 1844.[90]

State commissions were not passive. They investigated, reported, and occasionally acted. The limitation was not effort but capacity. Regulators without technical expertise, working within jurisdictions that railroad operations routinely crossed, could not produce the kind of evidence-based, iterative intervention the second prong requires.

Generalize Effective Policy: A Case Study in What Not to Do

What the states could not accomplish, Congress eventually attempted. The institutional deficits that had compromised state railroad commissions did not disappear when authority shifted to the federal level. They scaled up.

State laws were closely monitored and regularly contested both in political fights and litigation battles. Congress opted to formally and explicitly intervene in 1887 by passing the Interstate Commerce Act.[91,92] The resulting Interstate Commerce Commission (ICC) was tasked with setting "reasonable and just" passenger rates.[93] The Commission, though, had limited influence on railroad practices given that several Supreme Court cases narrowed its powers.[94]

The absence of laws may have allowed for significant influxes of capital and significant construction, but it did come at some costs. The nation's railroad network suffered from a dearth of standards, which imperiled the ability of trains to easily transfer and entrenched regional monopolies: "public service [was] a secondary consideration to monopoly privilege."[95] Under this "inefficient and wasteful" system, the nation's railroad infrastructure fell short of the country's needs.[96] "The dual system of railroad regulation by state and federal authority," wrote T. W. Van Metre, was "without doubt cumbersome and wasteful."[97]

Execution of policy was also a significant issue. Well-intentioned policies were often poorly implemented due to self-interested administrators, a problem that beset steamboat regulation as well, as previously covered. Van Metre observed that many of the members of state railroad and utility commissions were, at that time, "lawyers whose main interests lie, if not in politics, in legal rather than economic problems."[98] The need for broader representation among stakeholders with an interest in railroad policy generally went unheeded. Ideally, such groups would have included "bankers, engineers, railroad traffic managers, industry traffic managers and accountants[.]"[99]In sum, Van Metre lamented that "[i]ll-considered and unwise laws for railroad regulation ha[d] been passed

with too great frequency."[100] Retaliatory, punitive policy crowds out more constructive approaches.

Over time, this opposition calcified into a reflexive belief that the interests of the railroads were "diametrically opposed to all other business interests."[101] Van Metre explained as much when he cautioned against only building for a harmonious approach to railroad policy during trying times: "there is no reason for limiting the unified 'continental railway system' to the duration of [World War I]; its proved advantages will be all the more valuable with the return of peace."[102]

The absence of public unity and a lack of official clarity of vision—in short, a world in which "[p]urposes have been obscured by prejudices"—generated a policy landscape defined by an "unwholesome combination of good legislation, bad legislation, and no legislation."[103] This muddled landscape needlessly frustrated a functional national railroad system.

The railroad record added scale to the steamboat's lesson, not a different one. Effective generalization of policy demands institutional capacity, independence from capture, and the willingness to keep revising after initial legislation passes. Those demands went largely unmet in the nineteenth century.

IV. The Framework Applied: AI Governance and the Try-First Tradition

The framework developed in Part II and tested in Part III now meets its most consequential application. As transformative as the steamboat and railroad proved to be, AI has the potential to expand the nation's frontiers at an even faster pace than any prior technology. Whereas those earlier technologies were domain-specific—centered on transportation, with positive spillovers into agriculture, trade, and information exchange—AI is capable of

simultaneously transforming several domains at once.

In science, AI aided scientists in discovering that one of the supposed biomarkers of Alzheimer's may actually be a cause of the disease.[104] These sorts of discoveries will have massive ripple effects across the US economy and throughout US communities. Because Alzheimer's disease is the most common cause of dementia, the University of Southern California's estimate that dementia imposed more than $780 billion in economic costs in 2025 underscores the enormous stakes of Alzheimer's-related research.[105] The human costs are, of course, much larger.

In healthcare, AI outperforms doctors in reviewing the brain scans of stroke patients—allowing for more precise determinations of the onset time of the stroke.[106] Considering that nearly 800,000 Americans have a stroke each year, these improvements via AI may lead to quality of life improvements for millions of people over the span of just a few years.[107]

In climate studies, AI has scaled up the ability of state authorities to anticipate and respond to wildfires.[108] Again, marginal improvements in this domain will save lives as well as potentially billions of dollars. The LA fires of 2025 resulted in $53 billion in damage.[109]

In education, AI tools have proven capable of helping students achieve massive gains in a short period of time.[110] These improvements have been especially clear in countries in the global majority. Albeit to varying levels in recent years, the US has long spent considerable funds supporting education efforts abroad.[111] AI could assist those efforts, while also helping with domestic education goals as well.

AI for entrepreneurs, AI for energy, and, yes, AI for transportation all warrant discussion as well. The upshot is that AI, as a general purpose technology of incredible capabilities, has the potential to be many times more significant in creating new opportunities for Americans than earlier technological waves. Realization of that potential hinges on the same sequenced framework that governed America's earlier technological buildouts: develop and diffuse, address proven harms through iterative intervention, and generalize effective policy.

This Part reviews how the AI rollout is currently proceeding against the framework's three prongs. A comprehensive analysis of the policy developments that have transpired since late 2022, when OpenAI released ChatGPT,[112] exceeds the scope of this essay. Instead, with an eye toward the specific framework outlined here, the focus of this section is on the divergences from this framework.

A. Development and Diffusion

There is a pervasive sense that Americans have become heavily reliant on AI, including in particularly significant contexts such as at work. By way of example, as recently as March of 2026, Yahoo reported that nearly 80% of Americans use AI tools but most still want humans making financial decisions.[113] Thought leaders in the tech policy space have insisted that AI adoption is taking place at an unrivaled clip.[114] In many ways, such stories and pronouncements are correct. OpenAI boasts more than 900 million weekly active users.[115] Google's Gemini does not lag far behind at 750 million monthly active users.[116] Dozens of millions of Americans use Anthropic's Claude.[117] However, these statistics are somewhat akin to asking how many people set foot on a steamboat—they do not indicate the extent to which the people fully leveraged the technology.

A recent survey by the U.S. Census Bureau, for instance, indicates fairly low rates of AI usage by businesses for key tasks. Around seven percent of businesses use AI for legal and compliance tasks as well as for customer service functions. Yet, truly transformative use cases, such as using AI for the production of goods, are incredibly rare; less than two percent of businesses use AI for those kinds of tasks.[118] Gallup likewise determined that just nine percent of employees use AI on a daily basis.[119]

Even more granular analyses further pierce the narrative that everyone is using AI. Whereas 31 percent of small businesses in West Virginia use AI, use is twice that in several other states, including Florida, Nebraska, and Washington.[120] Anthropic's studies of its own users reinforce this finding: more than a quarter of Claude users reside in California alone.[121] Boomers are many times less likely to have tried standalone AI tools than Gen Zers.[122] The substantial majority of Claude users live in households with north of $100,000 in income.[123]

These divergences are wildly problematic when it comes to ensuring that AI lifts all boats rather than helping some people upgrade to yachts while poking holes in the lifeboats of others. The danger is not theoretical. AI adoption is already translating into labor-market advantages: workers who use AI are seeing their

wages continue to rise.[124] More generally, employers are paying a premium for individuals with AI skills.[125] Those wage increases[126] and job opportunities will be unavailable to Americans from zip codes in which AI is slow to diffuse—regardless of whether that pace is the result of regulation, culture, or some combination of the two.

B. Address Proven Harms Through Iterative Intervention

A litany of explanations evidence why some communities have resisted AI or have otherwise lagged in its adoption. Cultural stances toward technology may be especially influential.[127] A glance at recent *New York Times* headlines suggests that general opposition to "big tech" has transferred over to the major AI labs. A guest essay in late April questioned whether AI companies could ever truly be good.[128] A story in June of 2025 adopted a similarly dour perspective.[129] More generally, a majority of Americans fault AI companies for a lack of transparency.[130] A large percentage (42%) also do not trust those companies.[131] Given this cultural background, it's unsurprising that Americans have resorted to violence and vandalism in opposition to AI.[132]

Geopolitical factors may also dictate popular attitudes around technology.[133] A "cult of the sciences" was pervasive during the Cold War.[134] Notwithstanding the aforementioned cultural headwinds associated with AI, this national security angle still resonates with the public in AI conversations. A recent poll conducted by Fathom demonstrated that people do not want to see the U.S. cede its lead on AI to an adversary.[135]

Economic conditions can additionally shape popular responses to technology. Reports of a technology contributing to income inequality surely do little to inspire members of less affluent communities to lean into the latest technological advances.[136] Fathom reports that large swaths of the public insist on humans remaining firmly entrenched in the economy—endorsing, in effect, limits on automation of certain tasks.[137]

Regulation may alter a community's relationship with a novel technology as well. At one extreme, prohibitions will prevent any sort of use—at least in theory.[138] In practice, it may simply direct people to less regulated means of accessing the technology.[139] New York is considering a law that would significantly prohibit AI tools from offering outputs related to several different licensed fields, spanning from law to therapy, engineering to veterinary science.[140] Occupational licensing tends to act like a tax on consumers,[141] which AI could lessen—an important outcome at a time of growing concerns over affordability.

A deeper analysis of a specific class of AI legislation—AI companions—provides a glimpse into the larger dearth of iterative, evidence-based AI policy. In Connecticut, for instance, the state legislature weighed banning minors from using AI companions that "prioritiz[e] validation of the user's beliefs, preferences or desires over factual accuracy or the user's safety."[142] The bill lacked any sort of sunset clause to ensure that it would not remain on the books if and when the technology improved, social norms shifted, or the evidence suggested that the law was not functioning as intended.

State officials eager to signal that they are not "repeat[ing] the same harmful mistakes that were made with social media" are acting as though this is a static policy environment.[143] First, unlike the boilers that could be clearly identified as the cause of steamboat explosions, the causal connection between use of AI and deterioration in mental health is far more tenuous.[144] As flagged by the American Psychological Association (APA): "Different adolescents may react to the same content in very different ways; individual differences—such as temperament, neurodiversity, exposure to stress or violence, social isolation, traumatic experiences, mental health, age, and/or exposure to socioeconomic or structural disadvantage can all affect adolescents' responses to content or online experiences."[145] The APA also concluded that "[t]he effects of AI on adolescent development are nuanced and complex; AI is not all 'good' or 'bad.'"[146]

Second, AI is non-deterministic, which means that "AI may exhibit a range of behaviors under the same input conditions."[147] This stochastic characteristic is a feature of AI, not a bug. Interference with an AI model to make it less biased[148] or otherwise perform in a certain fashion may alter the model in unanticipated ways, perhaps even deepening previously undetected biases.[149]

Third, at this early stage in AI development, a wide variance exists between the reliability and efficacy of different AI tools. Premature laws threaten to subject AI tools with unique risk profiles to the same set of laws. Pursuant to Oregon's newly-enacted AI law, for example, "AI companion" covers AI systems that "recognize emotion from input and that are designed to simulate a sustained, human-like platonic . . . relationship[.]"[150] Meta, for example, recently introduced new mechanisms to allow parents to review—at a high-level of abstraction—how adolescents are using Meta's AI tools.[151] These internal updates can move at a faster clip than the law and be tailored more easily to changes in the technology and user norms.

Engine, which surfaces policy priorities from a diverse portfolio of startups, determined that even a simple update to a privacy policy may incur a legal bill of thousands of dollars.[152] Even compliance with a single state's tech-related laws may result in a staggering amount of regulatory costs. California officials calculated the annual costs for a small business to comply with the state's primary privacy law at more than $16,000.[153] Given that startups have running operational budgets of $55,000,[154] all such compliance costs add up.

Fourth, and critically, there's a strong case to be made that AI

users today are the least savvy AI users that will ever engage with this novel technology. Paternalistic regulations—grounded in the idea of technological determinism or the idea that "technology is an independent force standing outside of culture and society"—may "absolve[] adult educational and public welfare institutions of responsibility."[155]

This incomplete overview provides a snapshot into the move-fast-and-regulate-things mindset that has taken hold in many states. Thousands of bills[156] have been introduced since the launch of ChatGPT in late 2022. This surge in regulatory activity would warrant fewer concerns if the bills were designed to evolve in response to the technology, economy, and culture. However, the vast majority of bills do not feature that sort of dynamic approach. The exceptions, such as a regulatory mitigation program in Utah, point a path forward.[157]

C. Generalize Effective Policy

The regulatory approach taken by many states will do little to assist with generalizing the best interventions. Absent robust efforts to understand and map the intersection of law, technology, and public values and norms, such laws will uncover inadequate evidence for how best to move forward.

A more promising approach is underway in Utah—specifically, its operation of a regulatory mitigation program. The Utah Office of AI Policy implements the program, which "is designed to clear regulatory hurdles and provide support for Utah companies using AI."[158] AI companies with customers in Utah may approach the state about deploying their tool with a menu of potential legal carrots: they may negotiate to receive exemptions from certain laws; they may specify maximum penalties should they violate any laws; they may be granted cure periods to remedy any potential illegal activity prior to enforcement; and, they may receive a safe harbor from certain suits and fines so long as they adhere to other mandates.[159] The stick takes the form of increased information sharing between the AI company and the Office. For example, in the context of a mitigation agreement reached between the Office and Doctronic, which expedites medication renewal for patients with chronic conditions, the state made clear that it would "rigorously evaluate the platform's clinical safety protocols, patient experience, and real-world effectiveness."[160]

Not all states need to copy and paste the Utah model. The test is the extent to which states develop formal mechanisms that allow for adaptive governance. If and when such mechanisms surface any definitive policy conclusions—such as categories of tools that do not align with the public's values—legislators can then translate them into more binding regulations, while still leaving room for reconsideration at some point in time.

V. Conclusion

The case for a try-first approach to AI governance does not rest on optimism about technology or indifference to its risks. It rests on evidence. The historical record examined in this paper is not a record of recklessness rewarded. It is a record of sequenced decision-making, imperfectly applied, that nonetheless produced gains in prosperity, mobility, and opportunity that more cautious alternatives would not have matched. The steamboat opened inland America. The railroad stitched it together. Both did so under governance frameworks that were belated, underfunded, and frequently misdirected — and still delivered transformative results. The lesson is not that governance does not matter. It is that governance imposed before the technology is understood, the harms are identified, and the institutions are capable of calcifying the wrong answers.

AI policymakers face a version of that choice right now. The surge in state-level AI legislation documented in Part IV shares more than a passing resemblance to the pattern Van Metre described in the railroad era: an unwholesome combination of good legislation, bad legislation, and no legislation, driven by public pressure rather than evidentiary readiness.[161] The AI companion laws proliferating across state legislatures — broad in definition, static in design, and bereft of sunset clauses or retrospective review — are the regulatory equivalent of targeting engineers rather than boilers. They address a visible symbol of concern rather than a demonstrated and measurable harm.

The correction is not deregulation. It is a sequence. Policymakers who want to protect the public from AI's genuine risks are more likely to succeed if they invest first in the institutional capacity to identify those risks with precision, design interventions that are revisable by design, and resist the temptation to generalize before the evidentiary base can support it. Utah's regulatory mitigation program represents one model for what that looks like in practice. It is not the only model. The test, as this paper has argued throughout, is not whether a state adopts a particular policy but whether it builds the adaptive governance infrastructure that makes any policy capable of learning.

America has navigated this before. The country did not arrive at functional steamboat regulation because Congress got it right in 1838. It arrived there because the framework eventually reasserted itself — because measurement caught up to deployment, evidence accumulated, and institutions, however slowly, developed the capacity to act on it. The question for AI is whether that process can be accelerated, or whether the current wave of anticipatory restriction will compress the learning that the framework requires. The historical record suggests the costs of getting that sequencing wrong are real, measurable, and lasting. Policymakers who have read this far now have less excuse than their predecessors for repeating the same mistakes.

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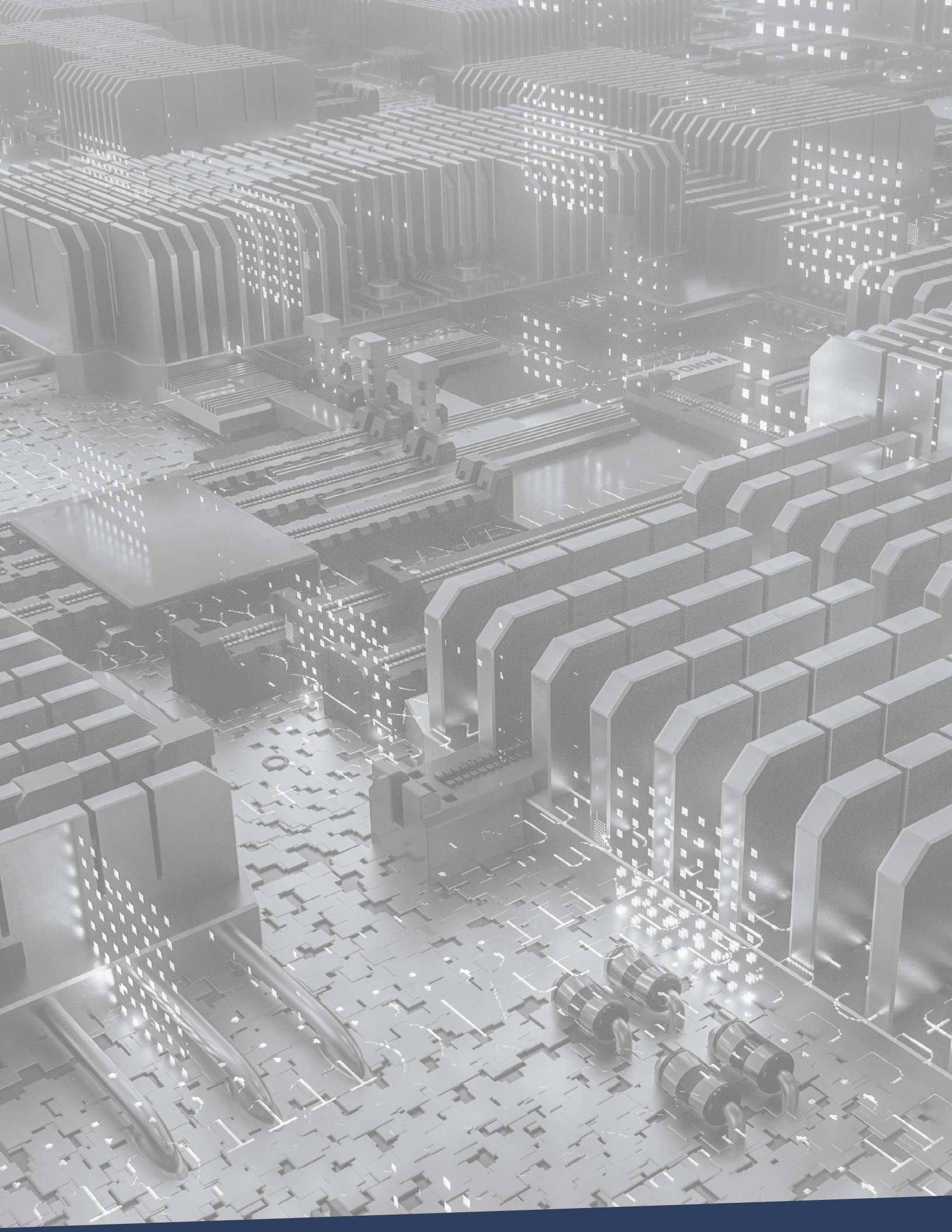

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